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Generativity is a Core Value of the ESJ: A Decade of Growth

Erik Erikson (1902-1994) was one of the great psychologists of the 20th century[1]. He explored the nature of personal human identity. Originally named Erik Homberger after his adoptive father, Dr. Theodore Homberger, he re-imagined his identity and re-named himself Erik Erikson (literally Erik son of Erik). Ironically, he rejected his adoptive father's wish to become a physician, never obtained a college degree, pursued independent studies under Anna Freud, and then taught at Harvard Medical School after emigrating from Germany to the United States. Erickson visualized human psychosocial development as eight successive life-cycle challenges. Each challenge was framed as a struggle between two outcomes, one desirable and one undesirable. The first two early development challenges were 'trust' versus 'mistrust' followed by 'autonomy' versus 'shame.' Importantly, he held that we face the challenge of **generativity** versus **stagnation in middle life**. This challenge concerns the desire to give back to society and leave a mark on the world. It is about the transition from acquiring and accumulating to providing and mentoring.

Founded in 2010, the European Scientific Journal is just reaching young adulthood. Nonetheless, **generativity** is one of our core values. As a Journal, we reject stagnation and continue to evolve to meet the needs of our contributors, our reviewers, and the academic community. We seek to innovate to meet the challenges of open-access academic publishing. For us,

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[1] Hopkins, J. R. (1995). Erik Homburger Erikson (1902–1994). *American Psychologist*, 50(9), 796-797. doi:http://dx.doi.org/10.1037/0003-066X.50.9.796

generativity has a special meaning. We acknowledge an obligation to give back to the academic community, which has supported us over the past decade and made our initial growth possible. As part of our commitment to generativity, we are re-doubling our efforts in several key areas. First, we are committed to keeping our article processing fees as low as possible to make the ESJ affordable to scholars from all countries. Second, we remain committed to fair and agile peer review and are making further changes to shorten the time between submission and publication of worthy contributions. Third, we are looking actively at ways to eliminate the article processing charges for scholars coming from low GDP countries through a system of subsidies. Fourth, we are examining ways to create and strengthen partnerships with various academic institutions that will mutually benefit those institutions and the ESJ. Finally, through our commitment to publishing excellence, we reaffirm our membership in an open-access academic publishing community that actively contributes to the vitality of scholarship worldwide.

Sincerely,

Daniel B. Hier, MD

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Risk-Based Asset Allocation in Factor Investing: Exploring the Inverse Factor Volatility Strategy

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Abstract

This study evaluates the effectiveness of the Inverse Factor Volatility strategy within the context of factor investing, comparing its performance to the conventional Risk Parity strategy. Using quantitative techniques, including portfolio construction and performance metrics analysis, this research employs data from five individual equities spanning the years 2000 to 2022. The methodology involves constructing portfolios based on Inverse Factor Volatility and Risk Parity principles and analyzing performance metrics, including mean returns, risk-adjusted returns, and drawdowns. The findings indicate that, compared to Risk Parity, Inverse Factor Volatility offers superior drawdowns, risk-adjusted returns, and mean returns. These results suggest that Inverse Factor Volatility may be a more effective strategy for portfolio management and could represent an advancement over traditional factor investing methods. The conclusions of this study hold significant implications for portfolio managers seeking to optimize their investment strategies.

Keywords: Quantitative Finance, Asset Allocation, Investment Performance, Risk Management, Portfolio Optimization

Introduction

Factor investing is central to contemporary portfolio management, presenting a methodical approach aimed at enhancing returns and diversification. This strategy involves fundamental characteristics known as factors—such as market size, value, and momentum—that significantly affect

asset returns. By concentrating on these factors, which have been extensively studied and documented in seminal research by Fama and French, portfolio managers strive to capture superior returns without proportionately increasing investment risk. For instance, Bessler et al. (2021) demonstrated that factor portfolios outperform sector portfolios over long-term horizons, providing higher returns with lower risk.

As the investment landscape evolves, factor investing strategies have also changed, giving rise to the Risk Parity (RP) strategy. Unlike traditional capital allocation approaches, RP strategies aim to generate a balanced risk contribution from each asset in a portfolio. The rationale is straightforward: by reducing the capital invested in higher-risk assets, the portfolio's overall vulnerability to market downturns can be mitigated. However, the Inverse Factor Volatility (IFV) strategy offers a novel contrast to RP. This strategy suggests that assets with lower volatility are predisposed to higher risk-adjusted returns—a principle known as the volatility anomaly. According to Shimizu and Shiohama (2020), IFV portfolios perform better than market-capitalization-weighted portfolios due to their ability to produce greater risk-adjusted returns, streamline risk management, and demonstrate global applicability. Thus, this study aims to evaluate the IFV method against the established RP strategy within the realm of factor investing. Therefore, the research seeks to determine whether the IFV strategy offers superior total returns and risk-adjusted returns compared to the RP strategy, and how their risk profiles, including volatility and drawdowns, differ.

Moreover, this study provides portfolio managers with tangible insights into the benefits of incorporating the IFV strategy into their investment decisions. This investigation employs a combination of historical data analysis from 2000 to 2022—a timeframe of significant market fluctuations and advancements in investment strategies—and performance metrics to provide a rigorous examination of these strategies.

In both academic research and industry practice, factor investing has become a central component of modern portfolio management, leveraging specific drivers of asset returns. The pioneering work of Fama and French (1992, 1993) laid the groundwork by isolating market risk, size, and value as key drivers in predicting stock returns. Their framework has since expanded, integrating elements such as profitability and momentum (Jegadeesh & Titman, 1993; Fama & French, 2015), each augmenting the model's predictive robustness. Although Ang (2014) makes a strong case for factor investing due to its risk-adjusted returns and diversification, there is a lack of clarity in this narrative on the limitations of these factors in different market conditions. Furthermore, there remains a gap in knowledge on the generalizability of these determinants across various asset classes, which this research attempts to fill.

Recent studies have emphasized the importance of multi-period portfolio optimization in enhancing investment strategies. Li et al. (2022) found that multi-period models achieve higher Sharpe Ratios and outperform their single-period counterparts in risk-adjusted performance, highlighting the benefits of considering multiple periods in portfolio optimization. This strategy uses sophisticated optimization techniques such as the successive convex program algorithm to improve portfolio management's efficiency and robustness (Li et al., 2022).

In addition to factor investing, the emergence of Risk Parity (RP) strategies has revolutionized traditional capital allocation based on market capitalization weights. Instead of distributing capital, RP aims to distribute risk equally among the different parts of a portfolio. This strategy has been the focus of much discussion and examination, notably by Ray Dalio of Bridgewater Associates and Qian (2016). While Qian (2016) argues that RP, as opposed to conventional market-capitalization-weighted portfolios, is a more equitable way to allocate risk, Bhansali et al. (2012) challenge this theory by pointing out that RP might not adapt well to changing asset correlations and volatility. This highlights an important research gap: a more sophisticated understanding of how adaptable RP is to systemic changes in the market.

Building on traditional RP strategies, Wu et al. (2020) introduced the General Sparse Risk Parity (GSRP) portfolio, which selectively allocates assets to achieve stable performance with lower transaction costs. According to the authors, the GSRP method guarantees a superior balance among performance criteria and is a cost-efficient approach to portfolio management. Although the GSRP portfolio's initial transaction costs were high, its profitability and cost-efficiency make it a valuable strategy for investors looking to minimize costs while maintaining robust performance (Wu et al., 2020).

Furthermore, with the introduction of the Hierarchical Risk Parity (HRP) technique, controlling tail risk-adjusted returns has shown tremendous potential, especially in the unpredictable cryptocurrency market. Burggraf (2021) showed that HRP works better than conventional risk-based asset allocation techniques, offering a superior trade-off between risk and return by skillfully allocating risk among portfolio components. This demonstrates how HRP may be used for more than only cryptocurrencies, highlighting its versatility and resilience in a range of market situations (Burggraf, 2021).

Additionally, Lee and Sohn (2023) discovered that integrated risk parity strategies offer consistent risk-return profiles, particularly in times of extreme volatility. Alpha factors and risk parity together can improve the performance and robustness of a portfolio, though the potential impact of fees and rebalancing costs should be considered.

On the other hand, the effectiveness of Inverse Factor Volatility (IFV) strategies has garnered attention for prioritizing lower-volatility assets to enhance portfolio performance. Strategies centered on less volatile assets have gained traction due to the volatility anomaly, with the theory that they can produce higher risk-adjusted returns (Blitz & Van Vliet, 2007). Clarke et al. (2006) further support this by showing how inverse volatility improves drawdowns and Sharpe Ratios. However, there is a dearth of research on directly comparing inverse volatility strategies to risk parity, especially regarding their performance during sharp market declines. This oversight offers an opportunity for this study to provide empirical support for the relative resilience of different approaches.

Risk management and volatility prediction have significantly improved as a result of recent developments in forecasting techniques. To improve volatility forecasting, Di Persio et al. (2023) developed hybrid models that fuse cutting-edge neural networks–specifically, GRU and LSTM–with traditional statistical techniques, such as GARCH. These hybrid models provide more accurate and reliable risk-controlled investing methods by better capturing volatility clustering. When adopting risk parity methods in turbulent market conditions, this incorporation of machine learning approaches delivers a significant improvement in forecasting accuracy (Di Persio et al., 2023).

Furthermore, Bellini et al. (2021) proposed the use of expectiles as a novel risk measure for risk parity portfolios. Compared to typical volatility metrics, expectile-based risk parity portfolios offer more stability and comprehensive evaluations. This strategy is a major development in the field of factor investing since it increases the precision of risk management and portfolio optimization (Bellini et al., 2021).

Costa and Kwon (2022) explored distributionally robust risk parity portfolios, finding that they yield superior risk-adjusted returns and are resilient in various market conditions. Distributional robustness can improve portfolio performance and optimization, although higher turnover rates might increase transaction costs.

Choi et al. (2021) demonstrated that diversified reward-risk parity strategies produce higher returns and reduced downside risks. Implementing diversified reward-risk measures can optimize portfolio performance, though these strategies are sensitive to model inputs and can be complex in high-dimensional spaces.

While factor investing and risk parity are well-documented in the literature, research on the application of inverse volatility methods within factor investing remains comparatively scarce. The present literature calls for an empirical investigation to discern the comparative effectiveness of risk parity and inverse volatility strategies across extensive time horizons and market conditions. By comparing these strategies over a two-decade period,

this research attempts to close these gaps by providing insights into their performance, risk profiles, and suitability for investors seeking to improve their factor investing techniques.

In a section on emerging markets, Stankov et al. (2024) highlighted that cost mitigation strategies improve factor investing performance. Implementing factor-based methods in less liquid markets requires effective cost management, however, recent reductions in risk premia should be considered.

Furthermore, Dong et al. (2020) introduced the willow tree method, which offers effective risk management and valuation for variable annuities. Improved methods for evaluating complex financial products can improve pricing precision and risk management, although their wider applicability may be limited by their emphasis on stochastic models.

Neisy and Bidarvand (2019) found that effective techniques for estimating volatility enhance the precision of American option pricing. Better pricing models contribute to more accurate hedging and risk management, despite high computational demands and specific model assumptions.

Methods
Data Collection
This study incorporated five stocks: Johnson & Johnson (JNJ), Apple Inc. (AAPL), Chevron Corporation (CVX), UnitedHealth Group Inc. (UNH), and JPMorgan Chase & Co. (JPM). Historical stock prices and trading volumes from 2000 to 2022 were sourced from Yahoo Finance, renowned for its comprehensive financial data. In addition to these primary data, the market risk premium (MktRF), size premium (SMB), and value premium (HML) statistics from the Fama-French three-factor model were obtained from the Tuck School of Business at Dartmouth College's official website. This integration of data provided a robust foundation for subsequent analysis.

Data Processing
Following collection, the data underwent a systematic normalization process to ensure consistency and comparability across different time frames. Dates were standardized to the appropriate R data type, and any superfluous columns were excluded to streamline the dataset. To facilitate long-term investment analysis, monthly returns were converted to an annualized format, and annualized standard deviations were calculated to accurately measure performance volatility.

Portfolio Construction
A dualistic portfolio construction methodology was adopted. Initially, the Risk Parity (RP) portfolio was formulated by calculating the real risk

contribution of each asset, subsequently adjusting the capital allocation to equalize the risk contribution following the risk parity principle. Conversely, the Inverse Factor Volatility (IFV) portfolio was constructed based on the inverse volatilities of the identified Fama-French factors. By normalizing these inverse volatilities to sum to unity, a portfolio was established where each asset's weight was inversely proportional to its factor volatility.

Performance Measurement Techniques

Performance evaluation was multi-faceted, incorporating various metrics to provide a comprehensive assessment. The Welch Two Sample T-test was employed to statistically analyze the mean returns differences between the RP and IFV portfolios. Annualized returns provided insight into Long-term performance, while the Sharpe Ratio offered a measure of risk-adjusted returns. The combined returns yielded information about the overall growth of the portfolios, while the annualized standard deviations offered a risk assessment. Additionally, a drawdown analysis was conducted to observe potential losses and portfolio resilience during market downturns.

Analytical tools

The analysis leveraged the statistical capabilities of R programming, utilizing specialized packages such as xts for time-series management, quantmod for financial data manipulation, Performance Analytics for calculating performance and risk metrics, and openxlsx for exporting results to Excel. This toolkit enabled a thorough examination of the data, ensuring the validity and precision of the study's conclusions.

Hypothesis testing

To rigorously determine the comparative efficacy of the Inverse Factor Volatility (IFV) and Risk Parity (RP) strategies, we posited and tested a series of hypotheses. These hypotheses were grounded in three pivotal areas: overall returns, risk-adjusted returns as gauged by the Sharpe Ratio, and the portfolio risk profile measured by volatility.

Hypothesis on Overall Returns:

H0 (Null Hypothesis for Returns): The mean return of the IFV Portfolio is less than or equal to the mean return of the RP Portfolio.

H1 (Alternative Hypothesis for Returns): The IFV Portfolio achieves significantly higher mean returns compared to the RP Portfolio.

Hypothesis on Risk-Adjusted Returns:

H0 (Null Hypothesis for Risk-Adjusted Returns): The Sharpe Ratio of the IFV Portfolio is less than or equal to the Sharpe Ratio of the RP Portfolio.

H2 (Alternative Hypothesis for Risk-Adjusted Returns): The Sharpe Ratio of the IFV Portfolio is greater than the Sharpe Ratio of the RP Portfolio.

Hypothesis on Portfolio Risk:
        H0 (Null Hypothesis for Portfolio Risk): The volatility (standard deviation) of the IFV Portfolio is greater than or equal to the volatility of the RP Portfolio.
        H3 (Alternative Hypothesis for Portfolio Risk): The volatility (standard deviation) of the IFV Portfolio is less than the volatility of the RP Portfolio.

Results
Welch Two Sample t-test

Metric	Value
t-value	-2.6051
Degress of Freedom (df)	444.99
p-value	0.009492
Mean of RP Portfolio (x)	-0.003827228
Mean of IFV Portfolio (y)	0.003262424
95% CI Lower Bound	-0.012438149
95% CI Upper Bound	-0.001741155

Table 1: Risk Parity Portfolio and IFV Portfolio Welch Two Sample t-test

The Welch Two Sample t-test was used to statistically analyze the difference in mean returns between the RP and IFV portfolios. The Welch Two Sample t-test yielded a significant p-value of 0.009492 and a t-value of -2.6051, with degrees of freedom estimated at 444.99, indicating a statistically significant difference between the portfolios' mean returns. The p-value, lower than the traditional alpha threshold of 0.05, suggests a statistically significant difference between the mean returns of the IFV and RP portfolios, The negative t-value indicates that the RP portfolio had a worse mean return (-0.003827228) than the IFV portfolio (0.003262424).

        In addition, the 95% confidence range for the mean difference, which spans from -0.012438149 to -0.001741155, does not include zero, supporting the conclusion that the IFV approach yields higher returns than the RP strategy and that the mean returns are considerably different. This result is consistent with the alternative hypothesis (H1) that was put forth regarding returns. It implies that the IFV technique may provide a better return profile than the conventional RP approach, rather than just a different one. These findings suggest that, in terms of mean returns, the IFV strategy should be preferred over the RP method.

Performance Metrics

RP			IFV		
Annualized Returns	Annualized SD	Sharpe Ratio	Annualized Returns	Annualized SD	Sharpe Ratio
-0.053414351	0.134991537	-0.140595119	0.036579845	0.079416444	0.070264083

Table 2: Risk Parity (RP) and Inverse Factor Volatility (IFV) portfolio performance metrics

Through the lens of the outlined research hypothesis, we scrutinize the portfolios across multiple dimensions: annualized returns, risk-adjusted returns via the Sharpe Ratio, and overall risk through annualized standard deviation.

At the forefront, the annualized return provides a stark contrast between the two strategies. The IFV portfolio's annualized return stands at a robust +3.66%, a significant departure from the RP portfolio's -5.34%. This disparity not only suggests that the IFV strategy yields higher returns than the RP strategy but also captures the conversion of losses into gains. This is consistent with our first alternative hypothesis (H1), which proposed that the IFV portfolio would produce a higher mean return than the RP portfolio.

Diving deeper into the risk-adjusted performance, the Sharpe Ratio reveals a telling narrative. The RP portfolio's Sharpe Ratio performs poorly, at -0.1406, signaling underperformance relative to a risk-free investment. On the other hand, the IFV portfolio, with its Sharpe Ratio of 0.0703, exemplifies a positive excess return over the risk-free rate. This result validates our second alternative hypothesis (H2), which states that superior risk-adjusted returns would be indicated by a larger Sharpe Ratio for the IFV portfolio than for the RP portfolio.

Turning to volatility, we measure the portfolio's risk via annualized standard deviation (SD). The IFV portfolio has a lower annualized standard deviation (SD) of 7.94%, juxtaposed with the RP portfolio's higher volatility of 13.50%. This reduction in volatility not only indicates a diminution of risk but also supports our third alternative hypothesis (H3), indicating that the IFV strategy is characterized by lower volatility than its RP counterpart.

In conclusion, the performance metrics analysis evidence that the Inverse Factor Volatility strategy appears to outperform the Risk Parity approach across all examined metrics. The IFV strategy delivered higher returns, exhibited superior risk-adjusted performance, and maintained lower volatility. This strong performance across various timeframes provides evidence to support the effectiveness of the IFV strategy, aligning with our alternative hypotheses.
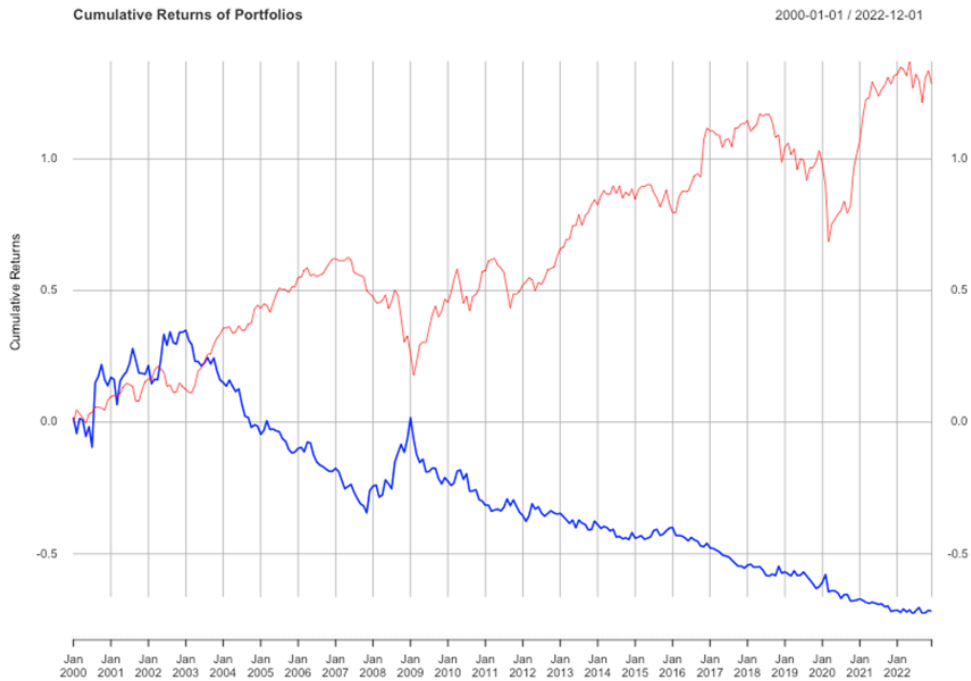
Cumulative Returns

Figure 1: Risk Parity and IFV portfolios cumulative returns

Figure 1 presents a comparative analysis of cumulative returns for the RP and IFV investment strategies for 22 years, from January 2000 to January 2022. The Risk Parity (RP) portfolio and the Inverse Factor Volatility (IFV) portfolio are depicted by blue and red lines, respectively. This visual representation allows for an immediate, intuitive grasp of the strategies' performance over time.

The RP portfolio, marked by the blue line, exhibits an overall decreasing trend, culminating in a negative cumulative return by the end of the analyzed period. This performance not only suggests a persistent underperformance in comparison relative to the zero-return baseline but also hints at the strategy's vulnerability, especially during market downtrends. Such patterns suggest that the RP strategy might not have consistently mitigated risk as anticipated.

Contrastingly, the trajectory of the IFV portfolio, illustrated by the red line, demonstrates a resilience that aligns with the theoretical expectations. After a period of initial fluctuation—common in investment portfolios—the IFV strategy started to rise steadily from 2003 onward. Despite encountering occasional setbacks, the IFV portfolio displays a remarkable recovery capability, ultimately achieving a positive cumulative return. This pattern affirms our statistical findings of a higher mean return for the IFV strategy.

Particularly telling is the behavior of both portfolios during episodes of market stress. The RP portfolio experiences sharp declines, while the IFV portfolio exhibits relative stability with quicker recoveries. This divergence is most telling of the strategic resilience each methodology offers, echoing our T-test results that favored the IFV strategy's mean performance.

Furthermore, the IFV portfolio's superior performance is reinforced by its positive Sharpe Ratio, which stands in testament to its commendable risk-adjusted returns. The less volatile path of the IFV portfolio, suggested by the smoother incline of the red line, is congruent with the strategy's lower annualized standard deviation, a forecast that the IFV strategy inherently bears less risk than the RP strategy.

Ultimately, the graphical examination of cumulative returns offers a strong visual endorsement of the theories put forward concerning the superiority of the IFV method over the RP technique. It illustrates not only an impressive return profile but also a strategic robustness in risk management. The empirical data, coupled with this graphical analysis, underscores the potential of the IFV strategy to enhance portfolio construction and management through tumultuous and tranquil market periods alike.

Drawdowns
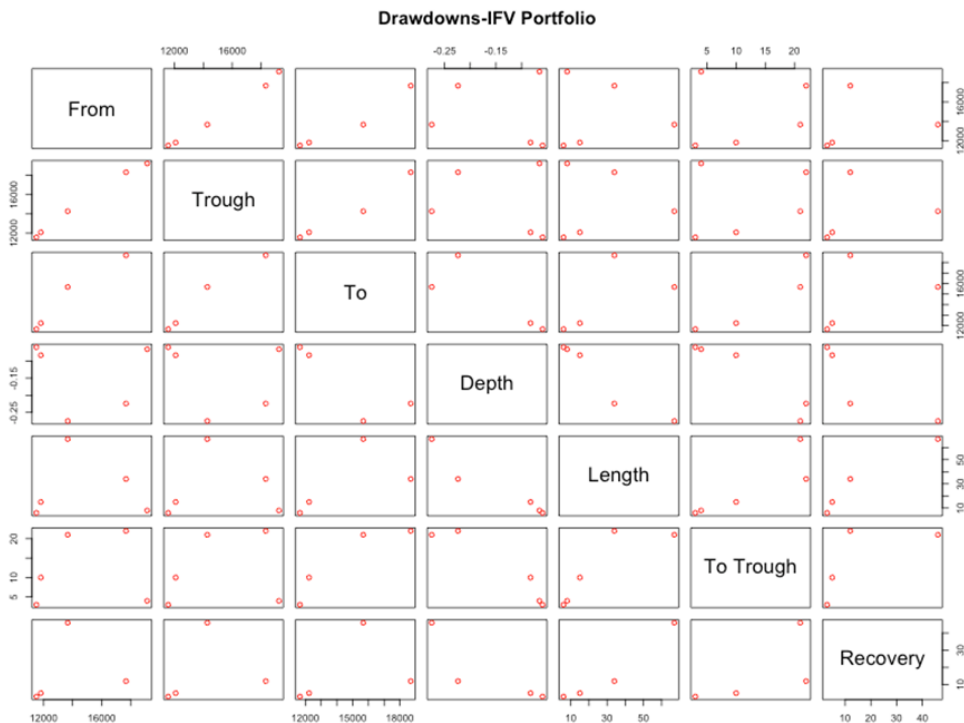
Figure 2: Drawdowns IFV Portfolio
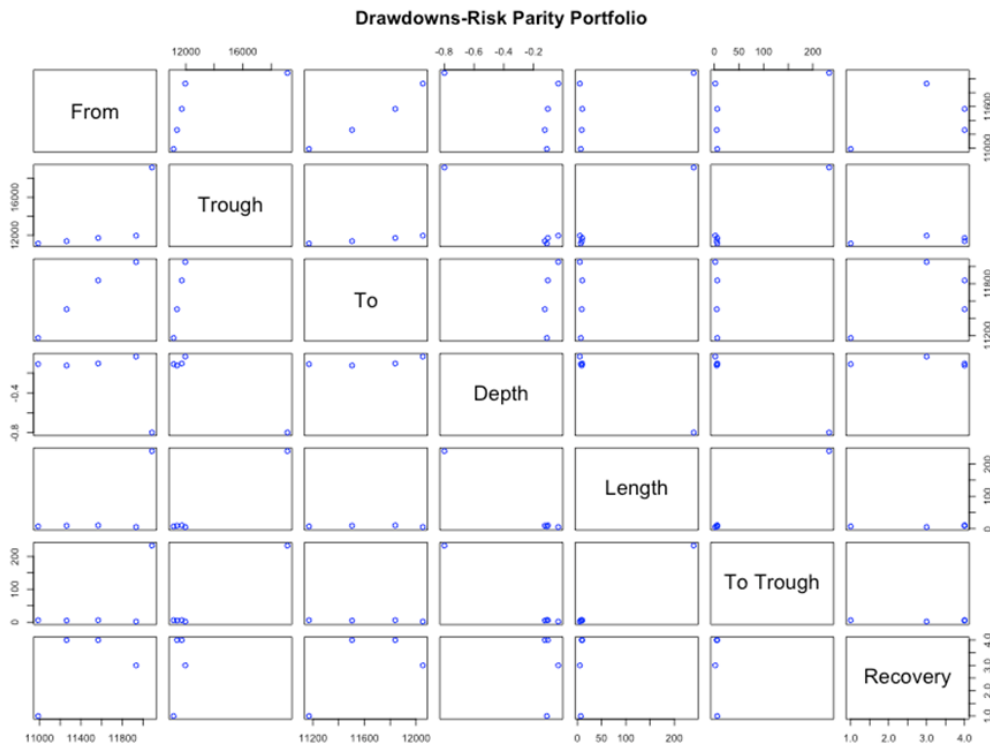
Figure 3: Drawdowns Risk Parity portfolio

Figure 2 and Figure 3 provide a detailed comparison of the drawdown profiles of the RP and IFV portfolios, respectively. These profiles are critical for understanding the extent and duration of losses that each portfolio could potentially experience from their peak values to their lowest during the investment period.

The IFV portfolio's drawdown graph (Figure 2) reveals a pattern of relatively modest declines, seldom exceeding a 15% drop. Both the length of these drawdowns and the recovery period seem to be quite short, indicating that the IFV method is effective in preventing losses and promoting a speedier recovery. The aggregation of data points toward lesser drawdowns underscores the IFV portfolio's robust performance, which is consistent with its notable cumulative returns and reduced volatility levels.

In contrast, the drawdown graph of the RP portfolio displays more profound drawdowns, with depths up to 80%. The graph's points are more widely distributed, which suggests that there is greater variation in the drawdowns' duration and depth as well as in the recovery times. This unpredictability is consistent with the higher volatility and negative cumulative returns previously mentioned, indicating that the RP portfolio is more prone to larger changes and might take longer to recover from losses.

The contrasting drawdown profiles yield insights that extend beyond mere performance metrics. The drawdown profiles support the theories that the IFV strategy not only generates larger returns but also does so with a more favorable risk profile when these findings are combined with the previous performance measures and t-test analysis. The IFV strategy's ability to deliver higher risk-adjusted returns is further substantiated by its shorter and shallower drawdowns, echoing the positive findings from our Sharpe Ratio analysis. Conversely, the RP portfolio's deeper and more prolonged drawdowns are reflective of its negative Sharpe Ratio and underscore a performance that has not met risk-adjusted return benchmarks.

The culmination of our drawdown analysis affirms the IFV strategy's superior performance relative to the RP approach. This is evidenced not only by higher returns but also by a robust drawdown profile characterized by resilience and swift recovery from market downturns. The findings from Figures 2 and 3 bolster the assertion that the IFV strategy may be a more effective tool for risk-based asset allocation, providing investors with both enhanced returns and a fortified defense against market volatility.

Discussion

This study critically examines the Inverse Factor Volatility (IFV) strategy in comparison to the traditional Risk Parity (RP) approach, with a focus on enhancing factor investing. We conducted a thorough investigation of the drawdown characteristics, risk-adjusted performance, and returns of both strategies over an extended period, and we have gained insights into the strengths and weaknesses of each strategy.

Statistical analysis using the T-test demonstrated that the IFV strategy significantly outperformed the RP strategy in terms of average returns, a finding corroborated by a p-value that significantly fell below the accepted alpha threshold. This superior performance of the IFV strategy was further evidenced by its positive Sharpe Ratio, indicating better risk-adjusted returns in contrast to the RP strategy's negative ratio. These findings are consistent with the research on factor investing, which suggests that strategies that leverage particular risk factors can outperform conventional market-cap-weighted portfolios in terms of excess returns (Fama & French, 1993; Carhart, 1997).

In examining drawdown behaviors, the IFV strategy exhibited a distinct advantage, characterized by its less severe losses and quicker recoveries. Such a performance profile, marked by shorter and shallower drawdowns, is particularly advantageous for risk-averse investors or those with shorter investment horizons, underscoring the strategy's capacity to maintain stability during market volatility. Although the RP method has long

been praised for its benefits in diversification, a larger annualized standard deviation suggested heavier drawdowns and a higher overall risk.

The IFV strategy may be attributed to its strategic allocation, which inversely corresponds to factor volatilities and potentially capitalizes on the mean-reversion of factor returns. The equal weighting of asset risk in the RP strategy, on the other hand, might not be as sensitive to movements in the market, increasing exposure during times of high volatility in particular asset classes. The findings highlight the importance of strategy selection in managing portfolio risk, especially during volatile periods, suggesting that the IFV approach may offer a compelling alternative for investors focused on optimizing risk-adjusted returns.

These discoveries have important ramifications for investors. Particularly in volatile market situations, the IFV approach may offer a more enticing risk-return profile because of its lower volatility and drawdown characteristics. If investors aim to optimize their returns while managing risk, the IFV strategy might be a strong substitute for conventional RP portfolios. Nevertheless, as past performance is not necessarily a reliable predictor of future outcomes, investors should also take overfitting into account and emphasize the value of out-of-sample research.

In conclusion, the research offers empirical backing for the IFV approach as a possible way to improve factor investing. It emphasizes how crucial it is to consider both returns and the risk associated with different investing techniques. These observations provide a useful foundation for investors seeking higher risk-adjusted returns and add to the expanding body of research on sophisticated asset allocation strategies.

Conclusions

This investigation demonstrates that the Inverse Factor Volatility (IFV) strategy significantly enhances factor investing, outperforming the conventional Risk Parity (RP) strategy in terms of higher mean returns, optimized risk-adjusted performance, and resilient drawdown profiles. These findings underscore the substantial impact of advanced asset allocation strategies in achieving the dual objectives of maximizing returns and managing risk effectively.

Moreover, this study combines data analysis from 2000 to 2022—a period marked by significant market fluctuations and advancements in investment strategies—with thorough performance indicators. The study's important ramifications lie in demonstrating how sophisticated factor-based techniques, such as IFV, can significantly enhance risk management and portfolio performance.

For investors and portfolio managers, adopting the IFV strategy may offer a forward-thinking approach to portfolio management, proving

particularly effective in markets characterized by uncertainty and volatility. The dynamic nature of the IFV strategy—prioritizing inverse volatility weighting—presents a versatile tool adaptable to varying market conditions and capable of mitigating potential losses more effectively than the traditional RP strategy.

However, while the study's findings are compelling, they are not exhaustive. Future research should broaden the analysis scope to encompass diverse asset classes and market environments. Examining the IFV strategy's performance, accounting for liquidity constraints and transaction costs will provide a more comprehensive view of its practical applicability. Integrating the IFV strategy with other factor-based investment frameworks, such as those combining alpha factors or utilizing hybrid forecasting methods, could reveal synergistic effects worth exploring.

Additionally, conducting stress tests and out-of-sample testing to examine the IFV strategy is recommended, especially to assess its endurance against extreme market scenarios. Moreover, incorporating advanced optimization techniques, as suggested by recent studies, can further refine the strategy. These future investigations will refine our understanding and potentially cement the role of the IFV strategy in the investment landscape, providing investors with a robust tool for achieving superior risk-adjusted returns.

Data availability: All of the data are included in the content of the paper.

References:
1. Ang, A. (2014, August 1). Asset Management: A Systematic Approach To Factor Investing. *Oxford Academic*. https://academic.oup.com/book/3342
2. Qian, E. E. (2016). Risk parity fundamentals. *Chapman & Hall/CRC*.
3. Bellini, F., Cesarone, F., Colombo, C., & Tardella, F. (2021). Risk Parity with Expectiles. *European Journal of Operational Research, 291*(3), 1149–1163. https://doi.org/10.1016/j.ejor.2020.10.009
4. Bhansali, V., Davis, J., Dorsten, M. P., & Rennison, G. (2012). The Risk in Risk Parity: A Factor-Based Analysis of Asset-Based Risk Parity. *Journal of Investing, 21*(1), 102–110. https://doi.org/10.3905/joi.2012.21.3.102
5. Bessler, W., Taushanov, G., & Wolff, D. (2021). Factor Investing and Asset Allocation Strategies: A Comparison of Factor Versus Sector

Optimization. *Journal of Asset Management, 22*(6), 488–506. https://doi.org/10.1057/s41260-021-00225-1

6. Blitz, D., & Van Vliet, P. (2007, April 17). The volatility effect: Lower risk without lower return. SSRN. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=980865

7. Burggraf, T. (2021). Beyond Risk Parity – A Machine Learning-Based Hierarchical Risk Parity Approach on Cryptocurrencies. *Finance Research Letters, 38*, 101523. https://doi.org/10.1016/j.frl.2020.101523

8. Choi, J., Kim, H., & Kim, Y. S. (2021). Diversified Reward-Risk Parity in Portfolio Construction. *Social Science Research Network*. https://doi.org/10.2139/ssrn.3871944

9. Clarke, R. G., De Silva, H., & Thorley, S. (2006). *Minimum-Variance Portfolios in The U.S. Equity Market. Journal of Portfolio Management, 33*(1), 10–24. https://doi.org/10.3905/jpm.2006.661366

10. Costa, G., & Kwon, R. (2020). Data-Driven Distributionally Robust Risk Parity Portfolio Optimization. *Social Science Research Network*. https://doi.org/10.2139/ssrn.3709680

11. Di Persio, L., Garbelli, M., Mottaghi, F., & Wallbaum, K. (2023). Volatility Forecasting with Hybrid Neural Networks Methods for Risk Parity Investment Strategies. *Expert Systems With Applications, 229*, 120418. https://doi.org/10.1016/j.eswa.2023.120418

12. Dong, B., Xu, W., Sevic, A., & Sevic, Z. (2020). Efficient Willow Tree Method for Variable Annuities Valuation and Risk Management. International Review of Financial Analysis. *International Review of Financial Analysis, 68*, 101429. https://doi.org/10.1016/j.irfa.2019.101429

13. Fama, E. F., & French, K. R. (1992). The Cross-Section of Expected Stock Returns. *The Journal of Finance, 47*(2), 427–465. https://doi.org/10.2307/2329112

14. Fama, E. F., & French, K. R. (1993). Common Risk Factors in the Returns on Stocks and Bonds. *Journal of Financial Economics, 33*(1), 3–56. https://doi.org/10.1016/0304-405X(93)90023-5

15. Fama, E. F., & French, K. R. (2015). A Five-Factor Asset Pricing Model. *Journal of Financial Economics, 116*(1), 1–22. https://doi.org/10.1016/j.jfineco.2014.10.010

16. Jegadeesh, N., & Titman, S. (1993). Returns to Buying Winners and Selling Losers: Implications for Stock Market Efficiency. *The Journal of Finance, 48*(1), 65–91. https://doi.org/10.1111/j.1540-6261.1993.tb04702.x

17. Lee, T. K., & Sohn, S. Y. (2023). Alpha-Factor Integrated Risk Parity Portfolio Strategy in Global Equity Fund of Funds. *International*

Review of Financial Analysis, 88, 102654. https://doi.org/10.1016/j.irfa.2023.102654

18. Li, X., Uysal, A. S., & Mulvey, J. M. (2021). Multi-Period Portfolio Optimization Using Model Predictive Control with Mean-Variance and Risk Parity Frameworks. *European Journal of Operational Research, 299*(3), 1158–1176. https://doi.org/10.1016/j.ejor.2021.10.002

19. Neisy, A., & Bidarvand, M. (2019). An Inverse Finance Problem for Estimating Volatility in American Option Pricing Under Jump-Diffusion Dynamics. *Journal of Mathematical Modeling, 7*(3), 287–304. https://doi.org/10.22124/jmm.2019.13082.1258

20. Stankov, K., Schiereck, D., & Flögel, V. (2024). Cost Mitigation of Factor Investing in Emerging Equity Markets. *Journal of Asset Management*. https://doi.org/10.1057/s41260-024-00353-4

21. Shimizu, H., & Shiohama, T. (2020). Constructing Inverse Factor Volatility Portfolios: A Risk-Based Asset Allocation for Factor Investing. *International Review of Financial Analysis, 68*, 101438. https://doi.org/10.1016/j.irfa.2019.101438

22. Wu, L., Feng, Y., & Palomar, D. P. (2020). General Sparse Risk Parity Portfolio Design Via Successive Convex Optimization. *Signal Processing, 170*, 107433. https://doi.org/10.1016/j.sigpro.2019.107433

Tourist itineraries for Sustainable Mobility: an application in the Salento Area (Italy)

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Abstract

The purpose of this work is to define the design process, implemented through an analytical methodology, of two sustainable mobility tourist routes in a specific area of southern Italy (Salento); methodology applicable to other territorial realities. This design process was developed in the context of the 2014/2020 Interreg V-A Greece-Italy cross-border cooperation strategic project called "AI SMART_Adriatic Ionian Small Port Network". It takes into account the analysis of existing Plans and Programs at different levels (Sustainable Mobility Urban Plans; cycling routes; Territorial Plans, etc.), the analysis of statistical data in the area related to employment and tourism; the interlocution with key stakeholders, the analysis of architectural, landscape and food and wine surpluses. These routes have been defined for the interaction of the port of Otranto with the hinterland territories and with the opposite Ionian coast to promote the sustainable and inclusive transnational tourist fruition of the Apulian territory. The genesis of the two thematic itineraries stems from the need/willingness to valorise some areas of Salento through the connection of significant nodes in terms of landscape, architectural and historical value, which define two routes with Pulsano and Otranto as their vertices. The project brings together the potential of the Salento as an area with a strong tourist value, with the theme of sustainable mobility, suggesting the seasonality of travel of each, to meet the needs of deseasonalization of an area with a high summer and seaside tourism vocation.

Keywords: Sustainable mobility, sustainable tourism, territorial development, internationalisation, deseasonalisation

Introduction

The events of the last few years, first because of the COVID-19 pandemic and then because of the latest war events in Ukraine, which involve us closely, have put a strain on people's livability, in cities as well as in remote areas and small towns. Now, therefore, more than ever, Europe and the world need to feel connected and close, also thanks to the development of sustainable mobility. A more connected world is a more accessible and open world. Connecting infrastructures that cross sovereign borders acquire special properties, a life of their own and become more than just motorways or high-voltage lines. They become shared services (Khanna, 2016).

More than one third of EU citizens live and work in European border regions (European Commission, 2015). In the last 20 years, border areas have gained importance (Fadigas, 2010, 2015; Castro and Alvarez, 2015; Castanho et al., 2016) and cross-border cooperation (CBC), has helped to overcome and solve important political, economic, environmental and socio-cultural issues (Nave and Franco, 2021).

Furthermore, in recent years, the aim of countries is to encourage sustainable mobility, in particular by (1) "avoiding unnecessary transport volumes, (2) changing transport regulations and practices and/or (3) improving the carbon efficiency of transport systems" (Griffiths et al., 2021). Administrative borders also create barriers associated with cross-border mobility, and efficient cross-border transport can be crucial in reducing the barrier effect on citizens' mobility and increasing the territorial integration of the European Union (EU). We can consider different types of constraints. According to Nijkamp et al. (1990), these can be 'physical' barriers (mountains, rivers, artificial walls), 'technical' (incompatibility between the railway systems of different countries) and 'cultural, linguistic and information', 'congestion' (discrepancy between supply and demand), 'fiscal' (visa costs), 'institutional' (costs of crossing a border between different jurisdictions).

Awareness of the strategic role of the tourism industry, as an instrument capable of exerting a driving force for the economy, with consequent positive externalities also for employment, can be seen in the succession of public interventions in this sector (Carlucci et al., 2012). Evidence of this can also be seen in the commitment shown by the European Territorial Cooperation Programmes that have invested substantially in the tourism sector, always associated with the term sustainable (Synthesis Report 2021 on Italian participation in the European Territorial Cooperation Programmes, ENI and IPA II 2014/2020).

Attention to sustainability is also associated with the terms of deseasonalisation because an increase in the rate of exploitation of a natural, environmental or landscape resource for tourism purposes leads to a deterioration in the quality of the resource itself. In the presence of a demand with preferences characterised by an aversion to crowding (Butler, 1991), it becomes fundamental to be able to identify what is the optimal degree of exploitation, that is, that level of tourist use that reconciles commercial profitability and maintenance of the qualitative integrity of the available natural resources.

It is accepted in the literature that, the market mechanism does not spontaneously lead to choices that are sustainable over time (Candela, 2010), which is why the intervention of the policy maker is necessary and should take place with a view to mobilising local actors and concerting the strategies to be pursued, interest groups, in order to guarantee success in terms of the feasibility of the chosen policy actions. It is worth mentioning that the transportation sector is one of the top five most polluting factors. It is worth noting that much research has shown the close relationship between transport pollution and its toxicity (Kurac et al., 2021; Tucki et al., 2019). In particular, approximately 40 per cent of all air eutrophication comprises the share of land motor transport (Markowska et al., 2021; Bazhinov et al., 2022). Strategic Interreg V-A Greece-Italy cross-border cooperation project 2014/2020 called "AI SMART_Adriatic Ionian Small Port Network", managed by the Apulia Region, aims at the implementation and development of a common port network in the Adriatic-Ionian area; this network is based on the concept of "smart, green and integrated port" and oriented to connect the small ports of the cross-border countries involved. In the context of this project the present work aims to recount the project path and the methodology applied for the definition of two itineraries aimed at the interaction of the port of Otranto with the territories of the Salento hinterland with the opposite Ionic coast. It also aims at systematising the need for sustainable mobility in an area of southern Italy (Salento), characterised by a scarce offer of transport services, with the territorial valorisation, encouraging the sustainable and inclusive transnational tourist fruition of the Apulian territory. The genesis of the two thematic itineraries stems from the need/willingness to enhance certain areas of the Salento, through the connection of significant nodes in terms of landscape, architectural and historical value, which define two routes with Pulsano and Otranto as their vertices. The two thematic itineraries are of considerable interest both in the towns (emergencies) identified, and in the routes connecting them, as the connecting routes have considerable appeal in terms of the valuable offerings offered by the local vegetation (olive groves and vineyards), as well as in the typical urban elements (dry-stone walls, historic farms, Salento trulli).

The effort made was to systematise these remarkable emergencies with multiple vocations, systematising them along two different paths. Systematising what has in fact always existed but is now present in a disaggregated and uneven manner, bringing out the potential of the sum of the excellences. Two structured thematic routes were therefore defined, for which both the transport and accessibility offer and the cultural offer present were fine-tuned. Planning must aim to identify strategies that reconcile the development of competitive tourism activitieŝ and ensure the attractivenesŝ of territories and the preservation of their natural and cultural resources, while promoting their adequate accessibilitỳ (Bergantino et al., 2021). The topic of sustainable mobility in rural areas or small towns and villages has always received less attention from planners and politicians than in densely populated areas. This means that the transport offer in these types of areas is mostly limited to a few (low-frequency) public bus services and few or no railway stations serving citizens. This overall picture leads to the synthesis that for the most part the local population is inclined, if not forced, to use the car for all needs and movements, effectively making citizens dependent on this private means of transport for any type of activity (work, leisure, education, etc.). Actions and policies to improve mobility in these areas act as a lever for change and as an added value for economic, social and tourism development and act as a multiplier of development, in a transversal and inclusive way.

Furthermore, we know that in small centres it is not true that all residents have a private car. Indigents, the elderly, the disabled and the very young are not able to own or drive a car, and the social conditioning due to this inability to provide for their own movement is very strong in terms of the commitment of those who provide care for their families and neighbours. If this is true for local residents, another argument must be made in terms of inclusiveness for the mobility of travellers.

On the other hand, for small centres, being equipped with good connection infrastructures becomes an indispensable prerogative to be able to welcome visitors, travellers and tourists. A prerequisite for any good planning result, related to sustainable mobility, is to involve the local population, public and private actors, the elderly, young people, businesses, women, taking into account their specific needs and the possible solutions that may emerge from collective confrontation.

After an introduction and a context analysis, the article highlights the benchmarking of some new sustainable transport modes, and then goes into the methodology adopted and the rationale behind the design of the two tourist routes described in section 4 of this paper. The conclusions are reported in section 5 of the paper.

Context analysis

The context analysis examines, albeit briefly in this section, socio-economic data, local planning, the offer of existing services and connection infrastructures, the cultural and landscape offer, local food and wine, and the organisation of other routes and dedicated roads

For the socioeconomic analysis, with 3,926,931 inhabitants on 1 January 2021, Apulia is the eighth most populous region in Italy. A total surface area of approximately 19,540.52 km2 means that the population density stands at 200.96 inhabitants per km2, a value that is intermediate in the national picture (the average Italian value on 1 January 2021 is 196 inhabitants/km^2). The female demographic component prevails slightly over the male, at 51.3% of the total regional population. The consolidated data for the period 2001-2019 show a decreasing demographic trend, with the trend becoming particularly intense in the period 2014-2019, which is also confirmed in the provisional data as at 1 January 2021. Focusing on some of the sectors most directly related to tourism, in 2018 in Apulia there were 9,487 companies of 3 employees and more active in the Accommodation and Catering sector, 1,001 companies active in the Artistic, Sporting and Recreational Activities sector, 1,743 operators in the Rental, Travel Agencies and Business Services sector, 586 companies active in the Real Estate sector and 17,242 companies operating in the Trade and Motor Vehicle Repair macro-sector. Accommodation and catering establishments account for 16.29% of the regional business fabric, while commercial activities account for 30.84%. The incidence of the Rental, Travel Agencies and Business Services (2.99%), Artistic, Sporting and Recreational Activities (1.72%) and Real Estate (1.01%) sectors is much lower (Elaborations on ISTAT 2019 data).
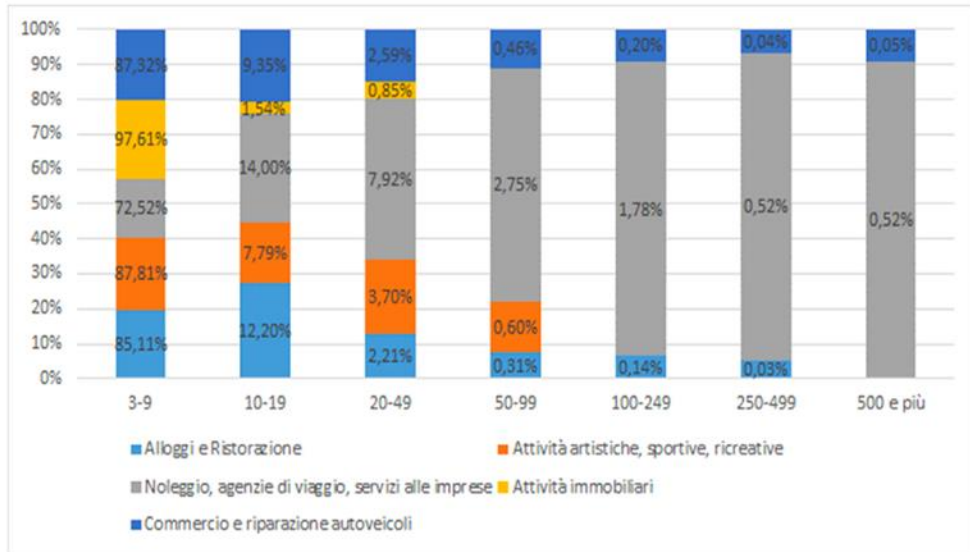
Figure 1: Active enterprises by size class, main tourism-related sectors, Apulia 2019 (elaboration on ISTAT data). In light blue the data of accommodation and catering. In gray the data of rental, travel agencies, business services. In blue the data of trade and motor vehicle repair. In orange the data of arts, sports, recreation. In yellow the data of real estate activities.

Considering the economic, employment and social importance that tourism, its related sectors and its allied industries express in the regional context, the important changes induced on the macro-sector by the outbreak of the pandemic emergency in 2020 have triggered - as in the rest of the country - a slump in tourist presences that only in the first half of 2021 seems to show the first signs of a trend reversal.

In order to highlight the first impacts of this framework on Apulia's tourism performance, it is useful to compare the incoming tourism flows observed at different points in time.

In the period 2015-2018, Apulia has pursued a dual positioning on the tourism market, as a leading competitive destination on both the national and international scene, while favouring the progressive deseasonalisation of tourist flows.

The results of this path can be fully seen in the growth in international arrivals (+41.8%) and presences (+32.5%) during the period under consideration, with a consequent increase in the internationalisation rate of incoming tourism, which rose from 21.3% in 2015 to 25.6% in 2018, enjoying particular success with the markets of France, the Netherlands, Germany, the United Kingdom and the USA.

The annual changes in the 2018 data compared to the previous year confirm this path. Arrivals in 2018 amounted to 4,065,983 (+3.7% compared to 2017) and stays amounted to 15,196,391 overnight stays (+0.5%).

Of these, 1,042,556 arrivals and 3,553,556 overnight stays relate to tourists from abroad, with annual increases - of +14% and 9% respectively. The internationalisation rate of arrivals stands at 25.6% (+2.4% compared to 2017) and that of overnight stays at 23.4% (+1.9%). The top five foreign markets in terms of importance of arrival flows are Germany, France, the United Kingdom, Switzerland and the Netherlands. Flows from Germany (21.7% of arrivals from abroad) are slightly down on the previous year (-0.5%), while the drop in flows from Switzerland is more significant (-5.5%, 7.8% of arrivals in 2018).

On the other hand, there are significant increases in demand from Spain (+34.5%, 2.6% of arrivals in 2018), Poland (+24%, 3.5% in 2018) the USA (+22%, 5.1% in 2018) and the Netherlands (+23%, 6% of arrivals in 2018). There were 3,023,427 tourists from Italy in 2018 (+0.2% compared to 2017) for 11,642,835 overnight stays (down -2%), mainly from the same region Puglia, Lombardy, Campania, Lazio and Emilia-Romagna.

According to the Survey on *Brand Awareness, Image and Equity* of Apulia, in 2017, for Italians the region is positioned as the destination of the sea, good wine and oil, characterised in particular by the opportunity to experience the traditions and the welcome of the local population. Foreign tourists, on the other hand, identify Apulia as the region of villages and traditions, handicrafts and local products, which is also characterised by the welcome and reliability of the local population, as well as the heritage of landscapes and nature.

A careful analysis and mapping of the tourism assets detectable in the territories of the municipalities involved in the two itineraries was carried out, providing a detailed snapshot of the local tourism heritage, dividing it into the following macro-categories (Environment and Nature; History and Culture; Food and Wine, Churches and Sacred Art; Tourist Services).

The main local planning tools were also taken into account:
Pulsano-Leporano Sustainable Urban Mobility Plan:

The PUMS details the offer of services and transport infrastructure and outlines two possible implementation scenarios. The Plan devotes much attention to the use of bicycles and stimulates citizens to active mobility. In this regard, a specific paragraph is dedicated to 'Incentivising the daily use of bicycles and electric micro-mobility devices. Cycling as an additional factor of local development'. The following is reported verbatim: "Interventions on the supra-local cycle network include addressing signposting and making safe the itineraries identified in the LAG Colline Joniche Green Route and the new

'Three Castles' cycle-tourist itinerary (San Crisperi Castle - Faggiano, de Falconibus Castle in Pulsano and Muscettola Castle in Leporano). The PUMS also envisages similar measures for a cycling 'Wine Route' connecting Lizzano and Manduria.

The urban and suburban cycle network is to be integrated with the network of pedestrian routes and paths in order to define a complete active mobility network (including related signposting) to support tourist and cultural activities. The Plan also envisages the setting up of two manned 'velostazioni - bike hubs', one to be located in the urban area and one in the coastal area, at which to offer support services for cycling (cycle workshop, cycle-tourist infopoint, bicycle rental, electric bike recharging points, guarded parking) and to coordinate activities for the promotion and dissemination of cycling.

Training measures and economic incentives for cycling as well as the provision of bicycle parking spaces in building regulations are part of this strategy."

Regional Territorial Landscape Plan (PPTR):

The Regional Territorial Landscape Plan identifies a multi-modal network of slow mobility, interconnected with the regional infrastructure system in order to make the regional territory continuously practicable and usable, through road, rail, cycle or maritime routes connecting nodes of naturalistic, cultural and landscape interest that cross and connect the Apulian landscapes with scenic and evocative stretches. The slow mobility network identified is the result of the implementation of a whole series of scenarios and projects implemented at a regional, wide area or park level, which the Plan acquires, putting them in dialogue with each other in view of the fruition of areas and territorial figures. The project represents an integrated system of nodes and networks at different levels and for different types of travel, aimed at achieving the multimodality necessary for capillary access to the territory and fruition of the landscapes.

The integrated landscape network of slow mobility therefore consists of the following projects:
   o creation of a quality road use network representing the main connection and visual access route to the historical nuclei and to the regional landscape heritage, to be implemented through the enhancement of the historical routes connecting the city systems identified in the 'Territorial morphologies' table of the Plan;
   o creazione di una rete regionale integrata di collegamenti ciclo-pedonali e greenway, in grado di connettere il sistema diffuso dei beni antropici e paesaggistici, da attuarsi sfruttando le potenzialità dei percorsi esistenti rappresentati dai tratturi, dalle ferrovie dismesse, dalle strade di servizio e dalle linee di approvvigionamento idrico;

o   creation of a sustainable and quality public transport system, integrated into the landscape and integrated, in railway stations, with private road transport, with regional cycle-pedestrian routes and with maritime connections, to be implemented through the valorisation of the railway heritage consisting of minor railway stations and local railway lines (Ferrovie del Gargano, Appulo-Lucane, Ferrovie del Sud Est, etc.) that cross or lap up contexts of high landscape value;

o   creation of a system for the use of regional coastal centres by sea, to be implemented through the valorisation of the landing places of the main tourist resorts, as places of access to coastal landscapes and interchange with land networks;

o   the creation of a system of multifunctional ecological corridors linking the coast to the hinterland, to be implemented through the active protection, enhancement and renaturalisation of the main rivers, blades, ravines and valleys;

o   the integration of all modes of transport that make up the multimodal network, giving priority to rail, cycle, pedestrian and maritime transport, to be implemented through the valorisation and adaptation of railway stations and landing places, as places of interchange and access to landscape resources;

o   the creation of a sustainable coastal use system of high landscape quality, to be implemented through the valorisation or adaptation of existing coastal infrastructures (roads, railways, stations and landing places);

o   the creation of a system of transversal multi-modal landscape corridors that function as the main (user and visual) access to the coast, to be implemented through the enhancement of the system of roads linking coastal marinas and sub-coastal centres and the creation of integrated multi-modal routes (railway, shuttle bus, cycle track, submarine) and interchange car parks at marinas;

o   redevelopment of the integrity and recognisability of the entrances and urban fronts of the historic core system, to be implemented through the redevelopment of historic city access roads.

From the Landscape Plan the one that emerges with great interest for our survey area with regard to infrastructure connections is Multimodal Project no. 4. "Salento Circuit": Railway circuit Lecce-Maglie- Otranto-Santa Maria di Leuca-Gallipoli-Lecce with the possibility of access to the coast and to the sea bed (station/landing interconnection) through multimodal connections (shuttle-bike): Spongano-Castro, Tricase- Tricase Porto, Gagliano-Santa Maria di Leuca, Marciano-Torre Vado, Ugento - Torre San Giovanni, Nardò-Santa Caterina.

With DGR no. 177 of 17/02/2020 the Regional Council adopted the 'Proposal for a Regional Cycling Mobility Plan'. The same resolution initiated, in accordance with the provisions of Article 14 of Legislative Decree 152/2006 and subsequent amendments and additions and Article 11 of Regional Law 44/2012 and subsequent amendments and additions, the consultation procedure as part of the Strategic Environmental Assessment procedure, including the Environmental Impact Assessment, of the plan proposal adopted.
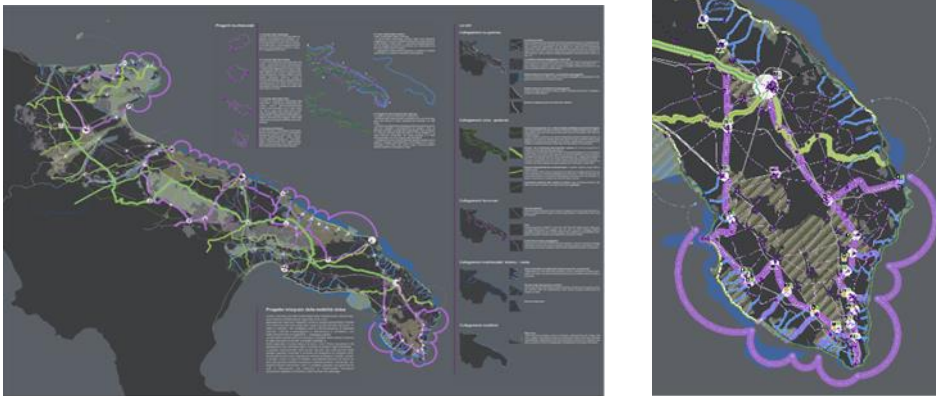
Fig. 2: Regional Cycling Mobility Plan (PRMC) with details of the multimodal mobility project

Of the defined routes, those that intercept the area of interest for the two routes planned for this work are:

Fig. 3: The Apennine cycle route (from PRMC)

The Apennine Cycle Route intercepts the municipalities of Nardò, Veglie, Avetrana, Manduria, which are part of our two routes, and the RP06/BI14-Cycling of the Three Seas.

Fig. 4: The Three Seas cycle route

The Ciclovia dei Tre Mari intercepts the municipalities of Copertino, Cutrofiano, Leverano, Maglie, Nardò, Porto Cesareo, Lizzano, Manduria, Maruggio, Pulsano, all of which are stops on our two thematic routes

Benchmarking of new sustainable transport modes

Below is a summary of some significant projects of new sustainable transport modes.

With respect to what is envisaged by Plans and Programmes, European rather than national, we would like to point out that the National Research Programme 2021-2027 - LARGE AREA OF RESEARCH AND INNOVATION, CLIMATE, ENERGY, SUSTAINABLE MOBILITY reports the indications envisaged by the Smarter Italy Programme, launched in 2020 by the Ministry of Economic Development, in collaboration with AgID, aiming at the design of innovative tenders. Among the 4 specific lines of action is Action 4: Innovative solutions for improving mobility in historical centres and villages.

The Programme reports on what has already been acquired in other studies, Programmes and Transport Plans at European and national level. In addition to dedicated programmes such as 7Fp and H2020, the CIVITAS and ELTIS initiatives at European level are carrying out initiatives of broad interest and wide-ranging environmental impact. The specific objectives are aimed at the progressive electrification and automation of transport systems; the expected results concern the reduction of polluting emissions, the decongestion of traffic, and the improvement of services, also in terms of accessibility and safety.

In the National Programme for Research 2021-2027 - GREAT ENVIRONMENTAL RESEARCH AND INNOVATION, CLIMATE, ENERGY, SUSTAINABLE MOBILITY it is emphasised how crucial it is, in

order to move the levers of change, to act with enabling policies, service offerings, policies and implementation organisation, attention to health and protection of citizens. Actions that require rapid and substantial changes in the direction of a joint and integrated development of public transport services and infrastructures and new solutions for sharing mobility, micro-mobility and active mobility, as well as mobility systems dedicated to tourism. Mobility that is sustainable and inclusive for citizens and travellers alike.

The following are some of the directions enabling change and improvement of mobility and thus of life itself:

Efficiency, equity and quality of public transport
Sharing mobility
Micro-mobility, assisted mobility and active mobility
MaaS (Mobility as a Service)
Tourism mobility and mobility tourism

Efficiency, equity and quality of public transport; emphasis is placed on the importance of automated and connected mobility solutions, aimed at maximising accessibility to areas and services, social inclusion, travel safety, environmental quality and efficient traffic management. With respect to these macro-themes and planning addresses, it must be considered that the specificity of the national territory requires attention to the design of solutions aimed not only at urban areas but also at extra-urban and rural areas (villages) with weak demand, of which our country is rich.

One possible direction could be to design conventional public transport services with stops and frequencies based on the needs of the local population, operating mostly during the high demand period. Another direction to pursue is to think of mini-hubs/interchange points, close to railway stations or main bus stops, offering different bike/car-sharing services and where multimodal travel information and payment systems are available.

The topic of sharing mobility, although growing nationwide (by 15% on average in 2018 compared to 2015), is currently not very widespread, especially in the south, which is little used by women and offers poor levels of intermodality. The direction is to think of shared mobility solutions (including DRT and car-pooling services offered by a single point/coordination unit that manages the transport services of several (small) municipalities;

Micro-mobility, assisted mobility and active mobility (mostly scooters, conventional and pedal-assisted bicycles), mostly reserved for the individual. This type of active mobility should be designed and planned with great attention to personal safety, providing dedicated lanes and protected, well-marked and appropriately lit zones. This mode alone cannot function as an alternative to car transport, but well accompanied by car sharing, public

transport and MaaS, it represents an excellent solution in terms of sustainability. In small towns and cities and in the Centre-South it represents a residual mobility solution to date, but it is an interesting way to promote intermodality between different means of transport. Pedestrian mobility opens up space for social inclusiveness, is democratic, affordable and open to all. Proof of this is the explosion of the phenomenon of widespread participation in the Cammini d'Italia, which, together with the system of national (Tourist Cycle Routes) and European (EuroVelo) cycle routes and Greenways, offer opportunities for the development of sustainable mobility and economic development, including in inland areas (Slow Tourism). In this sense, in the present study, ample space has been given to pedestrian and bicycle mobility on the two planned routes, against interventions aimed at the environmental upgrading of some identified stretches.

MaaS (Mobility as a Service) refers to the development of commercial solutions concerning the integration of mobility services; it has so far been implemented with reference to tariff integration and/or the concentration of several mobility services in the hands of the same operator.

Finally, the issue of tourist mobility and mobility tourism is among those that concern us most closely. In this sense, it is important to plan and design integrated transport services and infrastructures for tourist and local transport, also in terms of deseasonalisation. In favour of sustainable mobility are the many slow and gentle mobility initiatives based on the integrated use of collective means of transport, cycling and walking, or micro-mobility on-demand services.

Some interesting examples to consider in terms of a 'bottom-up' approach to sustainable mobility are those implemented at Burgerbus in Germany, Go-Mobil in Austria, Badenoch &Strathspey in Scotland. On the SMARTA website, there are many examples of EU-funded projects that are working on the topic of sustainable mobility.

Among the initiatives implemented at the national level, the projects are: LiMIT4WeDa - 'Light Mobility for Weak Demand Areas', financed by the European Interreg Europe Programme in which the Lazio Region also participates, and the 'SaMBA - Sustainable Mobility Behaviours in the Alpine Region' project, financed by the European Alpine Space Programme, led by the Piedmont Region.

The first project - LIMIT4WeDA - aims to improve, support and integrate local public transport in rural areas with low transport demand, making it more flexible and less expensive. Such urban or rural areas are generally characterised by inefficient public transport systems and consequently by widespread private car use. This reduces the spatial accessibility of these areas and perpetuates an unsustainable mobility system that discriminates against people.

To convert this trend in Perugia (IT), a pilot action was implemented for a new public transport system, through which a service with low demand became a high-performance and sustainable transport service that improved the quality of life, particularly of disadvantaged people. No timetables or fixed routes are required for this new public transport system.

Users book the service through a call centre by freely choosing the place and time of departure/arrival, thanks to software managed by the call centre operator who sends messages to a terminal on board the bus. Two types of booking are possible: - an "early" booking to book the bus in advance and a "real time" booking to book the next arriving bus.

Beneficiaries are disadvantaged people living in rural and urban areas with low population density, economically needy people and people with disabilities, public administrations at local/regional level, politicians/decision-makers at national/EU level.

The second SaMBA project (acronym for Sustainable Mobility Behaviours in the Alpine Region) is a project aimed at supporting low-carbon mobility in the Alpine Space by promoting policies and instruments to encourage changes in citizens' behaviour with respect to transport modes. With the aim of increasing decision-makers' awareness of the potential of policies to change mobility behaviour, reward-based mobility policies to trigger behavioural changes in favour of more sustainable travel options, such as the use of public transport, cycling and walking, were experimented with, also by means of gamification.

A relevant selection on the projects financed on the topic of tourism by the European Territorial Cooperation Programmes was carried out by the Territorial Cohesion Agency on the FARO projects, which identified 11 of them for the 2014-2020 Interreg programmes. (Agenzia di Coesione Territoriale, I Progetti Faro dei Programmi Interreg 2014-2020).

Methods

The Apulia region is not new to the definition of tourist routes and itineraries, which have been taken into account in the design of those proposed here. In order to design and define the two tourist itineraries, the notable emergencies with multiple vocations were systematised into two different routes, enhancing what has in fact always existed but is now present in a disaggregated and uneven manner, bringing out the potential of the sum of excellences. Therefore, two structured thematic routes were defined, for which both the transport and accessibilitỳ offerings and the cultural offerings present were fine-tuned. To do this, we started from the considerable richness that the territories offer at the present time, while also verifying areas of potential improvement in terms of accessibilitỳ to them. The value of the present,

however, leaves room for future planning, which must provide for improvements, additions and design of areas of enchantment, aimed at sustainabilitỳ and social integration and economic development.

Having to and wanting to give the two itineraries a focus on sustainable mobility, the present and relevant data defined and approved by the Regional Cycling Mobility Plan, and the areas of landscape relevance by PPTR were taken into account when defining them, as well as the Italian Cammini, which are increasinglỳ chosen by people of all generations to rediscover our country and live an experience dictated by a different perception of time, the desire to enjoy the silence and sociability that comes from meeting those who have a common path to live.

It is difficult to choose a single connotation to give to each itinerary, since this area of Apulia is rich in monuments, towers, castles, museums, with a landscape full of olive groves and vineyards, and with a strong food and wine connotation, and privileged enough to possess a landscape with a unique character, rich in history, traditions and areas to experience and discover.

The definition of the two thematic itineraries stems from having systematised and brought together severaÌ factors:

1) Stages identified by routes marked by two different LAGs (Local Action Groups):

o GAL "Terre del Primitivo": **Avetrana** - Erchie - Fragagnano - **Lizzano** - **Manduria** - **Maruggio** - Oria - San Marzano - **Sava** - Torre Santa Susanna - Torricella. Through the definition of these stages, a typical, experiential, relaxing journey is proposed, in a slow travel mode, also thanks to the knowledge of a product of excellence of this territory, Primitivo di Manduria DOP and DOCG.

o GAL Colline Joniche GreenRoad: Carosino - Crispiano - Faggiano - Grottaglie - Roccaforzata - Giorgio Jonico - **Pulsano** - Monteparano. The LAG identifies various Green routes based on the principles of the Green Economy and Sustainable Tourism, with the aim of making known and enhancing those territories covering the entire Jonian arc, which starts from the sea and connects the eleven municipalities of the LAG Colline Joniche: 132 Km to stimulate the development of an eco-sustainable economy in the area of the Ionian land, enhancing, on the one hand, the hidden cultural and natural assets, including through the discovery of paths and routes, and, on the other hand, promoting local food and wine through visits to farms, production and tasting companies and their products. Pulsano is identified in two routes: the Three Castles cycle route: (Castle of San Crisperi - _Faggiano, Castle de Falconibus of Pulsano and Castle Muscettola of Leporano). Another

route (route 17) starts from the centre of Pulsano and runs along provincial and rural roads. It is possible to intercept the Pulsano cycle path that leads to the sea.

2) The stages defined by 'Le Strade del vino DOC Primitivo di Manduria e Lizzano'.
The road identifies these stops as destinations of considerable interest and rich in history and traditions. **Pulsano**, **Lizzano**, Leporano, **Manduria**.

3) What is reported and taken from 'Unione dei Comuni Terre del Mare e del Sole'.
The Union of Municipalities comprises 7 municipalities located in the province of Taranto: Leporano, **Pulsano**, **Lizzano**, Torricella, **Maruggio**, **Manduria**, Fragagnano and **Avetrana**. The Union was established in 2001 with the common purpose of cooperating to propose integrated environmental redevelopment interventions, harmonise the exercise of functions and services with the needs of citizens, and ensure a fair use of resources; to exercise effective influence on supra-municipal bodies that manage services; to manage and expand the number of functions and services compared to those previously managed by individual municipalities, ensuring efficiency and greater cost-effectiveness for the benefit of the community.

4) As provided for and planned in the Regional Cycling Mobility Plan (PRMC):
Ciclovia dei Tre Mari (Otranto - Sapri) - Itinerary 14 BicItalia:
bicycle path in the lower Salento area between Otranto and the Gallipoli-Porto Cesareo section, passing through Nardò, an area interconnected with a Salento branch of the Ciclovia dell'Acquedotto.

5) What is provided for and planned by the Regional Territorial Landscape Plan (PPTR) in which the roads of landscape value in the area are indicated:
Pulsano, San Marzano di San Giuseppe, Fragagnano, **Manduria**, **Avetrana**, **Leverano, Copertino**, Galatina, **Cutrofiano**, **Maglie**, **Otranto**.

6) The presence of Coastal and Inland Towers: Torre Borraco:
Torre Ovo: Torre Saline; Torre Colimena; **Torre Castelluccia**; Torre Santa Susanna. A fourth cycle path is possible on the strategic horizon, from Gallipoli to Otranto, passing through Nardò and Galatina.

7) The pilgrims' routes: the Ionian Way from Matera to Finis Terrae: Pulsano, Marina di Lizzano, Maruggio, Manduria, San Pietro in Bevagna, Porto Cesareo, Nardò, Gallipoli, Ugento, Lido Marini, Leuca. the path examined is the stretch of the Cammino Materano (between Basilicata and Apulia) that defines 7 different routes. A sacred place of European and Mediterranean civilisation as a meeting point of peoples and cultures, and of pilgrims on their way to Rome or the Holy Land. A 215 km route along the Ionian coast rich in natural and scenic, historical and archaeological beauty. Most of the route runs along the Ionian Sea with its turquoise and crystal-clear waters, composed of backdune paths immersed in the Mediterranean maquis, long rocky and sandy beaches. The coast is also rich in 16th-century watchtowers and numerous natural oases. Along the route, however, it is possible to visit important cities (Taranto, Manduria, Nardò,) and small charming villages with museums and archaeological sites of the Messapian civilisation, to be discovered slowly, giving oneself the chance to meet locals and wayfarers, observe the places and experience the traditions. The section selected for route 2) intercepts Pulsano and the last stop it identifies is Nardò, before continuing on to Otranto. At the moment, the Via Jonica is still closed. Feasibility studies have been completed, but signposting and a list of accommodations are still being structured.

8) The presence of significant historical and architectural pre-existences:
   A careful analysis and mapping of the tourism assets detectable in the territories of the municipalities involved in the two itineraries was carried out, providing a detailed snapshot of the local tourism heritage, breaking it down into the following macro-categories:

o Environment and Nature: natural, environmental, landscape attractions, including beaches, nature parks and reserves, caves and other sites of specific environmental interest;

o History and Culture: remains and architectural relics of past civilisations that have inhabited or passed through the places on the itinerary; the category also includes the intangible heritage of festivals, fairs, events in which the local tradition of culture and folklore is reflected;

o Enogastronomy: typical products that are an expression of local culture and traditional practices (production, processing, consumption), capable of expressing a unique value proposition for its typicality and geo-identification;

- o Churches and Sacred Art: churches, basilicas, caves of faith, paintings, sculptures, statues, masonry works, evidence of the Catholic-Christian culture of the past and its deep intertwining with local devotion;
- o Tourist services: supply of local accommodation and its availability, as well as any added-value services for tourists (e.g. information services, guides, etc.).

9) The identification of typical places in the Taranto Murgia: route of and linking popular agricultural centres, vineyards and evidence of Messapian culture.

10) What emerges from the analysis of the socio-economic context, on the main motivations for tourism in this area.

11) What emerged from the SUMS (Sustainable Urban Mobility Plan) of Pulsano-Leporano

Results and Discussion

Having defined the two thematic itineraries, this project suggests walking them in different seasons, both to better enjoy the itineraries according to the potential of the seasons, and with a view to deseasonalisation. Notwithstanding the wonder of being able to appreciate the itineraries during all seasons of the year, the advice for walking the two itineraries is:

1) ITINERARY OF THE VILLAGES BETWEEN OLIVE GROVES AND VINEYARDS: Pulsano - Lizzano - Sava - Manduria - Avetrana - Veglie - Leverano - Copertino - Galatina - Cutrofiano - Maglie - Otranto (**SUMMER-WINTER**)
2) THE VIA JONICA BETWEEN THE TARANTINE WALLS AND FINIS TERRAE: Marina di Pulsano - Torre Castelluccia - Marina di Lizzano - Maruggio - San Pietro di Bevagna - Porto Cesareo - Nardò - Cutrofiano - Maglie - Otranto (**SPRING - AUTUMN**)

Spring and autumn for itinerary 2) are better suited to walking and cycling along the roads and routes that intercept the coastline, on foot or by bicycle, alone or in company, with the aim of enjoying each step or pedal stroke while experiencing emotions, observations and suggestions, in seasons when the heat or cold do not hinder the pleasure of walking and the walkability due to the density of the presences and the lights and colours are softer.

Slowness allows us to observe and feel even the smallest things that we do not normally notice, allowing and facilitating encounters and facilitating sociality, which the pandemic has put to the test. Walking to rediscover the pleasure of a slow pace, and to get to know and enjoy the spaces

we walk and cross. Walks are also attractive to all ages, they are inclusive, democratic, inexpensive and open to all.

A time to share but also to find oneself. One can enjoy the beautiful sea of the coast without being overcrowded; appreciate the Mediterranean vegetation present and the smells not distorted by the scorching heat of the summer season.

Itinerary 1) is advisable to be travelled in winter or summer, by car and in comfort (as there are no electric buses/shuttles to be activated yet, even with an on-call service), to enjoy the summer festivals, beautiful monuments and museums to be visited at leisure, but also in enclosed places protected from the cold or heat. The ideal for both routes would be to be able to offer all people (young, old, women, children, adults, the disabled) the opportunity to walk them at their best in all seasons of the year. This is not entirely possible at present, as there are no electric shuttle buses, protected cycle paths or signposted routes, but the hope is that starting from the structure of the two thematic routes defined here, the various municipalities intercepted can join forces to meet the needs of all categories of people.

Another important factor to be taken into account over time is the need to integrate what is emerging from the results of other projects funded under various European Programmes: (for example) the BioTours: Biodiversity and Tourism Strategy to protect cetaceans project (Interreg IPA CBC Italy-Albania-Montenegro Programme), or other results of the same AI SMART project on fast maritime connections along the Adriatic coast.

The two itineraries, although not very far apart, have different characteristics. Itinerary 1) of the Borghi tra uliveti e vigneti (villages among olive groves and vineyards) has more of an exploration character of the inland areas and villages, while itinerary 2) La via Jonica tra le murge tarantine e Finis Terrae (The Ionian Way between the Taranto Murgia and Finis Terrae) explores the coastal areas and joins the hinterland halfway inland. Both itineraries have a strong food and wine connotation.

Itinerary 1 is developed in 12 stages and has a total length of about 108 km. The route connects the Marina di Pulsano on the Ionian coast with Otranto on the Adriatic coast, crossing the Apulian territory longitudinally. With the exceptions of Marina di Pulsano and Otranto, all the intermediate stages of the itinerary consist of rural villages/small towns in the hinterland of Taranto and Lecce.

The route (fig. 5) is developed in the following stages:
1. Marina di Pulsano (Pulsano TA);
2. Lizzano (TA);
3. Sava (TA);

4. Manduria (LE);
5. Avetrana (TA);
6. Veglie (LE);
7. Leverano (LE);
8. Copertino (LE);
9. Galatina (LE);
10. Cutrofiano (LE);
11. Maglie (LE);
12. Otranto (LE).

Itinerary 2 is developed in 9 stages and has a total length of about 118 km. The route connects Marina di Pulsano with Otranto, first travelling south along the Ionian coast, in the section connecting Marina di Pulsano and Porto Cesareo, and then curving inland towards Nardò, from where the route then continues longitudinally towards Cutrofiano, Maglie and then Otranto, on the Adriatic coast.

The route (fig. 5) is developed in the following stages:
1. Torre Castelluccia presso Marina di Pulsano (Pulsano, TA);
2. Marina di Lizzano (Lizzano, TA);
3. Maruggio (TA);
4. San Pietro in Bevagna (Manduria, TA);
5. Porto Cesareo (LE);
6. Nardò (LE);
7. Cutrofiano (LE);
8. Maglie (LE);
9. Otranto (LE).

Fig. 5: The stages of the two planned routes.
1) Village itinerary among olive groves and vineyards_seasonality recommended to travel it, summer, winter. 2) itinerary of the Ionian way between the Taranto murge and finis terrae_seasonality recommended to travel it, spring, autumn.

Entire route 1) ITINERARY OF VILLAGES BETWEEN OLIVE AND VINEYARDS:
Pulsano – Lizzano – Sava – Manduria – Avetrana – Veglie – Leverano – Copertino – Galatina – Cutrofiano – Maglie – Otranto:
- o by car Duration 2 hours 27 minutes (121 km)
- o by bicycle duration 6 hours and 54 minutes (93 km)
- o on foot (non-stop) 18 hours 22 minutes (90 km)

It was not possible to calculate journey times by public transport due to the multiple changes and variations in waiting times for changing from one means of transport to another.

Entire route 2) LA VIA JONICA TRA LE MURGE TARANTINE E FINIS TERRAE:
Pulsano – Torre Castelluccia – Marina di Lizzano – Maruggio – San Pietro di Bevagna – Porto Cesareo – Nardò – Cutrofiano - Maglie – Otranto
- o by car Duration 2 hours 37 minutes (126 km)
- o by bicycle duration 6 hours and 11 minutes (118 km)
- o on foot (non-stop) 23 hours 16 minutes (114 km)

It was not possible to calculate journey times by public transport due to the multiple changes and variations in waiting times for changing from one means of transport to another.

Conclusions

The topics of connections, sustainable mobility and territorial development through tourism activities are closely linked. This work aims to demonstrate that through an analytical methodology that allows the study of the tools, data and information of an area, including through the involvement of key players, it is possible to formulate and design tourist routes and itineraries. It is developed within the framework of the strategic Interreg V-A Greece-Italy cross-border cooperation project 2014/2020, named "AI SMART_Adriatic Ionian Small Port Network", narrating the design path and the methodology applied for the definition of two itineraries aimed at the interaction of the port of Otranto with the territories of the Salento hinterland with the opposite Ionian coast, in order to foster the sustainable and inclusive transnational tourist fruition of the Apulian territory. Taking into account the sector's literature, but above all starting from an in-depth context analysis of complex territorial planning devoted to local sustainable development (PUMS, Regional Territorial Landscape Plan, Regional Cycling Mobility Plan, etc.); the offer of tourist itineraries already structured; the mapping of tourist assets detectable in the territories; the socio-economic context; the offer of existing transport infrastructures and services and the socio-economic and accommodation context, the two itineraries defined as follows: Itinerary 1) of the Borghi tra uliveti e vigneti (Villages among olive groves and vineyards) is more of an exploration of the inland areas and villages, while itinerary 2) La via Jonica tra le murge tarantine e Finis Terrae (The Ionian Way between the Taranto Murgia and Finis Terrae) explores the coastal areas and joins the hinterland halfway inland. Both itineraries have a strong food and wine connotation.

The two thematic itineraries are of considerable interest both in the towns (emergencies) identified, and in the routes connecting them, since the connecting routes have considerable appeal in terms of the valuable offerings offered by the local vegetation (olive groves and vineyards), as well as in the typical urban elements (dry-stone walls, historic farms, Salento trulli). The effort made was to systematise these remarkable emergencies with their multiple vocations into two different routes. The weaknesses found in the identification of the routes were revealed in the lack of concerted planning with the municipalities that the two routes pass through. From the scouting of the routes done, it is clear that to date many stages need infrastructural renovation; the presence of garbage and abandoned objects that should be removed was verified; the need to include route signage and to design lighting

appropriate and commensurate with this type of route (low environmental impact and environmental and landscape enhancement). If these results were adequately promoted and communicated to the individual municipalities involved in the stages, concerted planning could be initiated, which would be very useful in the implementation of what was done in the context of a European project, moving away from the logic of siloed planning and programming.

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Data Availability: All data are included in the content of the paper.

References:

1. Agenzia per la Coesione Territoriale, 2022. I Progetti Faro dei Programmi Interreg 2014–2020. Cultura e Turismo.
2. Bazhinov, A.; Bazhinova, T.; Podrigalo, M.; Kholodov, M. Dynamics Hybrid Vehicle Driven with Electric Motor Driving Wheels 411 from Batteries. In SAE Technical Paper, 2022.
3. Bergantino, A., Buongiorno, A., Intini, M., Turismo e mobilità sostenibile nelle aree naturali protette pugliesi (2021). REPoT (1-20).
4. Butler R., W., (1991). Tourism, Environment, and Sustainable Development. Environmental Conservation, Vol.18, pp. 201-209.
5. Candela, G., Figini, P., 2010. Economia del turismo e delle destinazioni. Seconda edizione. Mc Graw Hill,
6. Carlucci, F., Cirà, A., Migliardo, A., (2012). Aree naturali protette e strumenti di analisi per la pianificazione degli interventi. Italian Journal of Regional Science. Scienze Regionali Vol.11, n.1 pp. 93-116
7. Castanho, R., Loures, L., Fernández, J., & Pozo, L. (2018). Identifying critical factors for success in Cross Border Cooperation (CBC) development projects. Habitat International, 72, 92-99.
8. Castro, D., Alvarez, L., & Varela, E. (2015). Building Europolis on the Basis of Local "Informal" Cooperation in European Cross-Border Spaces: The Case of RIET. Geopolitical Magazine e Studies of Space and Power, 6(2), 225e246.
9. Fadigas, L. (2010). Urbanismo e Natureza e Os Desafios. Lisbon, Portugal.
10. Fadigas, L. (2015). Urbanismo e Territorio e As políticas públicas. Lisbon, Portugal

11. Griffiths, S., Del Rio, D. F., & Sovacool, B. (2021). Policy mixes to achieve sustainable mobility after the COVID-19 crisis. Renewable and Sustainable Energy Reviews, 143, 110919.
12. Kuranc, A., Caban, J., Šarkan, B., Dudziak, A., & Stoma, M. (2021). Emission of selected exhaust gas components and fuel con-402 sumption in different driving cycles. Communications-Scientific letters of the University of Zilina, 23(4), B265-B277.
13. Markowska, K.; Flizikowski, J.; Bieliński, K.; Tomporowski, A.; Kruszelnicka, W.; Kasner, R.; Bałdowska-Witos, P.; Mazur, Ł. 408 The Comparative Assessment of Effects on the Power System and Environment of Selected Electric Transport Means in Poland. 409 Materials 2021, 14, 4556, pp. 1-3.
14. Montaguti, F. Minghetti, V. (2017) BRAND AWARENESS, IMAGE ED EQUITY DELLA PUGLIA Sintesi ragionata dei risultati delle analisi condotte sul mercato italiano ed estero .CISET.
15. Nijkamp, P., Rietveld, P., Salomon, I., 1990. Barriers in spatial interactions and communications. a conceptual exploration. Ann. Reg. Sci. 24 (4), 237–252.
16. Khanna, P. (2016). Connectography: le mappe del futuro ordine mondiale. Fazi Editore.
17. Nave, E., & Franco, M. (2021). Cross-border cooperation to strengthen innovation and knowledge transfer: An Iberian case. Innovation: The European Journal of Social Science Research, 1-19.
18. PNR 2021-2027_ GRANDE AMBITO DI RICERCA E INNOVAZIONE: CLIMA, ENERGIA, MOBILITÀ SOSTENIBILE. (2020). Ministero dell'Università e della Ricerca
19. Piano Paesaggistico Territoriale Regionale http://www.sit.puglia.it/portal/portale_pianificazione_regionale/Piano%20Paesaggistico%20Territoriale
20. Piano Regionale della Mobilità Ciclistica: http://asset.regione.puglia.it/?mobilita
21. PUMS Pulsano-Leporano: https://www.comune.pulsano.ta.it/index.php/pums-piano-urbano-di-mobilita-sostenibile-pulsano-leporano
22. Relazione di sintesi 2021 sulla partecipazione italiana ai Programmi di Cooperazione Territoriale Europea, ENI ed IPA II 2014/2020. Presidenza del Consiglio dei Ministri e Agenzia per la Coesione Territoriale. 2021
23. Tucki, K., Mruk, R., Orynycz, O., Botwińska, K., Gola, A., & Bączyk, A. (2019). Toxicity of exhaust fumes (CO, NOx) of the 404 compression-ignition (diesel) engine with the use of simulation. Sustainability, 11(8), 2188.

Analyzing the Impact of Corporate Hedging on Enterprise Valuation: Evidence from China

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Abstract

In a dynamic global financial landscape marked by unprecedented turbulence, driven notably by the COVID-19 pandemic, corporate hedging practices emerged as a critical tool for managing risks and preserving enterprise value (EV). This research investigated the intricate relationship between corporate hedging and EV, with a specific focus on Chinese-listed firms spanning the period from 2012 to 2022. Employing an extensive sample of 4,574 Chinese-listed firms, the study examines the role of corporate hedging in shaping enterprise value. The findings support the statistically significant impact of corporate hedging on enterprise. The study further tested the moderating role of ownership structure and corporate governance. The findings reveal that ownership structure and corporate governance moderate the relationship between corporate hedging and enterprise value.

Keywords: Corporate hedging, enterprise value, corporate governance, ownership structure, Chinese firms

Introduction

The global financial landscape has experienced unprecedented turbulence in recent years, primarily driven by the outbreak of the COVID-19 pandemic (Hendrati et al., 2024). This period of economic uncertainty resulted in heightened volatility in interest rates, exchange rates, and commodity prices

within the international financial markets (Yang et al., 2023). Managing risks has become a critical aspect of corporate strategy in this dynamic and complex financial environment.

Meanwhile, derivatives have witnessed an exponential surge in popularity worldwide over the last decade. As the economic landscape evolves and globalization intensifies, they have emerged as indispensable instruments for diverse firms to proactively manage and mitigate risks inherent in operational and financial activities (Sridhar, 2023). It should be noted that the deepening integration of China into the international economy has exposed domestic enterprises, particularly listed companies, to the above-mentioned risks (Xiang, 2022). Therefore, there is a pressing need to investigate how the utilization of derivatives, specifically corporate hedging practices, impacts the valuation of Chinese enterprises.

This research paper profoundly expands the realm of financial knowledge. At its core, it offers a comprehensive review that delves into theoretical frameworks and empirical evidence concerning the impact of the financial derivatives market on enterprise value (EV). The empirical analysis conducted in this research is rooted in the Generalized Least Squares (GLS) model, a robust statistical approach renowned for its effectiveness in handling heteroscedasticity and autocorrelation. By employing the GLS model, this research leverages its essential advantages to provide accurate and reliable insights into the relationship between corporate hedging practices and enterprise valuation.

Furthermore, this study goes beyond the conventional by considering the moderating effects of two pivotal factors: property ownership and corporate government index (CGI). These moderating variables introduce a layer of complexity and depth to the analysis, shedding light on how ownership dynamics and corporate governance structures may influence the interplay between hedging and enterprise value. Therefore, beyond academics, this research offers valuable insights to practitioners, including corporate leaders, investors, and senior managers.

Literature review and research hypotheses
Theoretical framework and models

Financial derivatives represent a dynamic and critical facet of modern finance, continually evolving to address the complex risk landscape of global markets. Their origins can be traced back to the introduction of the "futures contract" by the Chicago Board of Trade in 1865 (Hull, 2022). Since then, derivatives have received much attention among scholars who aimed to investigate their impact on enterprise value. Modigliani and Miller (1958) were first to propose the M-M theory which postulated that the use of derivatives should not inherently create value or enhance financial or market

performance. This viewpoint prompted extensive debates within the academic and financial groups, questioning the role of derivatives in corporate finance (Buriro et al., 2023).

Subsequent studies rejected the M-M theory and found that risk management increases the value of companies due to specific market imperfections. Guay and Kothari (2003) identified and divided them into four categories: financial distress costs, costly external financing, asymmetry in tax costs, and the cost of managerial risk aversion. Moreover, many papers further illuminated the effectiveness of financial derivatives in mitigating firm risks. By smoothing earnings and cash flows, derivatives reduce capital costs, enabling firms to navigate financial challenges and uncertainties more effectively (Campbell et al., 2019) (Su et al., 2022). Consequently, this risk reduction can have a substantial impact on EV.

Recent studies have continued to build on these foundational theories. For instance, Hong et al. (2020) provided a comprehensive review of the empirical literature, emphasizing the value-creating potential of corporate hedging through various channels, such as reducing underinvestment costs and enhancing corporate liquidity. Similarly, Liu (2023) examined the global derivatives usage. They found that firms using derivatives had lower cash flow volatility and higher firm value, supporting that risk management via derivatives can enhance firm performance.

Empirical studies and research advancements

While the theoretical discourse surrounding the relationship between corporate hedging and enterprise value has been extensive in the last decade, empirical studies that offer concrete insights into this relationship remain relatively scarce. Two noteworthy research papers, authored by Buriro et al. (2023) and Yang et al. (2023), stand out in the literature for their empirical analyses, shedding light on the positive impact of corporate hedging on enterprise value.

In their respective studies, Buriro et al. (2023) and Yang et al. (2023) both approach the evaluation of enterprise value through the lens of Tobin's Q variable. However, their treatment of corporate hedging differs significantly. Buriro et al. (2023) measured the gain or loss associated with hedging activities for a specific year. Their methodology provides a detailed examination of the outcomes of corporate hedging efforts. It is important to note that this study, while insightful, has a relatively limited sample size, which may affect the generalizability of its findings.

On the other hand, Yang et al. (2023) employ a different but equally valid approach. They introduce a binary dummy variable, taking on values of 1 for firms that engage in hedging and 0 for those that do not. This approach simplifies the evaluation of hedging practices but offers a broader perspective

by considering the presence or absence of hedging activities. However, it should be acknowledged that their study employs a book-to-market value for robustness testing, a choice that may raise questions about the accuracy and appropriateness of this measure for capturing the full impact of corporate hedging.

Additionally, recent empirical work by Deng and Yang (2023) explored the impact of hedging on firm value across different industries, highlighting that the benefits of hedging are more pronounced in industries with higher exposure to exchange rate fluctuations. Similarly, Chang et al. (2024) analyzed a large sample of non-financial firms and found robust evidence that hedging activities are associated with higher firm value, particularly in firms with significant growth opportunities and financial constraints.

Research gap and study relevance

Despite extensive theoretical and emerging empirical research on corporate hedging and firm value, gaps remain. Existing studies primarily focus on developed economies, overlooking emerging markets like China with its rapidly evolving economic landscape and unique corporate ownership structures. The interplay between state-owned and non-state-owned enterprises and hedging strategy effectiveness is underexplored. Moreover, the moderating role of corporate governance in the hedging-firm value relationship has received limited attention, despite governance mechanisms' growing global prominence.

This study addresses these gaps by comprehensively analyzing how corporate hedging impacts enterprise value for Chinese listed firms. Employing robust methodologies like the Generalized Least Squares model and introducing moderators like ownership and governance index, provides nuanced insights into this relationship. Ultimately, it contributes to the literature and offers practical implications for corporate decision-makers, investors, and policymakers managing risk in today's dynamic financial landscape.

Corporate hedging and enterprise value

Corporate hedging has become an indispensable facet of risk management for firms navigating the complexities of today's financial markets. The central tenet of hedging is to protect a company from various financial disruptions and inefficiencies that can erode enterprise value (EV). Drawing upon the analysis of Chinese-listed firms from 2012 to 2022, this study underscores the pivotal role of hedging in enhancing firm value through several mechanisms.

Firstly, hedging helps mitigate the adverse effects of financial distress, which arises when a firm's operational cash flow falls short of covering its debt obligations. This financial strain can lead to costly bankruptcy or restructuring processes that directly diminish EV (Tron, 2021). By employing hedging strategies, companies can ensure adequate liquidity and working capital during economic downturns, thereby reducing the likelihood of financial distress and preserving EV (Sugiarto et al., 2023).

Secondly, effective hedging reduces the reliance on costly external financing. Firms operating in volatile financial environments often face unpredictable cash flows, compelling them to seek external capital at unfavorable terms. Hedging stabilizes cash flows, thus minimizing the need for external funding and the associated high costs. This reduction in financing costs enhances the overall enterprise value by allowing firms to allocate resources more efficiently and pursue growth opportunities without incurring excessive capital costs (Buriro et al., 2023).

Thirdly, corporate hedging can be strategically used to optimize tax positions. Firms can choose hedging instruments that align with their tax strategies, thereby reducing tax liabilities associated with gains and losses from financial instruments (Grima et al., 2020). This tax efficiency ensures that companies manage their overall tax burden effectively, contributing to higher net income and, consequently, increased EV (Campbell et al., 2019).

Lastly, hedging addresses the issue of managerial risk aversion. Managers often avoid high-risk projects due to personal financial risks and job security concerns. However, with effective hedging strategies in place, managers can mitigate these risks, making them more likely to undertake value-enhancing projects. This alignment of managerial actions with shareholder interests leads to strategic decisions that drive up enterprise value (Milidonis & Stathopoulos, 2014).

The empirical analysis using the Generalized Least Squares (GLS) model confirms a significant positive relationship between corporate hedging and EV among Chinese-listed firms. This relationship is particularly pronounced in state-owned enterprises and firms with robust corporate governance mechanisms, which further strengthens the argument that hedging is a vital tool for value creation in the corporate sector (Cardinale, 2021; Dang et al., 2021). Therefore, we hypothesize that corporate hedging is positively associated with enterprise value.

Moderating the role of enterprise ownership

Ownership structure plays a crucial role in shaping the effectiveness of corporate hedging strategies and their subsequent impact on enterprise value (EV). Different types of ownership structures, particularly the distinction between state-owned enterprises (SOEs) and non-state-owned enterprises

(non-SOEs), can influence how hedging practices are implemented and their outcomes. This study examines the moderating effect of ownership structure on the relationship between corporate hedging and EV in Chinese-listed firms.

SOEs typically have different objectives and governance structures compared to non-state-owned enterprises (non-SOEs). SOEs often prioritize stability and long-term growth over short-term profitability, which can lead to a more strategic and comprehensive approach to risk management, including hedging. This alignment with state goals allows SOEs to utilize hedging more effectively to stabilize cash flows and protect against financial distress, thereby enhancing EV (Cardinale, 2021).

On the other hand, non-SOEs, driven by market competition and shareholder expectations, might focus more on immediate financial performance. These firms may employ hedging to manage specific financial risks, such as foreign exchange or commodity price fluctuations, which can have a direct and immediate impact on their financial statements. This targeted approach to hedging in non-SOEs helps maintain liquidity and reduce financing costs, ultimately contributing to higher EVs (Dang et al., 2021).

Moreover, the difference in access to resources and information between SOEs and non-SOEs also plays a role in the effectiveness of hedging strategies. SOEs often have better access to financial resources and governmental support, allowing them to implement more sophisticated and comprehensive hedging strategies. This support can lead to a more significant positive impact on EVs than non-SOEs, which may face resource constraints and higher costs in accessing hedging instruments (Xie et al., 2023).

The empirical analysis reveals that the positive impact of corporate hedging on EVs is more pronounced in SOEs than in non-SOEs. This finding suggests that the ownership structure, particularly state ownership, enhances the effectiveness of hedging strategies in increasing EV. State support and strategic alignment with long-term goals in SOEs likely contribute to this stronger relationship (Antunez et al., 2023).

Furthermore, firms with diverse ownership structures, including mixed ownership, may experience varying degrees of effectiveness in their hedging practices. These firms can leverage the advantages of both state support and market-driven strategies, leading to an optimal balance that enhances EV. The study's results underscore the importance of considering ownership structure when evaluating the impact of hedging on firm value (Al-Gamrh et al., 2020). Consequently, we hypothesize that ownership structure moderates the relationship between corporate hedging and enterprise value.

Moderating the role of corporate governance

Corporate governance encompasses the set of processes, policies, and structures that guide and control corporate behavior, ensuring accountability,

fairness, and transparency in a company's relationship with its stakeholders. Strong corporate governance mechanisms can significantly influence the effectiveness of corporate hedging strategies and their impact on enterprise value (EV).

Effective corporate governance provides a framework for better decision-making, aligning the interests of managers with those of shareholders. Companies with robust governance structures are more likely to implement well-thought-out hedging strategies that align with their overall risk management objectives. This alignment reduces the potential for agency conflicts, wherein managers might otherwise pursue hedging strategies that benefit their interests rather than those of the shareholders (Campbell et al., 2019).

Board composition and independence are critical aspects of corporate governance that can affect hedging outcomes. Boards with a higher proportion of independent directors are better positioned to oversee management decisions, including hedging practices. Independent directors bring diverse perspectives and expertise, enhancing the board's ability to scrutinize and approve hedging strategies that align with the company's risk tolerance and financial goals. This oversight ensures that hedging contributes positively to EVs by mitigating risks without incurring unnecessary costs (Landi et al., 2022).

Additionally, companies with strong corporate governance often have more transparent and comprehensive risk management policies. These firms are likely to adopt a proactive approach to risk identification and mitigation, including the use of financial derivatives for hedging. Transparent reporting and disclosure practices associated with good governance enhance stakeholders' trust and confidence, contributing to a more favorable market perception and, consequently, higher EV (Su et al., 2022).

The role of executive compensation tied to firm performance is another governance mechanism that influences hedging effectiveness. When executives' compensation is linked to the company's financial performance, there is a greater incentive for them to engage in risk management practices that enhance EV. Hedging becomes a tool to stabilize earnings and achieve performance targets, aligning management's actions with shareholder interests. This alignment reduces the likelihood of risk-averse behavior that might otherwise hinder growth opportunities (Milidonis & Stathopoulos, 2014).

Empirical evidence from this study supports the hypothesis that corporate governance moderates the relationship between corporate hedging and enterprise value. Firms with strong governance structures exhibit a more pronounced positive impact of hedging on EVs. The findings suggest that effective governance enhances the benefits of hedging by ensuring that these

strategies are implemented in a manner consistent with the firm's overall risk management objectives and shareholder interests (Al-Gamrh et al., 2020).

Moreover, the study highlights the importance of integrating environmental, social, and governance (ESG) factors into corporate governance frameworks. Companies that incorporate ESG considerations into their governance practices are better equipped to manage long-term risks, including those related to market volatility and regulatory changes. This integration enhances the effectiveness of hedging strategies, contributing to sustainable value creation and higher EV (Landi et al., 2022). Thus, we hypothesize that corporate governance moderates the relationship between corporate hedging and enterprise value.

Methods
Sample selection

This research paper is founded upon an extensive sample comprising 4,574 Chinese-listed firms, spanning the years from 2012 to 2022. Notably, companies that had their issued stocks subjected to delisting risk warnings or any form of preferential treatment by China's Securities Regulatory Commission were intentionally excluded from the sample. This exclusion criterion was implemented to ensure the inclusion of firms characterized by stable financial performance, thereby mitigating the potential influence of outliers on analytical outcomes. Furthermore, organizations with incomplete or missing financial data were also systematically excluded, thus guaranteeing the data's completeness and reliability.

To conduct this analysis, we gathered information on firm performance from the China Stock Market and Accounting Research (CSMAR) database, renowned for its meticulousness and credibility in providing comprehensive financial and market data for all listed companies in China. The widespread reliance on the CSMAR database in empirical research concerning Chinese firms underscores its accuracy and dependability as a primary data source. Consequently, this paper's findings are anchored in the database which assures the highest level of precision.

Overall, this study's expansive sample encompasses a remarkable 12714 firm-year observations, spanning a decade from 2012 to 2022. This substantial sample size not only fortifies statistical power but also empowers us to conduct a rigorous and in-depth analysis of the intricate relationship between hedging and EV. Furthermore, the longitudinal nature of this sample equips us with the unique capability to discern temporal shifts in the hedging amount over time, providing invaluable insights into my research area within the specific context of China.

Variables definition

The dependent variable in this paper is TobinQ, a widely recognized financial measure used to assess the relationship between a firm's market value and its replacement cost or book value. TobinQ represents how efficiently a company utilizes its assets, which is highly relevant when considering corporate hedging practices. A TobinQ greater than 1 suggests that the market values the firm's assets higher than their accounting value, indicating potential growth opportunities and positive market sentiment. Conversely, a TobinQ less than 1 may indicate that the market values the assets lower than their accounting value, possibly suggesting undervaluation or inefficient asset utilization.

The independent variables include l_HedgeAmount and HedgeAmount1. The l_HedgeAmount variable represents the gain or loss from hedging activities undertaken by firms in a specific year. This measure captures the financial gain or loss resulting from a firm's hedging activities, where positive values indicate gains from successful hedging operations and negative values suggest losses due to ineffective or adverse market movements. HedgeAmount1 represents the total amount of hedging undertaken by the firm, providing an alternative measure of the hedging activities.

Moderating variables in this study are Enterprise_own and CG_index. Enterprise_own represents enterprise ownership, capturing the influence of ownership structures on corporate performance. The CG_index variable measures the quality and effectiveness of corporate governance practices within a firm. It evaluates aspects such as risk oversight, transparency, and adherence to legal governance principles. A higher CG_index value indicates stronger corporate governance practices, while a lower value suggests weaker governance structures. The CG_index helps gauge how the quality of corporate governance influences the relationship between corporate hedging and enterprise value.

Control variables are essential to account for factors that may influence the connection between the explained and explanatory variables. Size, representing a firm's scale or magnitude and measured as the logarithm of total assets, is anticipated to have a significant relationship with enterprise value. Leverage (Lev), calculated as the debt-to-asset ratio, is another control variable that can influence enterprise value due to the financial risks associated with higher debt levels.

Additional control variables include the Board, which reflects the total number of board members, and Indep, which indicates the proportion of independent directors to total board members. CEO duality (Dual) is a dummy variable indicating if the CEO holds two designations (1 if yes, otherwise 0). Ownership concentration is measured by the variables Top1, Top5, and

Top10, which indicate the ownership proportions of the largest shareholders. These variables help to provide a comprehensive understanding of firm performance, market valuation, hedging activities, and ownership structures. This framework helps contextualize how these factors interact and potentially influence firm performance and market outcomes in corporate finance.

The summary of all variables as well as their definitions can be found in Table 1.

Table 1. Variable definition

Variables	Symbol	Operational Definition
Enterprise Value	TobinQ	Market value of tradable shares + Number of non-tradable shares × Net assets per share + Book value of liabilities) / Total assets
Corporate Hedging (Proxy1)	l_HedgeAmount	Gain or loss from hedge in a particular year) / 1 million
Corporate Hedging (Proxy2)	HedgeAmount1	The total amount of hedging
Enterprise Ownership	enterprise_own	Enterprise ownership
Top1_Shareholder	Top1	Ownership of Top1 shareholder
Top5_Shareholder	Top5	Ownership of Top5 shareholder
Top10_Shareholder	Top10	Ownership of Top10 shareholder
Board Size	Board	Total number of board members
Board Independence	Indep	Proportionate of an independent director to total board members
CEO Duality	Dual	1 if the CEO holds two designations, otherwise 0
CG Index	CG_index	Corporate governance index
Firm Size	Size	Log(total assets)
Leverage	Lev	Debt to asset ratio

Research models

To examine the impact of corporate hedging (*HedgeAmount*) on enterprise value (*TobinQ*), this paper focuses on regression analysis using the following econometric model:

$$TobinQ_{,t} = \beta_0 + \beta_1*HedgeAmount_{,t} + \beta_2 i*Control\ Variables_{i,t} + \varepsilon_{i,t}$$

$$TobinQ_{,t} = \beta_0 + \beta_1*HedgeAmount_{,t} + \beta_2*Onwership_t + \beta_2 3*HedgeAmount\ Ownership_t\ \beta_2 i*Control\ Variables_{i,t} + \varepsilon_{i,}$$

$$TobinQ_{,t} = \beta_0 + \beta_1*HedgeAmount_{,t} + \beta_2*Corporate\ Governance_t + \beta_2 3*HedgeAmount\ Ownership_t\ \beta_2 i*Control\ Variables_{i,t} + \varepsilon_{i,}$$

Where:
- $X_{i,t}$ denotes a vector of control variables;
- $\varepsilon_{i,t}$ represents the error term, capturing unexplained variation in the enterprise value.

As it was mentioned before, the choice of employing the Generalized Least Squares (*GLS*) model for panel data analysis in this research is driven by its effectiveness in handling certain statistical issues commonly encountered in empirical studies. Panel data, which combines cross-sectional and time-series data, often exhibits two key challenges: heteroscedasticity and autocorrelation. This approach enhances the validity of the findings and contributes to the robustness of the empirical analysis.

Results
Descriptive statistics

For TobinQ, the mean is 1.9710, indicating that, on average, firms are valued at approximately 1.97 times their asset replacement cost. This metric serves as a gauge of market sentiment and investor confidence in the firm's performance and growth prospects. A higher TobinQ typically suggests that the market perceives the firm's value positively relative to its tangible assets, reflecting strong market valuation and potentially better growth opportunities (Deng & Yang, 2023).

Moving to the hedging-related variables, the mean for l_HedgeAmount is 2.7290, with a standard deviation of 0.1960. This variable represents the logarithm of hedge amounts, indicating the extent of hedging activities undertaken by firms. The average value of 2.7290 suggests that, on average, firms engage in moderate to substantial hedging activities, which could signify efforts to manage risks associated with fluctuations in interest rates, foreign exchange rates, or commodity prices. Hedging can provide stability to cash flows and protect profitability, thus influencing firm strategies and financial performance (Liu, 2023).

Regarding ownership structure variables, enterprise ownership has a mean of 0.307, indicating that, on average, about 30.7% of firms in the dataset have enterprise ownership structures. Enterprise ownership often implies a more diversified and stable shareholder base, potentially contributing to better governance practices and strategic decision-making. Higher levels of enterprise ownership are generally associated with reduced agency costs and improved alignment of interests between management and shareholders, which can positively influence firm performance and valuation (Buriro et al., 2023).

For ownership concentration variables, Top1, Top5, and Top10 have mean values of 0.339, 0.538, and 0.591, respectively. These figures indicate the average proportion of ownership held by the largest Top 1, Top 5, and Top 10 shareholders. Higher mean values suggest greater ownership concentration among these groups, which can impact corporate governance dynamics and decision-making processes. High ownership concentration may enhance

managerial discipline but could also lead to potential conflicts of interest and reduced managerial discretion (Chang et al., 2024).

In conclusion, these mean values provide foundational insights into the average characteristics of firms regarding their market valuation, hedging activities, and ownership structures. Understanding these averages helps contextualize how these factors interact and potentially influence firm performance and market outcomes in corporate finance (Vural-Yavas, 2016).

Table 2. Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
TobinQ	12572	1.9710	1.3540	0.8020	17.7290
l_HedgeAmount	12714	2.7290	0.1960	-1.3090	3.1630
HedgeAmount1	12714	59123927	588200000	-18540000000	14680000000
enterprise_own	12714	0.307	0.461	0.000	1.000
Top1	12712	0.339	0.150	0.081	0.758
Top5	12712	0.538	0.158	0.185	0.892
Top10	12712	0.591	0.157	0.206	0.910
Board	12711	2.118	0.199	1.609	2.708
Indep	12711	0.379	0.055	0.286	0.600
Dual	12714	0.304	0.460	0.000	1.000
CG_index	12712	0.778	0.623	0.018	2.961
Size	12714	22.554	1.375	19.525	26.430
Lev	12714	0.431	0.202	0.035	0.925
Cashflow	12714	0.053	0.066	-0.196	0.257
ListAge	12714	2.150	0.905	0.000	3.367

Correlation matrix

The correlation matrix provides insights into the relationships among variables. The results show that TobinQ is positively correlated with size (0.34), cash flow (0.12), and board composition (0.11), indicating that larger firms with stronger cash flows and potentially more effective boards tend to have higher TobinQ values, reflecting better market valuation.

l_HedgeAmount shows a modest positive correlation with cash flow (0.04) and a negative correlation with TobinQ (-0.07), suggesting that higher hedge amounts are associated with lower firm valuation, possibly due to perceived risk management strategies affecting market perceptions. HedgeAmount1 positively correlates with l_HedgeAmount (0.16), indicating consistency between raw and logged hedge amount measures. It also shows negative correlations with TobinQ (-0.02) and enterprise ownership (-0.00), suggesting minimal direct relationships with firm value and ownership structures.

Enterprise_own is positively correlated with Top1 (0.24), Top5 (0.08), and Top10 (0.01). Enterprise ownership indicates a more dispersed ownership structure within firms. It is negatively correlated with TobinQ (-0.16),

suggesting that higher levels of enterprise ownership may be associated with lower market valuations. Top1, Top5, and Top10 variables measure ownership concentration among the largest shareholders. They show positive correlations among each other (ranging from 0.64 to 0.97) and negative correlations with TobinQ (ranging from -0.09 to -0.12), indicating that higher ownership concentration tends to be associated with lower firm valuations (Nagahi et al., 2018).

Table 3. Correlation matrix

	TobinQ	l_HedgeAmount	HedgeAmount1	enterprise_own	Top1	Top5	Top10	Board	Indep	Dual	CG_index	Size	Lev	Cashflow	ListAge
TobinQ	1.00														
l_HedgeAmount	-0.07***	1.00													
HedgeAmount1	-0.02**	0.16***	1.00												
enterprise_own	-0.16***	0.06***	-0.00	1.00											
Top1	-0.12***	0.00	-0.01	0.24***	1.00										
Top5	-0.11***	0.03**	0.01	0.08***	0.74***	1.00									
Top10	-0.09***	0.03**	0.01	0.01	0.64***	0.97***	1.00								
Board	-0.11***	0.06***	0.03**	0.22***	0.01	0.03***	0.03***	1.00							
Indep	0.03***	0.02*	0.01	-0.01	0.04***	0.04***	0.03**	-0.54***	1.00						
Dual	0.09***	-0.03**	0.02	-0.29***	-0.05***	0.00	0.03***	-0.17***	0.09***	1.00					
CG_index	0.06***	0.03**	0.03***	-0.25***	-0.69***	-0.14***	-0.01	0.03**	-0.03***	0.07***	1.00				
Size	-0.34***	0.39***	0.13***	0.38***	0.21***	0.18***	0.15***	0.26***	0.02*	-0.19***	-0.10***	1.00			
Lev	-0.28***	0.15***	0.05***	0.28***	0.06***	-0.02**	-0.06***	0.16***	0.00	-0.15***	-0.11***	0.54***	1.00		
Cashflow	0.12***	0.04***	-0.01	-0.04***	0.10***	0.14***	0.15***	0.03***	-0.00	-0.01	-0.01	0.06***	-0.17***	1.00	
ListAge	-0.06***	0.19***	0.03***	0.40***	-0.09***	-0.33***	-0.41***	0.14***	-0.01	-0.26***	-0.17***	0.40***	0.35***	-0.05***	1.00

Regression analysis

The Variance Inflation Factor (VIF) presents an analysis of potential multicollinearity among the independent variables in the regression model. VIF values measure how much the variance of a regression coefficient is inflated due to multicollinearity. A VIF value above 10 typically indicates high multicollinearity, which can distort the regression results.

In this table, all variables have VIF values well below 10, with "Size" having the highest VIF at 1.61 and "HedgeAmount1" the lowest at 1.02. The mean VIF is 1.29, indicating that multicollinearity is not a significant issue in this model. The 1/VIF values, which are the reciprocals of the VIFs, further confirm this by showing values close to 1, suggesting that the independent variables are not highly correlated and multicollinearity is minimal.

Table 4. Regression analysis

Variable	VIF	1/VIF
Size	1.61	0.622809
Lev	1.54	0.648272
ListAge	1.23	0.809933
Cashflow	1.07	0.937588
HedgeAmount1	1.02	0.980056
Mean VIF	1.29	

The fixed effect regression results provide insights into the moderating role of ownership on the relationship between corporate hedging and firm value (TobinQ). The hedge amount in raw form shows a weak and mostly insignificant effect on TobinQ across all models, suggesting that hedge amounts do not have a strong direct impact on firm value. The values suggest that the combination of hedge amount and enterprise ownership does not significantly affect firm value (Nagahi et al., 2018). On the other hand, enterprise ownership shows a positive but insignificant effect on TobinQ, indicating that enterprise ownership alone may not significantly influence firm value (Vural-Yavas, 2016). The analysis shows that higher ownership concentration among the top five shareholders might negatively impact firm value. Top1 and Top10 also show negative coefficients, but these are not significant.

The lagged dependent variable (L.TobinQ) consistently shows a highly significant positive effect on TobinQ across all values, indicating strong persistence in firm value over time. For the variable HedgeAmount1 (hedge amount), the results are mixed. It has a positive and significant effect on TobinQ, suggesting that hedging activities initially enhance firm value.

The variable enterprise_ownership shows a highly significant positive effect on TobinQ, suggesting that firms with enterprise ownership tend to have higher market valuations. Additionally, the interaction between hedge amount and enterprise ownership is positive and significant, indicating that enterprise ownership strengthens the positive effect of hedging on firm value (Hong et al., 2020).

For Top1 (ownership concentration of the largest shareholder), the effect is significantly negative, implying that a higher concentration of ownership in the hands of the largest shareholder negatively impacts firm value. Similarly, Top5 has a significantly negative effect on Tobin Q, indicating that high ownership concentration among the top five shareholders reduces firm value. The interaction term HedgeAmount1_Top5 is insignificant, showing no significant moderating effect. Further, Top10 also shows a significantly negative effect on TobinQ, implying that concentrated ownership among the top ten shareholders is detrimental to firm value. The

interaction term HedgeAmount1_Top10 is insignificant, indicating no moderating effect on the hedge amount and firm value relationship (Campbell et al., 2023).

Concluding that, hedging activities can positively impact firm value, the presence and concentration of large shareholders generally have a negative effect. The significant positive interaction between hedge amount and enterprise ownership suggests that enterprise ownership can enhance the benefits of hedging, while the other ownership concentrations do not significantly moderate the hedging-firm value relationship (Vural-Yavas, 2016).

The regression results for l_HedgeAmount provide mixed insights into its relationship with firm value, measured by TobinQ. l_HedgeAmount shows a significant positive effect on TobinQ (0.563, $p < 0.01$), indicating that increased hedge amounts are associated with higher firm value. This suggests that firms engaging in more hedging activities tend to be valued higher in the market, possibly due to reduced risk and increased stability in cash flows (Guay & Kothari, 2003).

When considering the interaction with enterprise ownership, the direct effect of l_HedgeAmount becomes negative and insignificant (-0.117), and the interaction term l_HedgeAmount_ent is positive but also insignificant (0.844). The enterprise ownership variable itself is also negative and insignificant (-0.127). These results indicate that the presence of enterprise ownership does not significantly moderate the relationship between hedge amounts and firm value (Nagahi et al., 2018)

The GMM results reveal that hedging activities, as measured by the logarithm of hedge amounts, have a positive impact on firm value (TobinQ), although this effect varies with model specifications. The lagged TobinQ consistently shows strong persistence in firm value across all models. Enterprise ownership significantly enhances firm value, indicating potential benefits from better governance. However, the interaction between hedge amounts and enterprise ownership is not significant, suggesting no moderating effect. Ownership concentration variables (Top1, Top5, Top10) generally exhibit negative but insignificant effects on firm value and do not significantly moderate the impact of hedging activities. Overall, while hedging positively influences firm value, the role of ownership concentration is limited, with enterprise ownership playing a more crucial role in enhancing firm performance.

Table 5. Fixed effect regression (Model-l-moderating role of ownership)

VARIABLES	(1) TobinQ	(2) TobinQ	(3) TobinQ	(4) TobinQ	(5) TobinQ
HedgeAmount1	0.00435	0.00349	-0.000778	-0.00116	-0.000970
	(0.00624)	(0.00846)	(0.00777)	(0.00777)	(0.00777)
enterprise_own		0.117			
		(0.266)			
HedgeAmount1_ent		-0.00797			
		(0.0167)			
Top1			-0.461		
			(0.394)		
HedgeAmount1_Top1			0.00423		
			(0.0141)		
Top5				-0.656*	
				(0.352)	
HedgeAmount1_Top5				0.00403	
				(0.0141)	
Top10					-0.417
					(0.321)
HedgeAmount1_Top10					0.00441
					(0.0141)
Size	-0.525***	-0.446***	-0.431***	-0.416***	-0.413***
	(0.0266)	(0.121)	(0.0550)	(0.0550)	(0.0556)
Lev	0.137	-0.0319	0.247	0.220	0.193
	(0.115)	(0.360)	(0.265)	(0.262)	(0.262)
Cashflow	0.839***	-0.0859	1.320***	1.317***	1.320***
	(0.171)	(0.443)	(0.365)	(0.365)	(0.365)
ListAge	0.649***	0.271	0.523***	0.496***	0.510***
	(0.0339)	(0.184)	(0.0959)	(0.0974)	(0.0983)
Constant	12.32***	11.29***	10.62***	10.56***	10.35***
	(0.556)	(2.641)	(1.212)	(1.185)	(1.176)
F-Stats(P value)	0.000	0.000	0.000	0.000	0.000
Hausman Test(P value)	0.000	0.000	0.000	0.000	0.000
Observations	12,572	913	2,556	2,556	2,556
R-squared	0.052	0.036	0.051	0.053	0.051
Number of id	3,252	369	1,091	1,091	1,091

Table 6. GMM results (Model-l-moderating role of ownership)

VARIABLES	TobinQ	TobinQ	TobinQ	TobinQ	TobinQ
L.TobinQ	0.583***	0.167***	0.480***	0.469***	0.473***
	(0.0166)	(0.0313)	(0.0488)	(0.0488)	(0.0491)
HedgeAmount1	0.0110**	-0.00719**	-0.00239	-0.00278	-0.00467
	(0.00435)	(0.00336)	(0.00699)	(0.00687)	(0.00697)
enterprise_own		0.960***			
		(0.306)			
HedgeAmount1_ent		0.0378***			
		(0.0115)			
Top1			-2.284***		

VARIABLES					
				(0.724)	
HedgeAmount1_Top1				0.0182	
				(0.0206)	
Top5				-1.832***	
				(0.678)	
HedgeAmount1_Top5				0.0230	
				(0.0202)	
Top10					-1.043**
					(0.515)
HedgeAmount1_Top10					0.0256
					(0.0204)
Size	-0.384***	-0.494***	-0.354***	-0.284***	-0.313***
	(0.0518)	(0.0865)	(0.0897)	(0.0914)	(0.0935)
Lev	0.286	-1.257***	1.075*	0.828	0.646
	(0.254)	(0.350)	(0.623)	(0.619)	(0.590)
Cashflow	1.105***	-0.138	3.163***	3.284***	3.217***
	(0.221)	(0.309)	(0.570)	(0.555)	(0.558)
ListAge	0.258***	-0.283	-0.888***	-0.968***	-0.895***
	(0.0622)	(0.258)	(0.199)	(0.209)	(0.210)
Constant	8.795***	13.21***	11.66***	10.56***	10.77***
	(1.100)	(1.932)	(1.987)	(1.951)	(1.959)
Observations	8,795	780	2,161	2,161	2,161
Number of id	2,565	332	991	991	991

Table 7. Fixed effect regression (Model-2-moderating role of ownership)

VARIABLES	TobinQ	TobinQ	TobinQ	TobinQ	TobinQ
l_HedgeAmount	0.563***	-0.117	0.135	-0.0578	-0.248*
	(0.148)	(0.870)	(0.0912)	(0.129)	(0.138)
enterprise_own		-0.127			
		(0.123)			
l_HedgeAmount_ent		0.844			
		(2.213)			
Top1			-1.216**		
			(0.475)		
l_HedgeAmount_Top1			0.175		
			(0.147)		
Top5				-2.389***	
				(0.612)	
l_HedgeAmount_Top5				0.685**	
				(0.278)	
Top10					-3.035***
					(0.616)
l_HedgeAmount_Top10					1.170***

					(0.305)
Size	-0.430***	-0.511***	-0.540***	-0.517***	-0.508***
	(0.0522)	(0.0458)	(0.0269)	(0.0271)	(0.0274)
Lev	0.363	0.287	0.175	0.118	0.100
	(0.253)	(0.180)	(0.115)	(0.115)	(0.115)
Cashflow	1.097***	0.292	0.827***	0.826***	0.813***
	(0.220)	(0.229)	(0.171)	(0.171)	(0.171)
ListAge	0.214***	0.393***	0.589***	0.533***	0.527***
	(0.0641)	(0.0900)	(0.0362)	(0.0380)	(0.0386)
L.TobinQ	0.590***				
	(0.0165)				
Constant	8.358***	12.00***	12.85***	13.61***	14.16***
	(1.124)	(0.985)	(0.654)	(0.776)	(0.782)
F-Stats(P value)					
Hausman test(P value)					
Observations	8,795	3,858	12,569	12,569	12,569
R-squared		0.057	0.054	0.056	0.056
Number of id	2,565	870	3,251	3,251	3,251

Table 8. GMM results (Model-2-moderating role of ownership)

VARIABLES	(1) TobinQ	(2) TobinQ	(3) TobinQ	(4) TobinQ
L.TobinQ	0.547***	0.585***	0.583***	0.583***
	(0.0193)	(0.0168)	(0.0167)	(0.0166)
l_HedgeAmount	1.040*	0.714***	0.744***	0.371
	(0.589)	(0.141)	(0.230)	(0.261)
enterprise_own	0.411***			
	(0.154)			
l_HedgeAmount_ent	-1.896			
	(1.458)			
Top1		0.647		
		(0.855)		
l_HedgeAmount_Top1		-0.260		
		(0.248)		
Top5			-0.424	
			(1.273)	
l_HedgeAmount_Top5			-0.371	
			(0.585)	
Top10				-2.226
				(1.390)
l_HedgeAmount_Top10				0.683
				(0.692)

Size	-0.359***	-0.422***	-0.370***	-0.372***
	(0.0434)	(0.0528)	(0.0539)	(0.0545)
Lev	0.0498	0.386	0.427	0.411
	(0.263)	(0.260)	(0.261)	(0.259)
Cashflow	-0.135	1.085***	1.100***	1.087***
	(0.172)	(0.219)	(0.220)	(0.219)
ListAge	-0.0789	0.178***	0.0456	0.0507
	(0.155)	(0.0680)	(0.0786)	(0.0763)
Constant	7.763***	7.574***	7.211***	8.926***
	(1.096)	(1.314)	(1.600)	(1.637)
Observations	2,872	8,794	8,794	8,794
Number of id	744	2,565	2,565	2,565

Regression analysis (Moderating role of corporate governance)

The analysis presents the moderating role of corporate governance (CG) on the relationship between hedge amounts and firm value (TobinQ) with fixed effect regressions. The coefficients for HedgeAmount1, which represents logged hedge amounts, show insignificant effects on TobinQ, except where it becomes marginally significant (0.00396, $p < 0.1$). The interaction term l_HedgeAmount, however, is positively significant (0.102, $p < 0.001$), indicating that the impact of hedge amounts on firm value increases with better corporate governance practices. Overall, while hedge amounts alone do not robustly predict TobinQ, their interaction with corporate governance highlights a nuanced relationship where effective governance can amplify the positive impact of hedging on firm value (Guay & Kothari, 2003). In model 2. the fixed effect regression results explore how corporate governance (CG) moderates the relationship between hedge amounts (l_HedgeAmount) and firm value (TobinQ). l_HedgeAmount shows inconsistent effects, significantly positive (1.729, $p < 0.1$).

Moreover, GMM results in model 1, focusing on the moderating role of corporate governance (CG) concerning hedge amounts and firm value (TobinQ). Across the models, L.TobinQ consistently shows a positive and significant coefficient, indicating strong persistence in firm value over time. Regarding HedgeAmount1, its impact on TobinQ varies. The interaction term l_HedgeAmount is positively significant (0.0877, $p < 0.05$), indicating the relationship between hedge amounts and firm value strengthens with better corporate governance. These findings highlight the intricate interplay between hedging strategies, corporate governance quality, and firm valuation, underscoring the crucial role of governance frameworks in shaping how financial practices impact firm performance (Guay & Kothari, 2003). L.TobinQ, representing lagged firm value, consistently shows a positive and significant effect (coefficients range from 0.406 to 0.530, $p < 0.01$), indicating

strong persistence in firm performance. Notably, l_HedgeAmount exhibits varying impacts: highly significant and positive (coefficients around 7.090 to 7.078, p < 0.01), suggesting a robust positive relationship between hedging activities and firm value. Overall, these findings highlight the nuanced role of corporate governance in shaping the relationship between hedging activities and firm performance, with board composition and leadership structure influencing this relationship in distinct ways (Buriro et al., 2023).

Table 9. Fixed effect regression (Model-l-moderating role of corporate governance)

VARIABLES	(1) TobinQ	(2) TobinQ	(3) TobinQ	(4) TobinQ
HedgeAmount1	-0.000431	-0.000513	-0.00286	0.00396
	(0.00778)	(0.00778)	(0.0159)	(0.00624)
Board	0.0156			
	(0.181)			
HedgeAmount1_Board	0.00408			
	(0.0141)			
Indep		0.247		
		(0.527)		
HedgeAmount1_ind		0.00414		
		(0.0141)		
zee_Dual			0.604	
			(0.510)	
HedgeAmount1_dual			-0.0355	
			(0.0298)	
CG_index				-0.181***
				(0.0571)
l_HedgeAmount_CG_index				0.102***
				(0.0333)
Size	-0.425***	-0.425***	-0.0578	-0.527***
	(0.0548)	(0.0548)	(0.141)	(0.0273)
Lev	0.204	0.205	0.793	0.153
	(0.262)	(0.262)	(0.693)	(0.116)
Cashflow	1.336***	1.329***	1.118	0.841***
	(0.365)	(0.366)	(0.833)	(0.171)
ListAge	0.553***	0.549***	0.678***	0.636***
	(0.0933)	(0.0928)	(0.248)	(0.0341)
Constant	10.24***	10.19***	0.488	12.48***
	(1.236)	(1.192)	(3.773)	(0.568)
F-Stats(P value)	0.000	0.000	0.000	0.000
Hausman test(P value)	0.000	0.000	0.000	0.000
Observations	2,556	2,556	722	12,569
R-squared	0.050	0.051	0.041	0.053
Number of id	1,091	1,091	380	3,251

Table 10. GMM results (Model-l-moderating role of corporate governance)

VARIABLES	(1) TobinQ	(2) TobinQ	(3) TobinQ	(4) TobinQ
L.TobinQ	0.478***	0.479***	0.505***	0.583***
	(0.0489)	(0.0486)	(0.0655)	(0.0165)
HedgeAmount1	-0.00509	-0.00538	-0.0188	0.0107**
	(0.00737)	(0.00729)	(0.0131)	(0.00426)
Board	-0.225			
	(0.285)			
HedgeAmount1_Board	0.0221			
	(0.0210)			
Indep		0.0195		
		(0.574)		
HedgeAmount1_ind		0.0234		
		(0.0208)		
zee_Dual			-3.228***	
			(0.457)	
HedgeAmount1_dual			0.00894	
			(0.0255)	
CG_index				-0.232**
				(0.106)
l_HedgeAmount_CG_index				0.0877*
				(0.0510)
Size	-0.368***	-0.377***	-1.094***	-0.376***
	(0.0952)	(0.0932)	(0.221)	(0.0536)
Lev	0.580	0.540	1.274	0.306
	(0.592)	(0.593)	(0.863)	(0.256)
Cashflow	3.092***	3.116***	3.635***	1.117***
	(0.586)	(0.589)	(0.813)	(0.220)
ListAge	-0.736***	-0.718***	-1.081***	0.241***
	(0.190)	(0.188)	(0.227)	(0.0625)
Constant	11.52***	11.24***	33.02***	8.785***
	(2.030)	(2.084)	(5.347)	(1.134)
Observations	2,161	2,161	601	8,794
Number of id	991	991	335	2,565

Table 11. Fixed effect regression model (Model-2-moderating role of corporate governance)

VARIABLES	(1) TobinQ	(2) TobinQ	(3) TobinQ	(4) TobinQ
l_HedgeAmount	0.599	0.593	1.729	0.516
	(0.754)	(0.754)	(1.817)	(0.716)
Board	0.0236			
	(0.181)			
HedgeAmount1_Board	-0.0169			
	(0.0289)			
Indep		0.292		
		(0.529)		
HedgeAmount1_ind		-0.0167		
		(0.0289)		
zee_Dual			0.831	
			(0.564)	
HedgeAmount1_dual			-0.0924	
			(0.0634)	
CG_index				0.0115
				(0.0807)
HedgeAmount1_CG_index				-0.0133
				(0.0271)
Size	-0.435***	-0.434***	-0.0654	-0.432***
	(0.0561)	(0.0561)	(0.141)	(0.0569)
Lev	0.217	0.218	0.784	0.209
	(0.262)	(0.262)	(0.692)	(0.265)
Cashflow	1.324***	1.317***	1.050	1.327***
	(0.366)	(0.366)	(0.835)	(0.366)
ListAge	0.515***	0.511***	0.662***	0.520***
	(0.105)	(0.105)	(0.248)	(0.103)
Constant	8.762***	8.690***	-4.795	8.965***
	(2.227)	(2.242)	(6.756)	(2.178)
F-Stats(P value)	0.000	0.000	0.000	0.000
Hausman test(P value)	0.000	0.000	0.000	0.000
Observations	2,556	2,556	722	2,556
R-squared	0.051	0.051	0.044	0.051
Number of id	1,091	1,091	380	1,091

Table 12. GMM results (Model-2-moderating role of corporate governance)

VARIABLES	(1) TobinQ	(2) TobinQ	(3) TobinQ	(4) TobinQ
L.TobinQ	0.406***	0.405***	0.530***	0.417***
	(0.0477)	(0.0474)	(0.0658)	(0.0487)
l_HedgeAmount	7.090***	7.078***	2.843**	5.823***
	(0.997)	(0.992)	(1.422)	(0.916)
Board	0.124			
	(0.281)			
HedgeAmount1_Board	-0.235***			
	(0.0420)			
Indep		0.367		
		(0.576)		
HedgeAmount1_ind		-0.235***		
		(0.0418)		
Dual			-2.387***	
			(0.710)	
HedgeAmount1_dual			-0.0928*	
			(0.0538)	
CG_index				0.129
				(0.0964)
HedgeAmount1_CG_index				-0.178***
				(0.0381)
Size	-0.674***	-0.671***	-0.995***	-0.572***
	(0.111)	(0.109)	(0.255)	(0.108)
Lev	1.201*	1.177*	1.290	1.010
	(0.629)	(0.629)	(0.859)	(0.614)
Cashflow	1.902***	1.912***	3.385***	1.804***
	(0.583)	(0.584)	(0.800)	(0.582)
ListAge	-1.090***	-1.095***	-1.038***	-1.140***
	(0.205)	(0.205)	(0.232)	(0.206)
Constant	-2.253	-2.545	20.81**	-0.785
	(2.963)	(3.003)	(9.588)	(2.878)
Observations	2,161	2,161	601	2,161
Number of id	991	991	335	991

Discussion

The findings of this study offer significant insights into the complex interplay between hedging activities, ownership structures, and corporate governance on firm value, particularly within Chinese-listed firms. In line with prior research by Buriro et al. (2023) and Deng et al. (2023), our results affirm

that hedging activities positively influence firm valuation, as measured by Tobin's Q.

This study highlights that while ownership concentration has a direct negative impact on firm value, its moderating effect on the relationship between hedging and firm value is minimal. This finding suggests that although ownership concentration can restrict managerial discretion and potentially limit firm performance, it does not significantly alter the efficacy of hedging strategies. This aligns with Chang et al. (2024), who discuss the potential drawbacks of concentrated ownership in limiting innovation and managerial flexibility.

Moreover, our results underscore the crucial role of corporate governance in amplifying the benefits of hedging strategies. Firms with robust governance structures with higher levels of transparency, accountability, and strategic oversight are more adept at leveraging hedging activities to enhance firm value. This is consistent with the perspectives of Landi et al. (2022), who emphasize that effective governance practices ensure that hedging decisions are made with the primary goal of enhancing firm value, thus reinforcing the positive impact of hedging strategies.

The interaction between corporate governance and hedging activities underscores the importance of context-specific factors. Our analysis indicates that firms with strong governance frameworks benefit more from hedging activities, suggesting that effective corporate governance is essential for maximizing the potential advantages of hedging strategies. This finding supports the views of Al-Gamrh et al. (2020) on the significant role of governance in strategic decision-making and risk management.

While this study contributes to the existing literature, it is important to acknowledge its limitations. The exclusive focus on Chinese-listed firms may limit the generalizability of the findings to other geographic contexts. Additionally, the study employs specific measures of hedging activities (gains or losses from hedging) and firm value (Tobin's Q), which may not fully capture the multidimensional nature of these constructs. Future research could explore alternative measures and methodologies to validate and extend the current findings.

Conclusion

This study contributes to the ongoing debate on the impact of hedging and ownership structures on firm value. The findings suggest that while ownership concentration has a direct negative impact on firm value, its moderating effect on the relationship between hedging and firm value is not substantial. These results have practical implications for corporate governance, indicating that firms should consider the distribution of ownership when assessing the potential benefits of hedging strategies. Future

research could further explore these dynamics in different contexts and industries to provide a more comprehensive understanding of these relationships.

In conclusion, this study provides a nuanced understanding of how hedging activities, ownership structures, and corporate governance collectively influence firm value. The findings highlight that while hedging activities can potentially enhance firm value, their impact varies across different models, suggesting the importance of context-specific factors and interactions. Specifically, robust corporate governance practices significantly bolster the positive effects of hedging on firm performance. Enterprises with strong governance frameworks tend to leverage hedging strategies more effectively, mitigating risks and enhancing overall market valuation (De Boer et al., 2020).

Conversely, the study underscores the detrimental impact of high ownership concentration among major shareholders on firm value. This suggests that while concentrated ownership may align interests and foster strategic direction, it can also limit managerial discretion and hinder firm performance, especially when not complemented by effective governance mechanisms (Antunez et al., 2023).

Moreover, the positive association between enterprise ownership and firm value underscores the role of governance in strategic decision-making and long-term value creation. Enterprises with substantial ownership by institutional investors or diversified shareholders tend to benefit from enhanced oversight and strategic alignment, which positively impact market valuation (Kukaj et al., 2023).

Effective corporate governance mechanisms thus emerge as critical facilitators in amplifying the benefits of hedging strategies. By ensuring transparency, accountability, and strategic oversight, governance practices enable firms to navigate uncertainties more adeptly, thereby enhancing shareholder value and financial stability (De Boer et al., 2020).

These insights carry significant implications for corporate leaders and policymakers alike. They underscore the importance of tailoring governance frameworks to suit specific organizational contexts and market dynamics. By fostering environments conducive to effective risk management and strategic decision-making, firms can optimize their financial strategies amidst diverse ownership structures and regulatory landscapes (Hong et al., 2020).

Looking ahead, future research could further explore sector-specific nuances and global variations in governance practices to deepen our understanding of how these dynamics influence firm performance over time. By expanding our knowledge base, we can better inform policy recommendations and strategic initiatives aimed at fostering sustainable growth and value creation in corporate finance and governance (Liu, 2023).

References:

1. Al-Gamrh, B., Ku Ismail, K. N., Ahsan, T., & Alquhaif, A. (2020). Investment opportunities, corporate governance quality, and firm performance in the UAE. *Journal of Accounting in Emerging Economies*, 10(2), 261–276. https://doi.org/10.1108/jaee-12-2018-0134

2. Antunez, M., Ramalho, N., & Marques, T. M. (2023). Context matters less than leadership in preventing unethical behavior in international business. *Journal of Business Ethics,* 192(2), 307–322. https://doi.org/10.1007/s10551-023-05520-y

3. Buriro, M. H., Bhatti, A. A. & Jamali, M. A. (2023). Capital expenditure, corporate hedging and firms' value: Evidence from the oil and gas sector of Pakistan. *Journal of Development and Social Sciences*, 4(2), 428-438. https://doi.org/10.47205/jdss.2023(4-ii)38

4. Campbell, J. L., Mauler, L. M., & Pierce, S. R. (2019). A review of derivatives research in accounting and suggestions for future work. *Journal of Accounting Literature*, 42(1), 44–60. https://doi.org/10.1016/j.acclit.2019.02.001

5. Campbell, J. L., Cao, S. S., Chang, H. S., & Chiorean, R. (2023). The implications of firms' derivative usage on the frequency and usefulness of management earnings forecasts. *Contemporary Accounting Research,* 40(4), 2409–2445. https://doi.org/10.1111/1911-3846.12883

6. Cardinale, R. (2021). State-Owned Enterprises' reforms and their implications for the resilience and vulnerability of the Chinese economy: Evidence from the banking, energy and telecom sectors. *Networks and Spatial Economics*, 22(3), 489–514. https://doi.org/10.1007/s11067-021-09540-x

7. Chang, Y., Fan, Y., & (Nancy) Su, L. (2024). Foreign Exchange Risk and audit pricing: Evidence from U.S. multinational corporations. *Journal of Accounting and Public Policy*, 45, 107196. https://doi.org/10.1016/j.jaccpubpol.2024.107196

8. Dang, L. N., Nguyen, D. D., & Taghizadeh-Hesary, F. (2021). State-owned enterprise reform in Viet Nam: Progress and challenges. *Reforming State-Owned Enterprises in Asia*, 231–254.

https://doi.org/10.1007/978-981-15-8574-6_12

9. De Boer, J., Bövers, K. J., & Meyer, S. (2020). Business cycle variations in exchange rate correlations: Revisiting global currency hedging. *Finance Research Letters,* 33, 101195. https://doi.org/10.1016/j.frl.2019.05.013

10. Deng, Z., & Yang, J. J. (2023). Corporate reputation and hedging activities. *Accounting Finance*, 63(S1), 1223–1247. https://doi.org/10.1111/acfi.13018

11. Grima, S., Thalassinos, E. I., & Gonzi, D. R. (2020). Financial derivatives: A blessing or a curse? *Emerald Publishing.*

12. Guay, W. R., & Kothari, S. P. (2003). How much do firms hedge with derivatives? *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.262544

13. Hendrati, M. I., Kusumawardhani, I. N., Asmara, K., Marseto, & Rusdiyanto. (2024). Strategy for Developing Planning for Post-COVID-19 SME Economic Recovery: Evidence from Indonesia. *Quality - Access to Success*, 25(199), 94–107. https://doi.org/10.47750/QAS/25.199.11

14. Hull, J. C. (2022). *Options, futures, and other derivatives.* Pearson Education Limited.

15. Hong, L., Li, Y., Xie, K., & Yan, C. J. (2020). On the market timing of hedging: Evidence from U.S. oil and Gas Producers. *SSRN Electronic Journal.* https://doi.org/10.2139/ssrn.3333502

16. Kukaj, Q., Boros, A., & Bislimi, K. (2023). The impact of ownership type on the quality of study programs in the higher education sector of Kosovo: a comparative analysis. *Prizren Social Science Journal,* 7(2), 12–21. https://doi.org/10.32936/pssj.v7i2.429

17. Landi, G. C., Iandolo, F., Renzi, A., & Rey, A. (2022). Embedding sustainability in risk management: The impact of environmental, social, and governance ratings on Corporate Financial Risk. *Corporate Social Responsibility and Environmental Management*, 29(4), 1096–1107. https://doi.org/10.1002/csr.2256

18. Liu, Y. (2023). Corporate hedging and derivatives usage: a systematic literature review and new empirical evidence from an emerging market (Version 1). *Macquarie University.* https://doi.org/10.25949/24330895.v1

19. Merkert, R., & Swidan, H. (2019). Flying with(out) a safety net: Financial hedging in the airline industry. *Transportation Research Part E: Logistics and Transportation Review*, 127, 206–219. https://doi.org/10.1016/j.tre.2019.05.012

20. Milidonis, A., & Stathopoulos, K. (2014). Managerial incentives, risk aversion, and debt. *Journal of Financial and Quantitative Analysis*, 49(2), 453–481. https://doi.org/10.1017/s0022109014000301

21. Modigliani, F., & Miller, M. H. (1958). *The cost of capital, Corporation Finance and the theory of Investment*. American Economic Review.

22. Nagahi, M., Nagahisarchoghaei, M., Soleimani, N., & Jaradat, R. (2018). Hedge strategies of corporate houses. *Journal of Business Administration Research*, 7(1), 6. https://doi.org/10.5430/jbar.v7n1p6

23. Tron, A. (2021). Corporate distress and financial equilibrium: Genesis and prognosis. *Corporate Financial Distress*, 1–23. https://doi.org/10.1108/978-1-83982-980-220211002

24. Sridhar, S. (2023). An introduction to liquid exit derivatives enabling dynamic option pricing for private equity secondaries markets. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.4474915

25. Su, K., Zhang, M., & Liu, C. (2022). Financial derivatives, analyst forecasts, and stock price synchronicity: Evidence from an emerging market. *Journal of International Financial Markets, Institutions and Money*, 81, 101671. https://doi.org/10.1016/j.intfin.2022.101671

26. Sugiarto, H., Yanti, J., Cahyani, D., Junaidi, A., & Oktoriza, L. A. (2023). Exploration Financial Performance Optimization Strategies on Business Success: A Literature Review. *Journal of Management & Business*, 6(2), 402-411. https://doi.org/10.37531/sejaman.v6i2.4958

27. Vural-Yavas, C. (2016a). Determinants of corporate hedging: Evidence from an emerging market. *International Journal of Economics and Finance*, 8(12), 151. https://doi.org/10.5539/ijef.v8n12p151

28. Xiang, F. (2022). Financial derivatives: Application and risk management. *Proceedings of the 2022 2nd International Conference on Economic Development and Business Culture (ICEDBC 2022)*, 890–895. https://doi.org/10.2991/978-94-6463-036-7_131

29. Xie, D., Shi, X., Liu, J., & Zhu, Z. (2023). Free cash flow productivity among Chinese listed companies: A Comparative Study of soes and non-soes. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.4529406

30. Yang, A., Li, W., Teo, B. S., & Othman, J. (2022). The impact of financial derivatives on the enterprise value of Chinese listed companies: Moderating effects of managerial characteristics. *International Journal of Financial Studies*, 11(1), 2. https://doi.org/10.3390/ijfs11010002

Challenges and Opportunities in the Livestock Industry for higher productivity and sustainability: The case of Albania

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Abstract

The livestock sector plays an important role in the economic development of the country. This sector is a source of income and employment for many Albanian families who live mainly in rural areas. A large part of the population in our country deals with livestock. But regardless of all the contributions that livestock makes to the food chain, financial sustainability, and the entire economy, this sector faces many challenges. Based on the literature review, a questionnaire to identify these challenges was constructed. The questionnaire contains questions with answers on the Likert scale, is addressed to livestock farmers in Albania, and serves to identify the main challenges affecting the livestock sector. The questionnaire divided the challenges of the livestock sector into five parts, including animal welfare and livestock production, sustainable practices and environmental sustainability, market challenges, information, communication technologies and livestock marketing challenges, and challenges of innovations in livestock production.

Animal welfare affects the productivity of the livestock sector. The risk of the spread of epidemic diseases and the high costs of vaccination and medications are a concern for Albanian farmers, who often have difficulties ensuring sustainable profits. In recent years, the livestock sector has faced high

input costs. Lack of infrastructure also hinders the efficiency of the livestock sector.

The need for sustainable practices and environmental sustainability demands more attention. While farmers want to adopt sustainable livestock methods, they face difficulties in implementing them. Unpredictable livestock prices complicate financial planning for farmers. In addition, small farms face challenges competing with larger ones. Farmers face difficulties in becoming part of new markets due to a lack of effective marketing channels. The lack of a labor force is the biggest challenge that the livestock sector in Albania is facing.

Innovation often serves to solve many problems in the livestock sector. Farmers use new technologies to increase livestock productivity. But the use of new technologies requires knowledge, which Albanian farmers often don't have. They do not have the proper education to understand and apply these technologies. In conclusion, this paper aims to highlight the various problems faced by the livestock sector. Overcoming these problems by dealing directly with them can increase the productivity of the livestock sector, ensuring a better future for the industry.

Keywords: Livestock sector, challenges, productivity, innovation, market, sustainable

Introduction

The livestock sector is one of the most important sectors in Albania due to its importance in the country's economy. Over the years, the number of farmers working with livestock has been large. The wide range of livestock products produced on farms has often been part of informal markets. Over the years, the presence of Albanian livestock products in the formal and international markets began to increase. Internationalization drew the attention of government authorities to this sector and also increased the need for the modernization of this sector. The Albanian government tightens measures to improve food safety standards to protect the health of consumers inside and outside the country. The need for modernization led to increased investment in this sector. In addition to new technologies, special attention has been paid to increasing the care of livestock in order to increase the quality of livestock products (Lika, 2021). Strategies for improving the health of animals increase their lifespan and increase the quality of livestock products, which affects the health of consumers and sustainable livestock development (Biçoku & Uruçi, 2013).

However, the road to a successful livestock sector is not without challenges. The lack of infrastructure in rural areas hinders the transport of goods (Tomorri et al., 2018). Limited access to international markets, often as

a result of high competition, a lack of regulations, or their complexity, limits the possibility of Albanian farms being recognized internationally (Gjeçi et al., 2018). Epidemic livestock diseases require investment in preventive measures. A labor shortage affects livestock health and effective farm management. High input costs, and price volatility also hinder the development of the livestock sector. Farmers' low incomes reduce their opportunities to invest in improving farm conditions.

For the success of the livestock sector, it is necessary to minimize these challenges. Investment in infrastructure gives farmers new trade opportunities. Improving international trade regulations and encouraging cooperation with international buyers helps create a more equal environment for farmers in Albania. Government subsidies for farmers increase the profits of this sector and encourage young people to engage in animal husbandry (Gallerani et al., 2004). Investments in veterinary training and farmer education programs affect the improvement of animal health. Addressing the challenges and efforts to modernize the livestock sector will make the livestock sector in Albania an important engine of economic growth (Gjeçi et al., 2018).

Purpose

The purpose of this paper is to identify the challenges faced by the livestock sector in Albania through a questionnaire. Such a thing is realized by studying issues such as animal health, livestock production, marketing, invasion, etc. Minimizing these problems would affect the increase in livestock production.

1. To identify the main challenges faced by the livestock sector in Albania
2. To analyze whether Albanian farmers are ready to use new technologies to increase farm productivity
3. To analyze market challenges in the livestock sector, such as price volatility, market entry barriers, and competition.

The main objectives of the paper are:

1. To identify and analyze the key challenges faced by livestock farmers related to animal welfare, livestock production, market challenges, environmental sustainability, and innovation.
2. To examine the willingness and ability of farmers to adapt to new technologies in the livestock industry.
3. To identify the most important challenges related to market challenges such as price instability, high input costs, barriers to entering new markets, competitiveness, etc.

Research questions:
1. What are the main challenges facing livestock farmers in terms of animal health, production efficiency, market dynamics, environmental sustainability, and innovation adoption?
2. What is the level of use of new technologies by livestock farmers, and how ready are they to adopt these technologies?
3. How do market challenges affect the effectiveness of livestock production?
4. What measures can be taken to address the challenges identified in terms of increasing productivity in the livestock sector?

These research questions serve as a guide to exploring various problems in the livestock industry. They aim to identify the challenges faced by livestock farmers, current livestock production practices, the level of use of new technologies and the possibility of farmers using these technologies, the impact of market challenges on farm effectiveness, and possible strategies for addressing these problems.

Literature Review

The livestock sector has an important role in guaranteeing food security and promoting economic growth. It is a source of income for many people around the world. However, the livestock sector faces challenges that threaten its sustainability. One of the challenges this sector faces is related to animal health. The spread of epidemic diseases has been a constant concern for farmers, as it causes significant economic losses and threatens food security. (Perry et al., 2013). Epidemic diseases affect animal health. (Zawojskam & Siudek, 2018).

Another challenge faced by the livestock sector is related to livestock production limitations. Rising input costs, a lack of water supply, and inadequate infrastructure hinder the effectiveness of the industry (Tambi & Anyah, 2019). Furthermore, a lack of a labor force and qualified employees hampers livestock productivity, especially in developing countries (Mutibvu et al.,, 2012).

The impact of environmental conditions on livestock production is a growing concern. The livestock sector affects deforestation and water pollution (Kraham, 2017). On the other hand, climate change affects livestock production, water reserves, and animal health (Thornton & Herrero, 2010). According to the authors, sustainable practices are essential to ensuring the long-term sustainability of the livestock sector.

Market challenges affect livestock production. Unstable market prices, limited access to international markets and scale competition particularly affect small farmers, who are in unequal conditions compared to large farmers

(Williams et al., 2020). Information asymmetry, where small producers have little access to market information, further disadvantages them (Oliveira et al., 2006).

Innovation affects the success of the livestock sector. The financial limitations of farmers, the lack of knowledge about the use of new technologies, and the lack of proper infrastructure hinder the progress of the livestock industry (Kebebe, 2014).

Despite the challenges, there are many opportunities to increase the productivity of the livestock sector. Investment in road infrastructure, storage of livestock products, and veterinary services would increase the potential of this sector. Improved logistics can modernize operations and improve market access for farmers (Oosting et al., 2014).

For the success of the livestock sector, government support plays an essential role. Policies such as subsidizing the livestock sector, training programs for farmers, and supporting sustainable practices improve farm profitability, encourage and attract new generations to enter livestock farming, and promote the use of new technologies (Benin et al., 2003).

Improving trade regulations, promoting the cooperation of local farmers with international companies, and promoting the consumption of local products promote the development of the market for livestock products (Reardon et al., 2017).

Innovation is a powerful tool for answering many questions. New innovative animal breeding methods affect the improvement of livestock health and productivity. Advances in the veterinary field can improve the prevention and treatment of livestock diseases. Digital technologies increase farmers' access to data information, helping in effective resource management (Bicoku et al., 2018; Tomorri et al., 2018).

Improving marketing strategies is essential for the sale of livestock products (Negassa et al., 2011). According to the authors initiatives that increase access to market data and promote marketing channels empower smallholder farmers and improve their market competitiveness.

Farmers should pay special attention to the use of sustainable practices in order to mitigate the negative impact of changing climate conditions on livestock production (FAO, 2016). The use of practices that improve livestock health and increase livestock productivity should be the focus of farmers. Climate change impacts livestock production and management (Hahn et al.,1992). Strategies for improving the quality of livestock products, reducing food waste, and exploring alternative sources of food increase the sustainability of the livestock sector and reduce the impact of the livestock sector on climate change (Hoque et al., 2022). Applying proper practices when using organic manure is important, as it reduces greenhouse gas emissions and turns organic manure into a valuable source of fertilizer (Hyland et al., 2016).

Methodology

Based on the literature review, a questionnaire was constructed that was addressed to livestock farmers in Albania. The questionnaire contains questions on the demographic data of the respondents along with Likert scale responses. It was used to collect data and identify key challenges affecting the livestock sector. The questionnaire is divided into several parts. Each part of the questionnaire contains statements related to animal health and livestock production, sustainable practices and environmental sustainability, market challenges, information and communication technologies, livestock marketing challenges, and innovation challenges in livestock production. Farmers express their level of agreement with the given statements, using a rating scale from "strongly disagree" to "slightly agree". After data collection, an analysis was done to identify the main challenges faced by farmers in their daily activities. The results of the questionnaire were interpreted to give a comprehensive overview of the livestock sector in Albania.

A general overview of the livestock sector in Albania

Many Albanian families generate their income from livestock activities. Most of the livestock products that are sold in the market are produced on small and medium farms. Some of these products are sold in informal markets. On the other hand, many quality livestock products produced by large farms compete in international markets.

According to Instat (2022), the number of livestock has declined during the last few years. The number of cattle, containing primarily cows, has declined more than other types of livestock. The decline was 41% from 2015 to 2022. The number of sheep and goats, as well as the number of pigs, have decreased by 27% and 20%, respectively, over the last eight years. The number of Equidae, which generally contain horses, has declined by 28%, while the number of birds has fallen by 20%. The following table illustrates the changes in the number of livestock heads from 2015 to 2022.

Table 1. Number of livestock, 2015-2022(000 heads)

Nr.	Description	2015	2016	2017	2018	2019	2020	2021	2022
I	**Cattle**	504	492	475	467	416	363	337	298
	Cows	357	355	349	343	316	290	278	261
II	**Sheep/Goats**	2,850	2,911	2,859	2,781	2,621	2,332	2,256	2,093
III	**Pigs**	171	181	180	184	184	158	159	137
IV	**Equidae**	91	94	89	88	87	79	76	65
V	**Poultry**	8,558	8,326	7,835	8,362	8,179	7,907	7,652	6,848
VI	**Beehives**	271	303	290	285	288	358	394	479
	Total	12,446	12,307	11,727	12,169	11,775	11,196	10,873	10,181

Source: Instat 2022

Livestock farms in Albania are dominated by sheep, goats, and cows. This is because of the weight that cattle have in the production of the country's livestock product.

The decline in the livestock industry has come as a result of the problems faced by this sector. Emigration is one of the main phenomena that has affected the livestock industry. As a result of the increase in emigration, people's interest in working in the livestock sector has decreased. This has led to a decrease in the number of heads and a decrease in the number of farms. Also, a part of farmers, as a result of low incomes, have preferred to transfer from rural areas to urban areas. Subsidization of the livestock sector is not at the appropriate level in relation to the contribution that this sector makes to GDP.

The following table presents the number of heads by prefecture. The largest number of cattle is in the districts of Fier and Korça, with 13% of the total. Fieri is the district in which the largest number of birds are raised. The district with the largest number of sheep and goats is the district of Vlora with 24%, followed by the district of Korça with 16% of the number of heads. Lezha is the county with the largest number of pigs, while the largest number of Equidae grows in Korça.

Table 2. Number of heads by prefectures, 2022 (%)

Nr.	Prefecture	Total	Cattle	Sheep & Goats	Pigs	Poultry	Equidae
1	Berat	7	5	10	1	9	9
2	Dibër	7	9	5	1	4	10
3	Durrës	5	6	2	5	9	3
4	Elbasan	9	9	8	4	12	11
5	Fier	12	**13**	7	10	**25**	12
6	Gjirokastër	6	3	13	0	2	6
7	Korçë	14	**13**	16	6	11	**19**
8	Kukës	5	9	3	0	1	5
9	Lezhë	8	7	4	**43**	4	2
10	Shkodër	9	11	5	22	7	6
11	Tiranë	6	8	3	0	9	4
12	Vlorë	13	7	**24**	7	5	12
Total		100	100	100	100	100	100

Source: Instat 2022

In addition to the decrease in the number of heads, livestock production has also decreased.

Table 3. Livestock productions, 2015-2022 (000 tonnes)

Description	2015	2016	2017	2018	2019	2020	2021	2022
Meat live weight	158	160	161	161	157	150	148	140
Honey (tonnes)	3	4	4	4	4	5	5	5
Wool	3	3	3	3	3	3	3	2
Milk	1,131	1,145	1,156	1,144	1,112	1,052	1,013	970
Eggs (mill/pieces)	830	830	811	828	865	861	899	776

Source: Instat 2022

According to Instat (2022), milk is the most produced livestock product in Albania compared to other livestock products. The production of milk has decreased from 2015 to 2022 by 14.2%. Meanwhile, egg production from 2015 to 2022 has been fluctuating. It has increased in 2018, 2019, and 2021. Honey production from 2015 to 2022 has increased by approximately 66%. Meat and wool production decreased by 11.39% and 33.3%, respectively.

Results of the questionnaire

Table 1 presents the demographic data of 126 livestock farmers who answered the questionnaire. 78.57% of respondents are men, and only 21.43% are women. 16.66% of farmers belong to the 18-34 age group. Most of the farmers belong to the age group of 55-65 years. This indicates that young people in Albania do not like to work in the livestock sector. 41.27% of farmers answered that their income does not reach the value of 50,000 ALL per month. 30.16% of them answered that their monthly income from the livestock sector is between 50,000-100,000 ALL per month. Only 15.07% of the farmers answered that their income was over 150,000 ALL per month. This result shows that the livestock sector in Albania does not have high profits for the majority of farmers. Only a small percentage of the farmers questioned, 11.9%, had university and master's degrees, while 88.1% of them had a high school diploma or college. Such a result shows that, in general, people with higher education in Albania do not prefer to work in the livestock industry.

Table 4: Demographic profiles of the respondents

Demographics	Value	Frequency	Frequency
Gender	Male	99	78.57%
	Female	27	21.43%
Age	18-24	9	7.14%
	25-34	12	9.52%
	35-44	15	11.9%
	45-54	30	23.8%
	55-64	36	28.58%
	65+	24	19.06%
Monthly income	Below 50,000 LEK	52	41.27%
	50,000 - 100,000 LEK	38	30.16%
	100,000 - 150,000 LEK	17	13.5%
	150,000 - 200,000 LEK	10	7.93%
	200,000 LEK or more	9	7.14%
Education Level	High School Diploma	62	49.2%
	College	49	38. 9%
	Bachelor's Degree	9	7.14%
	Master's Degree	6	4.76%
	PhD	0	0%

Source: Author calculation

The following table summarizes the results of the questionnaire completed by the farmers. The questionnaire, through different statements, aims to identify the challenges facing the livestock sector. These challenges are divided into several groups. The first group of statements aims to identify challenges related to animal welfare and livestock production. The spread of epidemic diseases is a great risk only for around half of the farmers (49.96%). The rest of the farmers either do not consider the spread of epidemic diseases as a risk or are insensitive to this risk. A significant portion of the farmers (65%) are able to take care of their cattle if they get sick. Only 19.84% of farmers cannot treat their animals themselves in cases of illness. Such a result is related to the fact that most farmers have been working in livestock farming for many years. Almost half (44.84%) of farmers do not have enough income to cover the costs of vaccination and other medicines for animals, while 44.76% of respondents say that their income can cover vaccine and medicine costs. It is worth noting that some of the farmers say that the vaccination costs are not high.

The profits generated from work on livestock are not satisfactory for a large part of the farmers (60.32%). Only 20.64% of farmers are satisfied with the profits generated from the livestock work, and 19.84% of them could not give an accurate assessment of this question. All the farmers think that the costs of livestock products have increased a lot recently. Water supply is a concern for half (50%) of farms in Albania. Infrastructure hinders the development of business on Albanian farms. More than half of the farmers

(54.76%) say that the infrastructure prevents the sale of their products. 42.6% of the farmers are satisfied with the productivity of their livestock, while the rest stated that, due to various factors, the productivity of the livestock is not at the right level. Access to credit is relatively low (33.34%). This is not only due to the fact that financial institutions refuse to give loans to farmers for business expansion, but some Albanian farmers also refuse to receive loans. The lack of a labor force is a challenge that affects all the farmers asked.

Table 5. Challenges of the livestock sector

Animal welfare and livestock production	Strongly Disagree	Disagree	NA/D	Agree	Strongly Agree
The spread of epidemic diseases is a big threat to our farm.	10.32	19.84	24.6	30.16	15.08
When my cattle get sick, I cure them myself.	4.76	15.08	15.16	39.68	25.32
My income can cover the costs of vaccination and other costs for the treatment of cattle.	14.76	30.08	10.4	24.92	19.84
The livestock sector faces challenges in securing sustainable profits.	10.32	10.32	19.84	30.16	30.16
The cost of raising livestock has risen dramatically due to a significant increase in feed prices.	0	0	0	42.06	57.94
The current water supply is insufficient for our livestock needs.	4.76	15.08	24.66	34.92	20.58
Infrastructure damages our business.	4.76	15.08	25.4	34.92	19.84
Our cattle are productive.	7.94	15.87	34.13	26.98	15.08
I can get loans easily to expand my business.	16.67	20.63	29.37	25.4	7.94
It is difficult to find qualified employees.				22.22	77.78
Sustainable practices and environmental sustainability	Strongly Disagree	Disagree	NA/D	Agree	Strongly Agree
I am concerned about the impact of climate change on livestock production.	11.11	19.05	33.33	34.92	1.59
I'm interested in using practices that improve animal health and increase livestock production.	13.49	16.67	18.25	31.75	19.84
Consumer demand for quality livestock products has increased.	8.73	15.87	17.3	27.78	30.32
Market challenges	Strongly Disagree	Disagree	NA/D	Agree	Strongly Agree
Changes in input prices cause difficulties in financial forecasts.	7.14	22.98	27.78	25.4	16.67

I sell my livestock products at good value.	47.62	37.3	0	7.94	7.14
I find it difficult to enter new markets to sell livestock products.	3.97	15.87	23.81	41.27	15.08
Big farms control the livestock market.	7.14	18.25	23.02	34.13	18.25
Information and communication technologies and livestock marketing challenges	Strongly Disagree	Disagree	NA/D	Agree	Strongly Agree
I can easily find information on the market prices of livestock products.	41.27	29.37	7.14	14.29	8.73
I find it difficult to use different marketing channels to sell livestock products.	6.35	3.97	10.32	47.62	31.75
Innovation challenges in livestock production	Strongly Disagree	Disagree	NA/D	Agree	Strongly Agree
I am interested in using new technologies to improve livestock production.	8.73	19.05	23.81	26.98	21.43
I do not know how to use new technologies to increase the effectiveness of the farm.	7.94	19.05	13.49	35.71	23.81

Source: Author calculation

Considering sustainable practices and environmental sustainability, change in climatic conditions is perceived as an important challenge only by 36.51% of farmers. Using practices that improve animal welfare and increase livestock production is a priority for over half (51.59%) of the respondents. This fact is also influenced by the increase in consumer demand for quality livestock products.

Most of the farmers asked (84.92%) are not satisfied with the price at which they sell livestock products. More than half of them (52.38%) find it difficult to enter new markets, and a significant part think that large farms dominate the market. Providing information on market prices and the use of different marketing channels for livestock products continues to be a challenge for Albanian farmers.

A significant part of farmers (48.41%) are interested in using new technologies in order to expand their businesses, although due to different factors such as age, education, etc., they have difficulty using new technologies.

Conclusions

The livestock sector in Albania faces many challenges. The spread of epidemic diseases is a constant threat to farmers. A large number of farmers,

due to their long experience in the livestock sector, take care of the health of their animals. Some of them say that their budget can afford the purchase of vaccines and other medications for the treatment of animals. This is because the cost of cattle vaccination in Albania is not high. For another part of the farmers, the cost of vaccinations and other animal medications remains a concern. The increase in the profits of the livestock sector is hindered by the increase in input costs and the lack of proper infrastructure for the sale of livestock products. Some farms in Albania face difficulties with water supply. A small number of farmers express dissatisfaction with livestock productivity production, while the majority of them think that they can do more to increase the productivity of the farms, but such efforts require additional sources of financing. The lack of a labor force is the biggest challenge that the livestock sector in Albania is facing. Climate change is another challenge for the livestock sector. In recent years, the interest of Albanian farmers has increased in the use of practices that improve the health of animals and increase the quality of livestock products. Market challenges represent how price volatility affects farm financial planning. Entering new markets and international markets, as well as market dominance by large farmers, are challenges for small farmers. Also, limited access to market information and difficulty in using effective marketing channels hinder the success of smallholder farmers in particular.

Despite the challenges, the livestock sector in Albania has great opportunities for development. The improvement of the infrastructure gives farmers the opportunity to become part of new markets. Government support through subsidies, farmer training programs, and the promotion of sustainable practices increases the profitability of the livestock sector and encourages younger generations to work in this sector. In this way, the problem of the lack of a labor force will be mitigated. Improving trade regulations and encouraging cooperation with international companies give Albanian farmers the opportunity to become part of the global livestock market. Investing in new technologies improves the efficiency of the livestock sector. Initiatives to improve access to market data and to connect farmers with consumers can increase marketing efficiency.

References:

1. Benin, S., Ehui, S., & Pender, J. (2003). Policies for livestock development in the Ethiopian highlands. Environment, development and sustainability, 5, 491-510.
2. Biçoku, Y., & Uruçi, M. (2013). Dairy sector in Albania: Challenges and perspectives. Scientific Papers. Series D. Animal Science, Vol. LVI, 197-202.
3. Biçoku, Y., Zeqiri, M., & Gjeçi, G. (2018). Awareness about livestock standards: The case of dairy farmers in Albania and Kosovo. Albanian Journal of Agricultural Sciences, 17(4), 187-196.
4. FAO. (2016). Climate Change and Livestock: Addressing Risks and Seizing Opportunities. https://www.fao.org/3/i6171e/i6171e.pdf
5. Gallerani, V., Krypa, N., Raggi, M., Samoggia, A., & Viaggi, D. (2004). Rural development in Albania and the role of agriculture: A case study in the prefecture of Elbasan. In The Role of Agriculture in Central and Eastern European Rural Development: Engine of Change or Social Buffer (pp. 37-51).
6. Gjeçi, G., Shytaj, F., & Biçoku, Y. (2018). Livestock Sector in Albania: Trends and Challenges. Albanian Journal of Agricultural Sciences (Special edition - Proceedings of ICOALS, 2018), Agricultural University of Tirana, 221, 221-232.
7. Hahn, G. L., Klindinst, P. L., & Wilhite, D. A. (1992). Climate change impacts on livestock production and management.
8. Hoque, M., Mondal, S., & Adusumilli, S. (2022). Way forward for sustainable livestock sector. In Emerging Issues in Climate Smart Livestock Production (pp. 473-488). Academic Press.
9. Hyland, J. J., Styles, D., Jones, D. L., & Williams, A. P. (2016). Improving livestock production efficiencies presents a major opportunity to reduce sectoral greenhouse gas emissions. Agricultural Systems, 147, 123-131.
10. INSTAT. (2017). Statistikat e blegtorisë së vitit 2017. Number of livestock, 2013- 2017. https://www.instat.gov.al
11. INSTAT. (2022). Statistikat e blegtorisë së vitit 2022. Number of livestock, 2018- 2022. https://www.instat.gov.al
12. Kebebe, E. (2019). Bridging technology adoption gaps in livestock sector in Ethiopia: A innovation system perspective. Technology in Society, 57, 30-37.
13. Kraham, S. J. (2017). Environmental impacts of industrial livestock production. International Farm Animal, Wildlife and Food Safety Law, 3-40.
14. Lika, E. (2021). Sustainable rural development in Albania through agriculture and livestock: Challenges in the European Union

perspective. Journal of Agronomy, Technology and Engineering Management, 4(2), 577-582.

15. Mutibvu, T., Maburutse, B. E., Mbiriri, D. T., & Kashangura, M. T. (2012). Constraints and opportunities for increased livestock production in communal areas: A case study of Simbe, Zimbabwe. Livestock Research for Rural Development, 24(9), 165.

16. Negassa, A., Rashid, S., Gebremedhin, B., & Kennedy, A. (2011). Livestock production and marketing. Ethiopia Strategy Support Program II (ESSP II). ESSP II Working, 26.

17. Oliveira, G. M. D., Cunha, C. F. D., Caleman, S. M. D. Q., & Maia, R. L. G. (2019). Information asymmetry: the case of cattle supply transaction in Brazil. British Food Journal, 121(8), 1825-1837.

18. Oosting, S. J., Udo, H. M. J., & Viets, T. C. (2014). Development of livestock production in the tropics: farm and farmers' perspectives. Animal, 8(8), 1238-1248.

19. Perry, B. D., Grace, D., & Sones, K. (2013). Current drivers and future directions of global livestock disease dynamics. Proceedings of the National Academy of Sciences, 110(52), 20871-20877.

20. Tambi, M. D., & Anyah, F. J. (2019). Constraints and challenges in livestock production in Cameroon. South Asian Research Journal of Business and Management, 1(1), 10-17.

21. Thornton, P., & Herrero, M. (2010). The inter-linkages between rapid growth in livestock production, climate change, and the impacts on water resources, land use, and deforestation. World Bank Policy Research Working Paper, (5178).

22. Tomorri, I., Keco, R., Meço, M., & Kapaj, I. (2018). Rural sector development in Albania, strategies and challenges for its future. In The 6th Virtual Multidisciplinary Conference-QUAESTI (pp. 151-155).

23. Williams, T. G., Guikema, S. D., Brown, D. G., & Agrawal, A. (2020). Resilience and equity: Quantifying the distributional effects of resilience-enhancing strategies in a smallholder agricultural system. Agricultural Systems, 182, 102832.

24. Zawojska, A., & Siudek, T. (2018). Socio-economic impacts of epidemic diseases of farm animals. Acta Scientiarum Polonorum. Oeconomia, 17(3).

Enhancing Community Participation in Local Development Projects: The Bangladesh Context

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Abstract

This paper focuses on developing an approach for effective community participation in local development projects. Researchers conducted a field study in Sunamganj district, one of the most vulnerable areas in Bangladesh, and collected information from 54 respondents, including Union Parishads (UP) chairpersons and members, secretaries, committee members, and local beneficiaries through interviews and FGDs using purposive sampling. Researchers also collected relevant documents from the Union Parishad (project plan, evaluation report, and annual progress report) to compare the information obtained from the participants in the field and analyzed them using the thematic analysis method. Study findings revealed that although UP is considered a close-knit community-based organization due to the nature of its development work and geographic location, inclusive decentralization and a democratic environment have not been established at the local level institutions to enhance meaningful community participation in development projects. This deficiency is attributed to outsider interferences, nepotism, lack of knowledge and information, top-down bureaucratic decisions, gender discrimination, and corruption. It is believed that the model of a meaningful decentralized participation system would help mobilize the comprehensive local development process.

Keywords: Enhancement, Community participation, Local development projects, UPGP, Bangladesh

Introduction

In recent development discourse, the focus has turned to how community participation can be harnessed properly, given its importance as a key strategy for ensuring sustainable local development programs in both developed and developing countries (Wasilwa & Wasilwa, 2015). Community participation has been likened to the heart that circulates lifeblood in community development (Waweru, 2015). Since decentralization and community participation are integral to achieving local development priorities (González Rivas, 2014), more emphasis should be placed on the need for increased proactive steps. This view is widely held among development scholars and practitioners who constantly advocate for active community participation in development projects, emphasizing the immense importance of ensuring sustainable grassroots development (Matarrita-Cascante, Lee, & Nam, 2020), as well as fostering a democratic environment for the key stakeholders of the projects (Waheduzzaman, 2015). Indeed, it has become a global agitation and movement with the recognition of the role of community participation in the development process, emphasizing the implications of comprehensive and participatory principles such as equality, awareness, empowerment, and development (Ezeudu & Ezekwelu, 2024). Development projects often have the potential to disrupt established cultural and belief systems, thus constituting a threat to local and internal cultures (Shrestha, Shen, & Bhatta, 2024). These fears and possible damages can be counteracted by deploying community involvement in development projects, thereby fostering positive social change without imposing external cultural influence on society (Wodajo, Yiadom, & Asfaw, 2014). Community involvement in project planning and management tends to enhance project success by achieving desired outcomes and increasing sustainability (Okunade et al., 2024). In terms of accomplishing key performance indicators and project milestones, government officials, development practitioners, and donor agencies agree that local government plays a central role in participatory local development practices (Ansell, Sørensen, & Torfing, 2022). In modern development thinking, participation has reached a pivotal point, and it is now generally advocated and recognized as a key arrangement and approach in development (Amer, 2017). Community participation has proven to be a burning issue that continues to attract opinions from both developed and developing countries. Despite the richness and quality of the debate around the subject, there is no unity of thought about its structure. In ancient Greece, community participation was limited to several customary activities, such as

paying taxes and levies, voting in elections, and defending the state (Tridimas, 2020).

However, the scope and practice of community participation have recently outgrown civic duties or communal activities aimed at self-preservation. Community participation is now considered a significant strategy for making local-level development projects more accountable, citizen-centric, and sustainable (Costumado & Chemane, 2024). The role of government in community participation has evolved. The primary functions of governments and other concerned agencies now include ensuring community engagement in local development projects through the introduction of participatory and decentralized systems, with a focus on inclusive and sustainable outcomes (ibid). The benefits of reorientation and policy shift in community engagement and participation are immense. Community participation in local development projects acts as a watchdog and prolongs the possibilities of impeccable selection, implementation, and meticulous follow-up of the project for imperishable results (Mutie, 2022). Participation also raises community awareness and enthusiasm regarding the needs and priorities of local development, which were previously overlooked before the citizen-oriented participatory approach was initiated in Bangladesh (Kassen, 2021). Mia, Islam, Sakin, and Al-Hamadi (2022) keenly observed that community involvement in development functions not only involves the engagement of individuals or groups in planning, implementing, and monitoring development projects, but also positions them as active agents fulfilling their collective needs and demands while overcoming common development challenges. One such measure is ensuring tangible beneficiary involvement in every phase of the local development project cycle to comprehend development and achieve a worthwhile project (Flora Yvonne de, Elsyan Reinette, & Sarlota, 2016). If successful project implementation, viable follow-ups, and qualitative outcomes are the goals, community participation must be a major part of the planning process. When well-implemented, it engenders good governance and local rural development in both developed and developing countries. It must be noted that good governance serves as an entry point for effective community participation at the local level, as community members are more willing to engage when they believe in the government's plans and policies. In summary, community participation ensures the sustainability of projects, better decision-making, a democratic environment, effective services for the local community, mobilization of local resources, and empowerment of the community (Otieno & Maria, 2020).

This study is innovative, adding value for further research that contributes to new knowledge about the measures of promoting meaningful participation of beneficiary communities in local development endeavors. It is believed that the findings of this study will serve as a guide for future researchers,

academics, donors, development workers, and practitioners interested in studying this issue from unique perspectives, and will prompt policymakers to enhance community participation in local development initiatives. As a close-knit community-based organization, local governments can help build a resilient community through participatory practices within their strategies and functions. Hence, this study's findings will inform policy recommendations regarding effective participatory development processes, strategies, and actions to boost national development.

Problem Statement

Although participatory development practices are gaining special importance in national rural development policy (Olum, 2014), decentralized local government systems have not yet been institutionalized in Bangladesh and are still far from achieving the expected level of peoples' participation for different reasons (Panday, 2011). Decentralization and peoples' participation in Bangladesh acquired exceptional preference in military regimes through the formation of several reform commissions and committees (Elias Sarker, 2006). However, the primary objective of the military government was to perpetuate their power by creating a new political channel from the central to the local level (Asaduzzaman, 2008). As a result, only the strong economic and political power holders enjoyed some benefits from decentralized local government (Rigon, 2014), while disadvantaged groups such as poor women, who constitute almost 49% of the total population (Khatun, 2003), were deprived of participation in local development projects, except through the election of local level representatives (Waheduzzaman & As-Saber, 2015). Although the Union Parishad is responsible for implementing local-level development projects, and local development largely depends on the functions of this local self-institution, the objectives of this decentralized local government unit have not been achieved, Consequently, poor villagers continue to live in vulnerable situations due to a lack of active participation in local development projects (Mohammad, 2010). This group of people is isolated from community participation (Chowdhury & Panday, 2018). The Constitution of Bangladesh recognizes the rights of citizens to meaningful channels for direct involvement in the creation and operation of local governments (Panday, 2019). However, there is a wide discrepancy between the existing provisions of the Constitution and the actual level of community participation in local development programs.

Considering the contextualized problems, the government of Bangladesh enacted the Local Government (Union Parishad) Act 2009 to ensure meaningful citizen engagement in local development programs by creating new avenues such as Ward Sava, open budget meetings, right to information, and citizen charters (Ahmed, 2011). International development

partners, including NGOs, have been involved in various projects alongside the Bangladeshi government's efforts to create a participatory local government system. Building on the success of the Local Government Support Project-2, implemented by the Local Government Division of Bangladesh in collaboration with the WB, UNDP, UNCDF, and DANIDA, the Union Parishad Governance Projects (UPGP)[1]   were launched to strengthen democratic accountability and local governance at the union parishad level. UPGP operations initially covered 571 Union Parishad across seven selected districts out of more than 5000 Union Parishads in Bangladesh. Therefore, this study aims to assess the effectiveness of UPGP in fostering community participation and to propose an approach for meaningful community participation in local development projects in Bangladesh.

Nature and Status of Community Participation in Local Development Projects: A Theoretical Overview

Community participation in public business is integral for the tenable accomplishment of development policies. However, in many developing countries, due to bureaucratic predominance and ill cooperation between the government and the people, community participation in a significant number of local development projects remains merely a myth (WahedUzzaman & Alam, 2015). There is a discrepancy between the theoretical concept of participation and its practical implementation. Not everyone in the community can actively participate in the development process (Rosli, Omar, & Ali, 2017). Moreover, the structure of participation is based on local power relations and gender, resulting in the marginalization of women in decision-making process (Lewis & Hossain, 2017). Poor people in rural communities also face limited opportunities to benefit from development programs (Lewis, 2017). The common feature of participatory approaches is that local elites and dominant males tend to benefit, reinforcing existing power dynamics and gender inequalities (Hamlet, Gutierrez, Soto, & Dickin, 2022). The concept of empowerment in participatory approach often reflects 'Foucauldian terms of subjections' (Klestil, 2023), raising questions about who truly benefits from empowerment: individuals or communities, women, or socially excluded people (Klestil, 2023). The patron-client relationship in social influences during the negotiation process increases the conflict of group interest, often involving the dissemination of false information to serve mutual interests (Biermann, 2024). Local community participation in complex technological projects represent potential threats to the lives, health, security, and prosperity of the community people (Bolat, Yaşlı, & Temur, 2022). Empirical evidence suggests that community participation is not always beneficial.

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[1] UPGP-Funded by UNDP, UNCDF, DANIDA and EU.

The outcomes of participatory development programs will be more sustainable through community participation only if the community understands its actual meaning, perspectives, objectives, and overall circumstances (Geekiyanage, Fernando, & Keraminiyage, 2020). In many developing countries, participatory practices and culture, such as meaningful democratic elections, citizen access to information and local functionaries, decentralized decisions, and freedom of local representatives, have not yet been developed (Panday & Chowdhury, 2020). In Tanzania, both central and local management systems are very weak in combating corruption. Therefore, widespread corruption across all sectors hampers the community participation process in local development projects (Estomih Muro & Namusonge, 2017). A key theme in development discourse has always been the role and extent of the involvement of women in community participation. The existence of entrenched discrimination in most communities has served as a barrier to women's effective participation. Instead, the local elite, predominantly composed of men, have consistently been the primary beneficiaries of such benefits. In Ghana, most women and girls are influenced by older male members (Ackatia-Armah, Addy, Ghosh, & Dubé, 2016). Furthermore, the traditional socio-cultural system and family practices are also barriers to women's participation (Charway & Strandbu, 2023). In Nepal, women and girls play an important role in rural development but are mostly unpaid and unrecognized, often encountering continuous social barriers and discrimination in rural development programs (Khanal, 2015). They face systematic violence perpetrated by men and society, with limited decision-making power in social, economic, political, and other developmental spheres (Montesanti & Thurston, 2015). In many developing countries, women cannot even cross the boundaries set by their male partners (Seddiky, 2020). In Bangladesh, the unequal distribution of power based on gender subordinates women in all aspects of life, making them victims of societal, familial, and state-based subordination (Islam & Biswas, 2014). Control over property rights determines the extent of their participation in all stages of development projects. Women are more likely to experience extreme poverty, illiteracy, and landlessness (Ram, Strohschein, & Gaur, 2014).

Consequently, they suffer the most from birth discrimination, which prevents them from accessing opportunities and advantages within their families and communities. Land ownership is primarily held by men due to inheritance rules, societal structures, customs, and prejudices. Women, who are often the poorest among the poor, bear the brunt of the struggle for existence (Begum, 2023). From Africa to Asia, a consistent barier exists that keeps women out of effective participation. This barrier is reinforced by factors such as illiteracy, poverty, domestic violence, lopsided inheritance laws, and community customs.

Research Methodology

In this study, the philosophy of the social constructivist paradigm was employed to determine the details of community participation in local development projects. A qualitative research approach was employed to explore the participants' experiences, attitudes, and interactions concerning community participation at the local level to address the study's aims and objectives. In the field of social sciences, a better understanding of the overall picture and situation can be achieved through the application of constructivism, which aims to discover the details of the situation and the underlying reality (Wahyuni, 2012). As a social construct, the nature of community participation should be investigated to explain social phenomena. Researchers conducted a field study in Sunamganj,the most hazard-prone district in Bangladesh (Figure 1). Sunamganj district comprises 11 upazillas or subdistricts: Sunamganj Sadar, Derai, Chatak, Jamalgonj, Dharmapasha, Modhabpur, Jagannathpur, Tahirpur, Shalla, Doarabazar, and Bishwamvar. With ethnic groups from nearby Indian states, including Manipuri, Khasia, Garo, and Hajong, Sunamganj district has a rich historical and cultural legacy. It borders the Khasia and Jaintia hilly areas of Meghalaya (Indian State) to the north, Habiganj District to the south, Sylhet District to the east, and Netrokona District to the west. The tiers of the local government system face various challenges in providing services to the community. A total of 54 respondents were selected, including the elected union chairman, union parishad secretary, presidents and members of local development committees, and project beneficiaries (Table-1). Data were collected in the field from July to December, 2023.

This is because respondents or participants must possess the necessary knowledge and experience to answer the research questions questions (Flick, 2014).
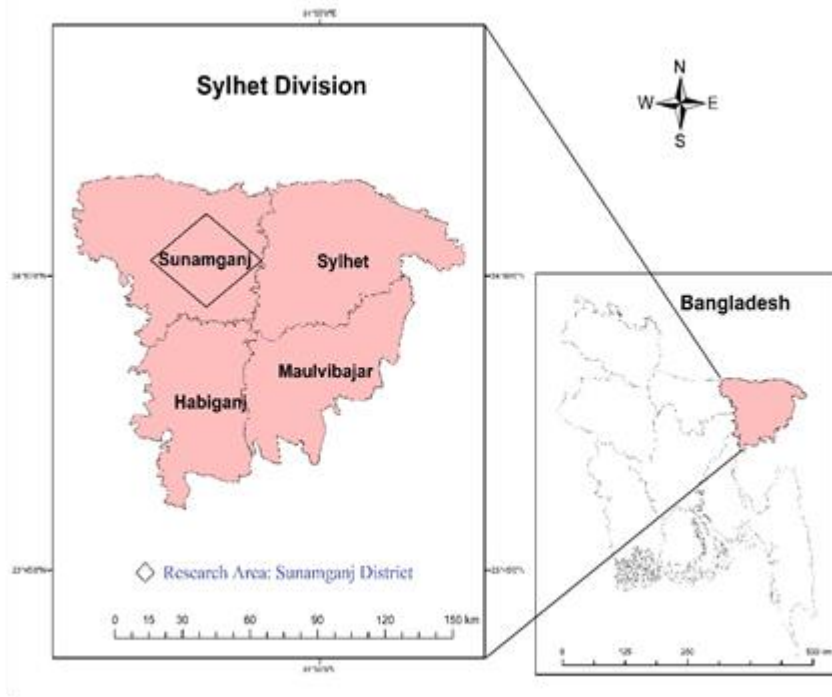
Figure 1 : Map of Sunamganj District
Source: Authors

Onwuegbuzie and Leech (2007) rightly noted that for subjective inquiry, specific numbers are not recommended. However, they advocate considering the sample sizes of previous studies with comparable designs, in which saturation was achieved, and using a sample size within this range. Hence, the saturation point of view determines the sample size for this study. Researchers have employed purposive (non-probability) sampling because it is appropriate for unique cases. The rationale for using purposive sampling is to select information-rich cases from which one can learn a great deal, aligned with the research objectives (Merriam & Tisdell, 2015; Neuman, 2014). Based on these principles, the researcher applied purposive sampling to select specific respondents. To achieve a logical answer to the research questions, the researchers employed methodological triangulation using a qualitative approach, which included interviews, document studies, and Focus Group Discussions (FGDs).

Table 1. Number of participants of the study

Types of participants	Nature of participants	Number
Elected chairman	UP chairman	07
Secretary	Government official	08
Chairman	Presidents of development comittees from union	13
Members	Members of development committee at union	16
Beneficaries (FGDs 2*5)	Outside the committee (beneficiaries)	10
Total	-	54

Source: Authors, based on field data

Interviews are the most commonly used strategy for developing research (Willis, 2006). As stated by Abejirinde et al. (2018) and Nilsen et al. (2018), when obtaining detailed information from qualitative study participants, they should be selected based on their knowledge and experience of the particular issue under investigation. Two Focus Group Discussions (FGDs) were conducted with beneficiary communities, each containing a maximum of six participants, outside the development committee. FGDs increase the possibility of framing a dynamic and synergic approach, as there is considerable flexibility and opportunity for respondents to react to each other's responses. Researchers collected relevant documents from the Union Parishad (project plan, evaluation report, and annual progress report) to compare the information gathered in the field from participants.

Data Analysis

In qualitative research, the data analysis proceeds throughout the data accumulation process. The researchers employed a thematic analysis approach for this study because it offers flexibility and is widely used across various research objectives and topics, particularly where quantitative analysis is not applicable (Castleberry & Nolen, 2018). While qualitative data analysis is primarily inductive, allowing themes to emerge from the data rather than following a hypothesis-centered deductive method used in quantitative analysis (Castleberry & Nolen, 2018), the researchers used both inductive and deductive approaches. Inductive methods are typically situable for small samples where findings are not generalizable (Owi, 2020). Furthermore, inductive analysis is data-driven, focusing on discovering patterns and themes from collected data (Patton, 2002). Deductive analysis is concept- or theory-driven, drawing from the literature to connect broader themes and interpret findings (Marshall & Rossman, 2011). To analyze the data from this qualitative study, the researchers followed the steps outlined by Creswell (2009), who delineated six stages of qualitative data analysis (Figure 2).

Researchers employed two-cycle coding, consisting of structural coding and provisional coding. Provisional or selective coding is theory-driven, whereas structural coding, also known as open coding, is derived from

the data (Seddiky, Giggins, & Gajendran, 2021). To categorize the various notions, researchers utilized first-cycle coding (open coding), facilitating the progression of their research. The second cycle (selective coding) was used to choose and incorporate categories of organized data that contributed to theoretical frameworks. Subsequently, they developed the narrative of the case at a higher degree of abstraction based on perspectives, which is called pattern coding (Seddiky, Giggins, & Gajendran, 2020).
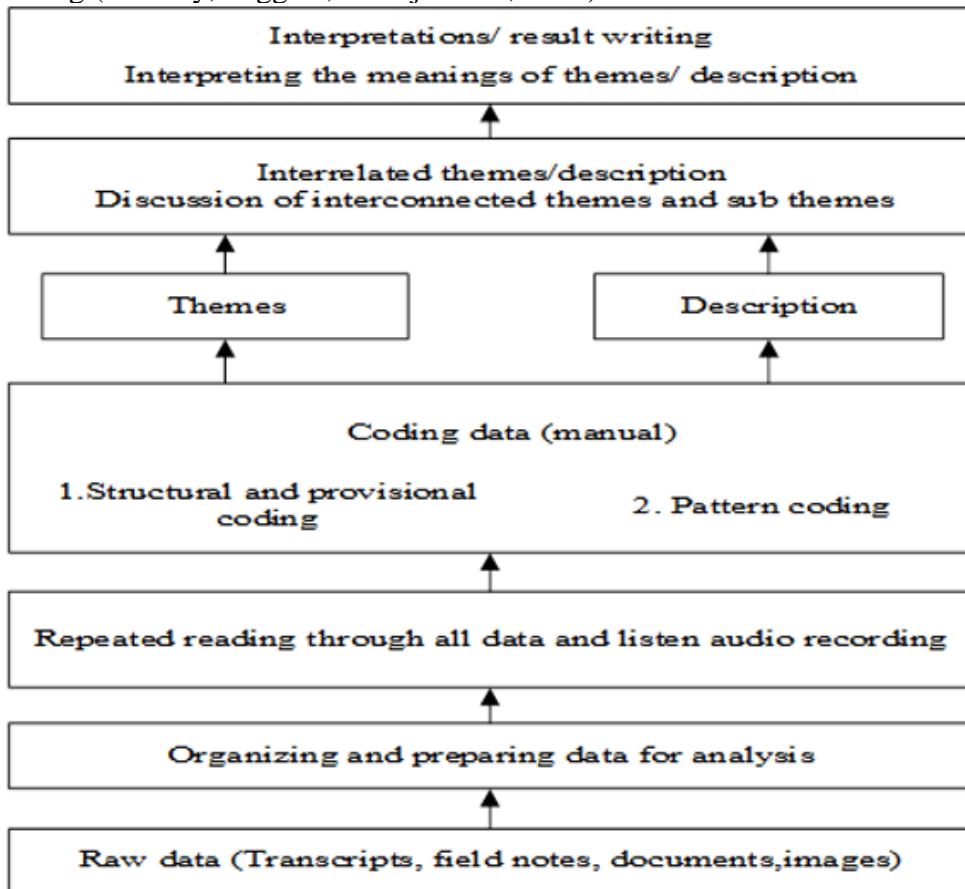
Figure 2: Data analysis process
Source: Creswell & Creswell, 2013

Pattern coding assisted the researcher in providing crucial information for interpreting the study findings. Finally, they interrelated and interpreted the meanings of themes accordingly. Using Google scholar and Scopus as key resources, this study carefully identified and reviewed articles, books, book chapters, and conference papers as secondary sources. To facilitate and prevent duplication of references, the EndNote citation manager was used in this study.

Ethical Consideration

The researchers obtained informed consent by describing the objectives and impacts of the study before conducting interviews with respondents. To protect the confidentiality of each respondent's personal information and contribution to the study, the researchers ensured anonymity and de-identified responses for each participant. They rigorously adhered to data sharing and access regulations, storing hard copies securely in a locked cabinet and soft copies in protected Google Drive. Respondents had the option to remove, delete, or withdraw their names from the research at any time up until publication.

Findings and Discussion

Sustainable local-level development is possible if the local government system can ensure meaningful community participation in the various development activities of the local area. Open codes, selective codes, and emerging themes generated from the study findings are listed in Table 2.

Table 2. Process of open coding, selective coding, and emerging themes

Selective coding	Open coding	Emerging themes
Scope of community participation	Raising community awareness	Although the space for community participation has increased, meaningful community engagement has yet been established.
	Committee formation	
	Selection and implementations of projects	
	Monitoring and evaluation	
	Budgetory activities	
Nature of women's participation	Increased women's involvement	There is a wide discrepancy between form and reality regarding gender inclusiveness in local development projects.
	Unaware of women's roles	
	Discrimination in decision	
	Participation only in name	
Barriers to participation	Absolute power of chairman	Lots of challenges hinder effective community participation in local development projects.
	Technological inadequacies	
	Lack of training	
	Political influence	
	Lack of transparency	

Source: Author, based on the filed data

In the following section, researchers discussed emerging theories regarding the current nature and status of community participation in local development projects based on the experience of the UPGP.

Although the Space for Community Participation has Increased, Meaningful Community Engagement has yet been Established

The UPGP consistently emphasizes the involvement of community members from all sections of society. These local-level projects have increased the scope of community participation at different levels of local development initiatives, such as the formation, selection, and implementation of projects, as well as monitoring and budgetary functions. These initiatives have also geared up community awareness regarding their roles and responsibilities in development projects. Local people possess intimate knowledge of their challenges; therefore, implementing projects based on their suggestions will result in long-term and positive impacts on rural-local development. As Ahmed (2011) emphasized, effective coordination through out the project cycle is crucial among union parishad officials, community people, and government officials from different sectors involved in local development functions. To enhance the governance of union parishad projects, numerous committees and sub-committees have been formed at the union level. These include elected UP members and civil society representatives such as freedom fighters, teachers, social workers, and women. Prior to forming various committees, the UP authority publicized the meeting dates and locations through miking, leaflet distribution, and verbal communication. They encouraged community members to participate in the committee formation procedure. One participant stated,

> *"Earlier, we didn't know what happened in the Union Parishad, but now, in addition to miking, we also get invitation letter from the up authority at homes before the formation of various committees."*

Primarily, these committees are more visible at the union level, such as the Ward Shava committee, scheme implementation committee, and scheme supervision committee. These committees have been formed to integrate community opinions for the success of projects. They are responsible for encapsulating the collective community feedback regarding the implementation procedure and the benefits of respective development projects. However, most community members are unfamiliar with the structure and function of these committees. One participant noted that:

> *"Community people were not aware of the UPGP. Everything was controlled under the supervision of the UP chairman and secretary. Sometimes, the UP members even did not know about many things of the UPGP projects. Those who are very close to the chairman were*

only aware of the project activities, the rest of the members signed only when necessary".

In addition, there was a wide gap between the UP Act 2009 and the existing committee systems, which had yet to be institutionalized to facilitate smooth local development activities and community participation. The performance of the standing committee in this regard was poor. Various types of development projects were proposed in the Ward Shava (meeting) of each ward within the union parishad. Despite the expectation that these meetings would involve residents of specific wards, attendance was low due to lack of information. In these meetings, names of committee members for planning and implementing local projects were also put forward. However, the final project selection and appointment of committee members were determined in the coordination meeting of the Union Parished, where there was no opportunity for public participation. Even common people did not know who the members of each project were or how they were selected. One of the participants noted:

> *"I did not initially know that I was a member of any committee, I did not even attend any of the committee meetings. One day when I went to the Union Parishad for a need, the chairman told me that as a teacher, I have been placed in a committee".*

In addition, the projects board, steering committee, policy and capacity development team, technical assistance team, and monitoring and evaluation team were all formed by bureaucrats and higher-level government officials (Figure 3). Common people could only participate in open discussion sessions twice a year during the Ward Shava to express their views on project selection and planning. The local community can voice their opinion, but have no voting rights for or against decisions made by higher authorities. Outsiders' paternalistic roles often marginalize the community from development projects (Botes & Van Rensburg, 2000). Moreover, the UPGP observation committee was formed with the Upazila engineer and two nominated members from the district commissioner's office, leaving the remaining scheme supervision committee members from the community as passive participants in this process. One participant expressed his bitter experience as follows:

> *"I have never been called to any meeting as a monitoring member for a road repair project. I was only told to come and see the road works. At the end of the work, the UP chairman only took a signature from me".*

In developing nations, most local development projects fail due to insufficient active community participation and excessive intervention by external authorities (Marzuki, Hay, & James, 2012). Outsiders arrive unexpectedly and communicate with the community, and sometimes professional experts manipulate and dominate decisions and processes instead of fostering community participation (Futrell, 2003).
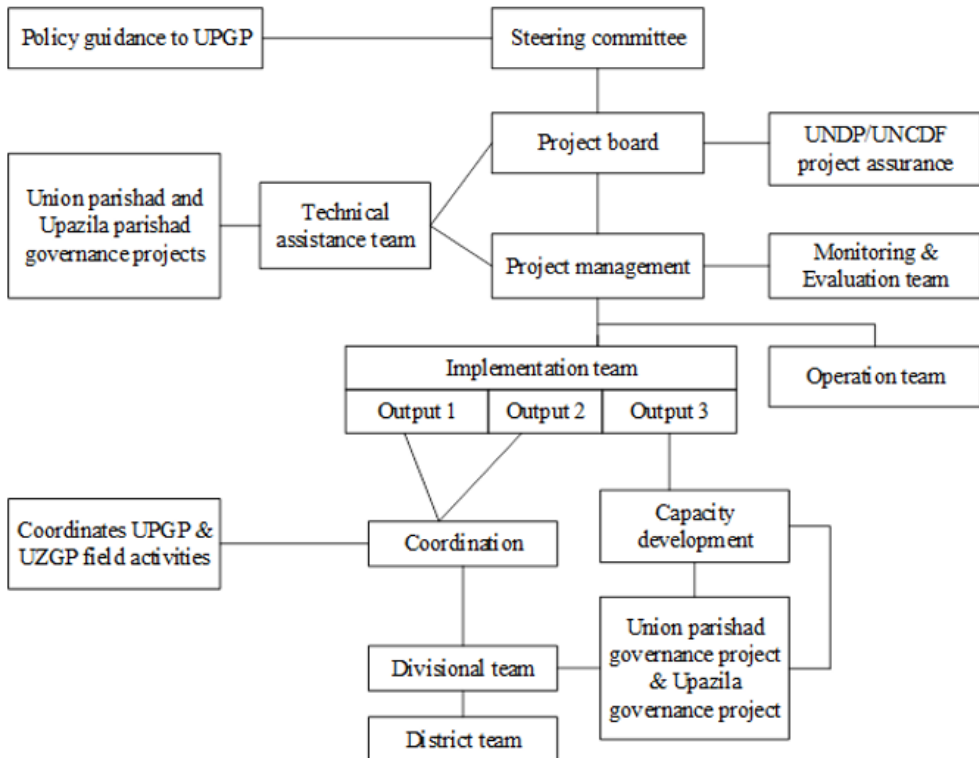

Figure 3: Organization and Management Structure of UPGP projects
Source: UNCDF (2014) Mid-Term evaluation report on UPGP

In local development projects, all key decisions, resources, and allocations come from the top level of the government, with communities playing a passive role. In the UPGP project, funds was released to the union parishad through banks based on recommendations from the Deputy Director of Local Government (DDLG). Occasionally, the governing authority took initiatives and organized meetings with communities for consultations, primarily aimed at utilizing local and community resources (Waheduzzaman & As-Saber, 2015).

Moreover, the local elite and dominant classes have influenced the overall development process. It is evident that community participation is crucial for balanced development in particular regions, as local people have valuable experience in addressing problems in their own areas. However, the

motivation of local communities to participate in local development projects is very low due to various inconsistencies.

The activities and overall progress of the projects were monitored and evaluated by the Monitoring and Inspection Wing of the local government division. This oversight also included the Management Information System (MIS) officer of the project, who wields significant power in information technology. The monitoring and evaluation team, composed primarily of bureaucrats, also played a dominant role in the project. The evaluation report is presented during the Ward Shava meetings for beneficiaries of local development projects. The Ward Shava holds prominence as a focal point for community participatory decision making, allowing beneficiary communities to post comments on notice boards and provide opinions during meetings.

There is a Wide Discrepancy Between Form and Reality Regarding Gender Inclusiveness in Local Development Projects

Local government development projects are generally initiated to benefit everyone in rural areas, irrespective of class, caste, gender, or religion (Pless & Appel, 2012). The role of the Union Parishad in Bangladesh began during the colonial period, with women's representation being ensured in 1997. Since then, women have been striving to assert their rights at the local level, with the UPGP being part of this initiative. Although women's participation at various stages of the UPGP project cycle was observed, their decisions were not adequately valued. Gender equality is a precondition and indicator of any development; however, in many developing countries, women's participation in planning, decision-making, and evaluation is negligible (Alvarez, 2013). According to regulations, two out of seven committee members in each UPGP project committee were women, but the opinions of women members were not given serious consideration in decision-making or project implementation. One participant narrated her bitter experiences as follows:

> *"Although there were opportunities for women to participate in some areas including participation in training programs, monitoring the progress of the project, in most cases there was discrimination between men and women in the implementation of the project. Even if ward members like us are made president or secretary of a project, we are not given the opportunity to work independently".*

It was observed that most of the women members of the committee had little idea about the roles and procedures of the projects. After everything was planned in advance and the work completed, only signatures were obtained from the members. Echoing this sentiment, one participant said:

> *"There was no meeting with the members of this committee, so I don't know how many male and female members there were and what my job was. A signature has been taken from me as a member of the classroom construction project that the work has been duly completed".*

Currently, four thousand nine Women Development Forums (WDFs) have been organized throughout the country, involving five hundred and fifty-five female representatives in the Women Development Forum of the Union Parishad. Although WDFs act as pressure groups in promoting gender issues at the local level, they are still immature in successfully operating women's organizations at the local level. Hence, the actual purpose of gender equality remains unclear and ambiguous. Similarly, Cleaver (2001) stated that the objectives of the local development projects are unclear to all empowered individuals or communities, including women, the poor or socially excluded people. Most women prefer to stay at home and are reluctant to engage in outside work, featuring conflict outside their families. The country's social system and family traditions largely influence this cultural dynamic. Many local families maintain strict attitudes towards women's participation in political activities, and women often lack time to engage in development projects after completing household chores. One participant said:

> *"Some committees are headed by women members of our Union Parishad. But beyond that it is difficult to keep them in the committee as ordinary members. Women are not interested in joining these places for family and social reasons, and although they are placed on the committee upon request, they are not available during working hours".*

Apart from women elected from reserved seats, other women are not interested in participating in local development projects. However, since they come from reserved seats, their decisions are not given much importance in the project cycles. Thus, gender inclusiveness in local governance development projects remains only in form, but the reality is quite different.

Lots of Challenges Hinder Effective Community Participation in Local Development Projects

As Union Parishad evolved into a citizen-oriented rural local government institution, it became heavily influenced by local dominant individuals who exercise local power under the patronage of the ruling party's central leader. Most locally elected representatives are not highly educated and are influenced by the upper-level political elites. As Asaduzzaman (2008) stated, political culture and bureaucratic dominance pose major challenges to community participation in development interventions in Bangladesh. At the union level, very few community members are aware of development projects,

and a majority remain ignorant about local development initiatives (Kala & Bagri, 2018). There is little opportunity created for their participation in development. Consequently, the participation of people from all sections is not guaranteed. One participant stated:

> *"Poor and helpless people come to us only hoping to get something. Keeping them in the committees of UPGP is risky, therefore educated and respectable persons, who understand the work, are selected as members of these committees".*

Although it is claimed that committee members are selected in consultation with Union Parishad members, in reality, the implementation of UPGP project and the selection of committee members depend solely on the decision of the UP Chairman (Akter & Mamun, 2018). Furthermore, favouritism and corruption hinder meaningful community participation in local-level development projects. Almost all schemes for installing sanitary latrines for indigent families are allocated to the close relatives and confidants of the Chairman and Union Parishad members to achieve sanitation coverage under the UPGP. Mohammad (2010) noted that community participation in decision-making process for local development projects in Bangladesh is minimal due to nepotism, class bias, and corruption. Irregularities were also observed in the installation of arsenic-free tube wells under the supervision of the council. One participant noted that:

> *"The chairman used to nominate contractors for the implementation of small projects. It was also found that only one person close to the chairman was appointed as the contractor for three or four projects".*

With the signatures of all members, it was shown that the project was properly implemented, thus even if irregularities occurred, no one raised any objections. Despite providing such opportunities, maintaining project quality was challenging. Moreover, various obstacles were observed in informing project committee members about meetings. Although the Union Parishad was instructed to inform each committee member four to five days in advance via mobile phone, most members did not recieve any notification and rarely attended the meetings. One participant expressed his views as follows:

> *"As a member of the standing committee on sanitation and sewerage, I was never informed about any meeting. I'm not even interested. I am fine with my profession (imam) in the mosque".*

Although the district and Upazila administrations organize training sessions for Union Parishad members once a year, no separate training is provided for general project members under the UPGP scheme. There was a lack of knowledge and motivation among union council members to

effectively operate and manage project committees. Similarly, the general public remained unaware of the procedures and benefits associated with local development projects. As a result, achieving the expected level of participation in various committees discussed was not feasible. Political influence in the decision-making process further discourages community participation in local development projects (Tosun, 2000). In summary, the key constraints to community participation include lack of awareness, unequal power structures, political influence, poverty, sense of inferiority, misuse of power, and deprivation.

Approach for Enhancing Meaningful Community Participation in Local Development Projects

Community engagement in local development programs is an indispensable tool for ensuring that projects are not just only successfully implemented but also meaningful, providing the host community with a platform for sustainable growth. Although the concept of participation is fraught with inconsistencies related to its true meaning, theories, and contextual application, this does not diminish its wide acceptance for promoting transparency, development, good governance, and accountability at the local level. In recent times, the structure of local governments in Bangladesh has undergone reorientation, with increased awareness of the importance of community participation. New initiatives have been launched to encourage community involvement at the union level. Union Parishad represents a shining light among local government units in Bangladesh due to its key features of grass-root engagement, high citizen orientation, and its close geographical and physical closeness to rural communities. Although challenges exist in enhancing community participation in local development endeavors, Union Parishad may provide a template for effective community participation that can be replicated across the country to ensure participatory development at every unit. Consensus among diverse scholars suggests that without community involvement in local development projects, achieving sustainability and success becomes increasingly challenging. The opinions and practical experiences of the local community in UPGP projects provides a model for contemporary Bangladesh to enhance community-friendly environments and broaden the scope of opportunities for meaningful citizen participation.

Raising community awareness is the first step in fostering meaningful community engagement in local development projects. For effective community involvement, communities hosting local development projects must have the full picture of what it represents, as community involvement is often hindered by a lack of information about these projects. Community members neither trust the intentions of the government nor understand the

value that the project will provide for the community. Hence, the purpose, period, expected outcomes, cost implications, resources, and benefits should be clearly explained to them. Authorities must also establish a well-defined structure for community involvement. Bureaucratic channels of communication should be dispensed, and community members should be encouraged to contribute their indigenous knowledge and practical experience. Proper implementation of decentralization policies by the government can reduce the gap between citizens and government, enhance local development, and increase participation irrespective of gender, religion, and status (Figure 4).
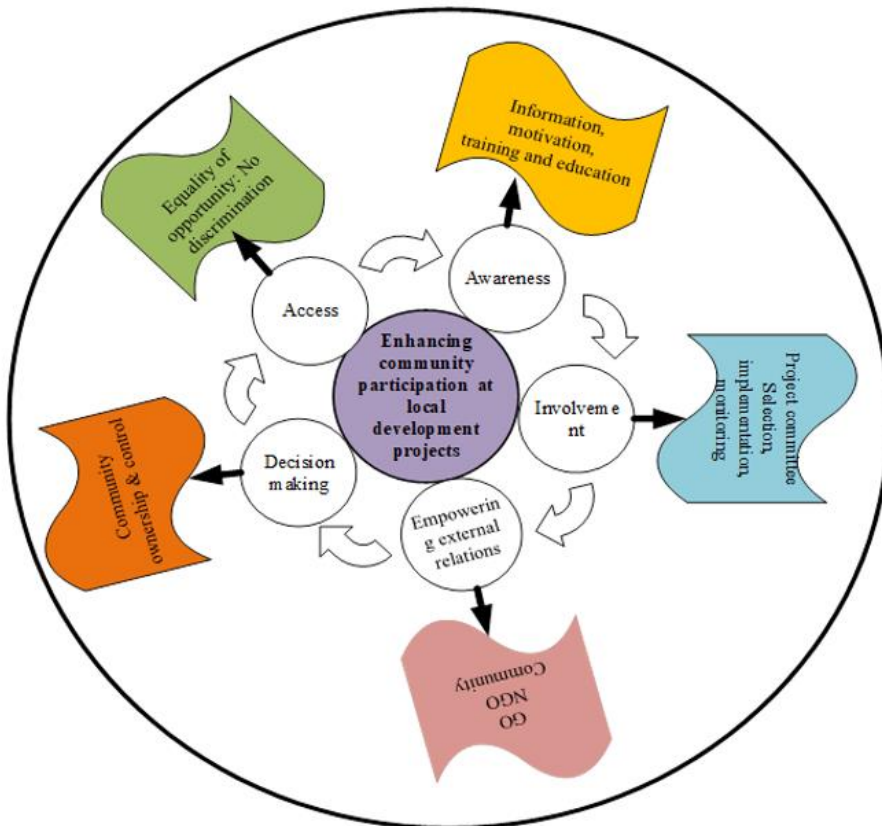
Figure 4: Effective community participation approach
Source: Authors

Regardless of the strength of laws and policies supporting community participation, they are constantly undermined by issues such as domestic violence, gender inequality, poverty, illiteracy, and marginalization. Effective deployment of good governance and outreach within these communities is essential for the government to address these issues. However, achieving these lofty objectives and strategies requires a competent pool of experts. To bring

about the necessary change and effectiveness that Bangladesh deserves, the government must prioritize and fund training programs on community involvement and participation. These programs will empower trained staff to engage with the community effectively and communicate the objectives, expected outcomes, benefits, and opportunities for involvement in each project. The involvement of NGOs, as   close-knit community-based organizations, is a key requirement for enhancing community participation.

Conclusion

Despite some problems, the continuous progress of local community participation at the union level has been notably advanced in recent years compared to the last two decades. The Union Parishad Manual 2009, in particular, is seen as a tool to enhance transparency in public participation process for local projects. In many countries, the local level is identified and subdivided into smaller units as focal points for rural development, thereby upgrading institutional capacity and emphasizing local involvement and decision making – a model known as bottom-up social systems. However, in Bangaldesh, active community participation in local development projects still faces scrutiny due to traditional political culture, lack of awareness, patriarchal social structure, class discrimination, nepotism, and corruption. Local communities possess deep awareness of their own issues and experiences, necessitating their involvement and decision-making roles in local development project planning and implementation. They should be treated as stakeholders rather than passive beneficiaries, encouraged to actively participate in local development efforts. Strengthening coordination among government entities, NGOs, and communities is crucial to raising awareness and developing community skills, fostering meaningful community participation. This study critically examines the challenges of community participation and develops an approach for enhancing meaningful community involvement in local development initiatives. The findings can guide policymakers, practitioners, NGO officials, and communities in adopting and integrating effective approaches in local development projects. Future research could explore decentralization theory, institutional theory, and elitism theory, incorporating a broader range of research areas from different angles to both challenge and support the study's conclusions and fill gaps in related domains. The results of this study were contextualized in Sunamganj district, which is representative of most rural areas in developing nations. Hence, careful interpretation is necessary when generalizing these findings to developed nations.

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References:
1. Abejirinde, I. O., Ingabire, C. M., van Vugt, M., Mutesa, L., van den Borne, B., & Busari, J. O. (2018). Qualitative analysis of the health system effects of a community-based malaria elimination program in Rwanda. *Research and reports in tropical medicine, 9*, 63-75. doi:10.2147/RRTM.S158131.
2. Ackatia-Armah, N. M., Addy, N. A., Ghosh, S., & Dubé, L. (2016). Fostering reflective trust between mothers and community health nurses to improve the effectiveness of health and nutrition efforts: An ethnographic study in Ghana, West Africa. *Social Science & Medicine, 158*, 96-104.
3. Ahmed, T. (2011). Planning Situations in the Union Parishad of Bangladesh and Outline of A Planning Guideline. *The Local Government Support Programme-Local Innovation Component (LGSP-LIC)*, 9.
4. Akter, S. & Mamun, M. M. H. (2018). Original Paper Analysis of the Link between Central Government and Local Government in Bangladesh: A Case Study of Union Parishad. *Urban Studies and Public Administration, 1*(1), 1-12.
5. Alvarez, M. L. (2013). *From unheard screams to powerful voices: A case study of women's political empowerment in the philippines.* Paper presented at the 12th National Convention on statistics.
6. Amer, N. (2017). *Community Participation in Self-Developed Areas and Development Projects.* Paper presented at the 1st International Conference on Towards a Better Quality of Life.
7. Ansell, C., Sørensen, E., & Torfing, J. (2022). The Key Role of Local Governance in Achieving the SDGs. In *Co-Creation for Sustainability* (pp. 9-22): Emerald Publishing Limited.
8. Asaduzzaman, M. (2008). *Governance in practice: Decentralization and people's participation in the local development of Bangladesh*: Tampere University Press.

9. Begum, A. (2023). Political participation of female in Pakistan: Prospects and challenges. *Unisia, 41*(1), 39-76.
10. Biermann, R. (2024). Conceptualising patron-client relations in secessionist conflict. A research agenda. *Territory, Politics, Governance*, 1-19.
11. Bolat, H. B., Yaşlı, F., & Temur, G. T. (2022, 2022//). *Risk Analysis for the Tech Startup Projects with Fuzzy Logic.* Paper presented at the Intelligent and Fuzzy Techniques for Emerging Conditions and Digital Transformation, Cham.
12. Botes, L. & Van Rensburg, D. (2000). Community participation in development: nine plagues and twelve commandments. *Community Development Journal, 35*(1), 41-58.
13. Castleberry, A. & Nolen, A. (2018). Thematic analysis of qualitative research data: Is it as easy as it sounds? *Currents in Pharmacy Teaching and Learning, 10*(6), 807-815.
14. Charway, D. & Strandbu, Å. (2023). Participation of girls and women in community sport in Ghana: Cultural and structural barriers. *International Review for the Sociology of Sport*, 10126902231214955.
15. Chowdhury, S. & Panday, P. K. (2018). Strengthening local governance in Bangladesh. *Springer international publishing, 5*(2), 169-181.
16. Cleaver, F. (2001). Institutions, agency and the limitations of participatory approaches to development. *Participation: The new tyranny?*, 36-55.
17. Costumado, M. & Chemane, J. A. D. (2024). Stakeholder Engagement and Community Participation in Sustainable Development in Southern Africa. In N. Tshishonga & I. Tshabangu (Eds.), *Democratization of Africa and Its Impact on the Global Economy* (pp. 48-72). Hershey, PA, USA: IGI Global.
18. Creswell, J. W. (2009). *Research design: Qualitative, quantitative, and mixed methods approaches* (3rd ed.): Sage publications.
19. Elias Sarker, A. (2006). The political economy of decentralized governance: an assessment of rural local government reforms in Bangladesh. *International Journal of Public Administration, 29*(13), 1285-1309.
20. Estomih Muro, J. & Namusonge, G. (2017). Governance Factors Affecting Community Participation In Public Development Projects In Meru District In Arusha In Tanzania.
21. Ezeudu, T. S. & Ezekwelu, K. C. (2024). Governmentality Perspective as a Contemporary Strategy for Rural Community Development in Nigeria. *RUDN Journal of Public Administration, 11*(1), 112-136. doi:10.22363/2312-8313-2024-11-1-112-136

22. Flick, U. (2014). *An introduction to qualitative research* (5th Ed.): Sage.

23. Flora Yvonne de, Q., Elsyan Reinette, M., & Sarlota, R. (2016). Study of Community Participation in the Process of Villages Infrastructure Development on Program PNPM Mandiri in Jayapura Regency. *Journal of Social and Development Sciences, 7*(2). doi:10.22610/jsds.v7i2.1304

24. Futrell, R. (2003). Technical adversarialism and participatory collaboration in the US chemical weapons disposal program. *Science, Technology, & Human Values, 28*(4), 451-482.

25. Geekiyanage, D., Fernando, T., & Keraminiyage, K. (2020). Assessing the state of the art in community engagement for participatory decision-making in disaster risk-sensitive urban development. *International Journal of Disaster Risk Reduction, 51*, 101847.

26. González Rivas, M. (2014). Decentralization, community participation, and improvement of water access in Mexico. *Community Development, 45*(1), 2-16.

27. Hamlet, L., Gutierrez, V., Soto, A., & Dickin, S. (2022). Barriers to women's participation, leadership, and empowerment in community-managed water and sanitation in rural Bolivia. *H2Open Journal, 5*(3), 532-548.

28. Islam, A. & Biswas, T. (2014). Health system in Bangladesh: challenges and opportunities. *American Journal of Health Research, 2*(6), 366-374.

29. Kala, D. & Bagri, S. (2018). Barriers to local community participation in tourism development: Evidence from mountainous state Uttarakhand, India. *Tourism: An International Interdisciplinary Journal, 66*(3), 318-333.

30. Kassen, M. (2021). Understanding decentralized civic engagement: Focus on peer-to-peer and blockchain-driven perspectives on e-participation. *Technology in Society, 66*, 101650.

31. Khanal, D. (2015). Gender and its relation with community Development and in context in Nepal.

32. Khatun, D. H. (2003). Integrating gender into World Bank financed transport programs: case study-Bangladesh Third Rural Infrastructure Development Project (RDP 21).

33. Klestil, M. (2023). Unveiling Subjection, Practicing Subjectivation: Race, Power, and Strategies of Rewriting the Self in Charles W. Chesnutt's The Marrow of Tradition. *Power in Language, Culture, Literature and Education: Perspectives of English Studies, 28*, 215.

34. Lewis, D. (2017). Organising and Representing the Poor in a Clientelistic Democracy: the Decline of Radical NGOs in Bangladesh.

Journal of Development Studies, 53(10), 1545-1567. doi:10.1080/00220388.2017.1279732

35. Lewis, D. & Hossain, A. (2017). *Revisiting the Local Power Structure in Bangladesh : Economic Gain, Political Pain?*

36. Marshall, C. & Rossman, G. B. (2011). Managing, analyzing, and interpreting data. In C. Marshall & G. B. Rossman (Eds.), *Designing Qualitative Research* (5th ed., pp. 205-227): Sage.

37. Marzuki, A., Hay, I., & James, J. (2012). Public participation shortcomings in tourism planning: The case of the Langkawi Islands, Malaysia. *Journal of Sustainable Tourism, 20*(4), 585-602.

38. Matarrita-Cascante, D., Lee, J. H., & Nam, J. W. (2020). What elements should be present in any community development initiative? Distinguishing community development from local development. *Local Development & Society, 1*(2), 95-115. doi:10.1080/26883597.2020.1829986

39. Merriam, S. B. & Tisdell, E. J. (2015). *Qualitative research: A guide to design and implementation*. San Farncisco: John Wiley & Sons.

40. Mia, M. T., Islam, M., Sakin, J., & Al-Hamadi, J. (2022). The role of community participation and community-based planning in sustainable community development. *Asian People Journal (APJ), 5*(1), 31-41.

41. Mohammad, S. N. (2010). *"Peoples Participation in Development Projects at Grass root Level: A Study on Alampur and Jagannathpur Union Parishad".* Masters Dissertation, NSUB, Bangladsh.

42. Montesanti, S. R. & Thurston, W. E. (2015). Mapping the role of structural and interpersonal violence in the lives of women: implications for public health interventions and policy. *BMC women's health, 15*(1), 1-13.

43. Mutie, B. M. (2022). *Stakeholder participation in electoral process in Kenya.* JKUAT-COETEC.

44. Neuman, W. L. (2014). *Social Research Methods: Qualitative and Quantitative Approaches* (Pearson New International ed.). London: Pearson Education Limited.

45. Nilsen, P., Wallerstedt, B., Behm, L., & Ahlström, G. (2018). Towards evidence-based palliative care in nursing homes in Sweden: a qualitative study informed by the organizational readiness to change theory. *Implementation Science, 13*(1), 1.

46. Okunade, B. A., Bukola, A., Adediran, F. E., Adewusi, O. E., Daraojimba, R. E., & Igbokwe, J. C. (2024). Community development programs in Rural Africa: An effectiveness review. *International Journal of Science and Research Archive, 11*(1), 1217-1226.

47. Olum, Y. (2014). Decentralisation in developing countries: preconditions for successful implementation. *Commonwealth Journal of Local Governance*(15), 23-38.

48. Onwuegbuzie, A. J. & Leech, N. L. (2007). Validity and qualitative research: An oxymoron? *Quality & Quantity, 41*(2), 233-249.

49. Otieno, E. & Maria, Z. (2020). An Assessment of Rural Youth Participation in Community Development Projects in Turkana South Sub-County: An Approach to Community Development and Sustainable Development.

50. Owi, T. (2020). *A governance framework for mitigating flood risks in Nigeria.* (Doctoral Dissertation), University of Newcastle, Australia.

51. Panday, P. K. (2011). Local government system in Bangladesh: How far is it decentralised? *Lex Localis-Journal of Local Self-Government, 9*(3).

52. Panday, P. K. (2019). Public participation in local governments in Bangladesh: experience, challenges and the future. *Asia Pacific Journal of Public Administration, 41*(2), 85-96.

53. Panday, P. K. & Chowdhury, S. (2020). Responsiveness of local government officials: insights and lessons from participatory planning and budgeting. *Asia Pacific Journal of Public Administration, 42*(2), 132-151.

54. Patton, M. Q. (2002). *Qualitative research and evaluation methods*. Thousand Oaks.Cal: Sage.

55. Pless, N. M. & Appel, J. (2012). In pursuit of dignity and social justice: Changing lives through 100% inclusion—How Gram Vikas fosters sustainable rural development. *Journal of Business Ethics, 111*, 389-411.

56. Ram, U., Strohschein, L., & Gaur, K. (2014). Gender socialization: Differences between male and female youth in India and associations with mental health. *International Journal of Population Research, 2014*.

57. Rigon, A. (2014). Building local governance: Participation and elite capture in slum-upgrading in Kenya. *Development and Change, 45*(2), 257-283.

58. Rosli, N. M., Omar, D., & Ali, N. E. H. (2017). Participatory Planning Process for Community Resettlements Program. *International Journal of Academic Research in Business and Social Sciences, 7*(12), 2222-6990.

59. Seddiky, M., Giggins, H., & Gajendran, T. (2021). Non-DRR NGOs strategies for livelihood development in the coastal communities of Bangladesh: a case study. *Natural Hazards*, 1-21.

60. Seddiky, M. A. (2020). Decentralized Health Service Delivery System in Bangladesh: Evaluating Community Clinics in Promoting Healthcare for the Rural Poor. *European Scientific Journal ESJ, 16*(12). doi:10.19044/esj.2020.v16n12p253

61. Seddiky, M. A., Giggins, H., & Gajendran, T. (2020). International principles of disaster risk reduction informing NGOs strategies for community based DRR mainstreaming: The Bangladesh context. *International Journal of Disaster Risk Reduction, 48*, 101580.

62. Shrestha, R., Shen, Z., & Bhatta, K. D. (2024). Cultural Heritage Deterioration in the Historical Town 'Thimi'. *Buildings, 14*(1). Retrieved from doi:10.3390/buildings14010244

63. Tosun, C. (2000). Limits to community participation in the tourism development process in developing countries. *Tourism management, 21*(6), 613-633.

64. Tridimas, G. (2020). Modelling the quest for status in Ancient Greece: Paying for liturgies. *Homo Oeconomicus, 37*(3), 213-236.

65. Waheduzzaman, W. (2015). Community participation and local governance in Bangladesh Swinburne University of Technology. *Australian Journal of Political Science, 50*(1), 128-147.

66. WahedUzzaman, W. & Alam, Q. (2015). Democratic Culture and Participatory Local Governance in Bangladesh. *Local Government Studies, 41*(2), 260-279. doi:10.1080/03003930.2014.901217

67. Waheduzzaman, W. & As-Saber, S. (2015). Community participation and local governance in Bangladesh. *Australian Journal of Political Science, 50*(1), 128-147.

68. Wahyuni, D. (2012). The research design maze: Understanding paradigms, cases, methods and methodologies. *Journal of applied management accounting research, 10*(1), 69-80.

69. Wasilwa, C. & Wasilwa, F. (2015). Effect of community participation on sustainability of community based development projects in Kenya. *Retrieved on March, 8*, 2017.

70. Waweru, R. (2015). Factors which promote community participation in the community driven development approach. *International Journal of Humanities & Social Science Studies, 6959*(13), 2349-6959.

71. Willis, K. (2006). Interviewing. *Doing development research*, 144-152.

72. Wodajo, D., Yiadom, K., & Asfaw, M. (2014). Improving People's Participation in Local Development Project: A Case of Urban Local Government in Oromia-Ethiopia. *Develoing Country Studies, 4*(8), 9-17.

Etat des lieux des laboratoires des Sciences de la Vie et la Terre au cycle Secondaire (Région orientale du Maroc): Disponibilité, usabilité du Matériel didactique et sécurité

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Résumé

Les laboratoires scolaires des sciences jouent un rôle crucial dans la réalisation des travaux pratiques, une activité essentielle pour l'enseignement des sciences de la vie et de la terre (SVT). L'objectif de notre recherche est d'étudier la disponibilité et l'utilisabilité du matériel de laboratoire des SVT, ainsi que d'évaluer la sécurité au sein de ces laboratoires. À cet effet, une enquête composée de 17 questions a été menée auprès d'un échantillon de 39 préparateurs et 7 enseignants responsables des laboratoires de SVT. Cette enquête a été complétée par des observations sur le terrain dans deux laboratoires scolaires. Les résultats obtenus ont révélé une insuffisance générale du matériel, dont le manque dans certains laboratoires peut constituer un obstacle majeur à la compréhension des concepts scientifiques. Les laboratoires des deux cycles d'enseignement présentent des caractéristiques techniques similaires, mais ne sont que partiellement conformes aux spécifications matérielles requises. De plus, le matériel de sécurité n'est pas

encore largement répandu et sa couverture reste insatisfaisante. Dans une perspective d'amélioration, il est impératif d'investir dans du nouveau matériel afin de pallier au manque crucial actuel des laboratoires. Il est aussi primordial de mettre l'accent sur l'exploitation optimale du matériel, sa mobilité et sa maintenance afin d'améliorer la qualité des activités pratiques dans l'enseignement des SVT.

Mots-clés: Matériel, laboratoire, disponibilité, usabilité, sécurité

The current state of Life and Earth Sciences laboratories in the secondary cycle (Eastern region of Morocco): Availability, usability of didactic material and safety

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Abstract

School science laboratories play a crucial role in conducting practical work, an essential activity for teaching life and earth sciences (LES). The aim of our research is to study the availability and usability of LES laboratory equipment, as well as to evaluate safety within these laboratories. To this end, a survey consisting of 17 questions was conducted with a sample of 39 laboratory technicians and 7 teachers responsible for LES laboratories. This survey was supplemented by on-site observations in two school laboratories. The results revealed a general lack of equipment, the absence of which in some laboratories may constitute a major obstacle to understanding scientific concepts. Laboratories in both teaching cycles exhibit similar technical characteristics, but only partially comply with the required material specifications. Furthermore, safety equipment is not yet widely distributed, and its coverage remains unsatisfactory. In an improvement perspective, it is imperative to invest in new equipment to address the current crucial shortage in laboratories. It is also essential to

focus on optimal equipment utilization, mobility, and maintenance to enhance the quality of practical activities in LES education.

Keywords: Equipment, laboratory, availability, usability, safety

1.   Introduction

Partout dans le monde, l'enseignement expérimental s'affirme depuis l'école primaire jusqu'à l'université comme un moyen de développement des compétences pratiques chez les apprenants (Carré, 2019; Sibari et al., 2020). En effet, les activités expérimentales conduites dans les laboratoires scolaires jouent un rôle capital dans l'enseignement et l'apprentissage des sciences. Dans ce champ de savoir, les sciences de la vie et de la terre (SVT) en tant que discipline scolaire fondamentale permettent de mieux comprendre le monde vivant et les enjeux environnementaux (Houssaini et al., 2014).

Au Maroc, l'analyse des performances des élèves en sciences montre une faiblesse des acquisitions. En effet, les résultats du programme international pour le suivi des acquis des élèves en 2018 (Organisation de coopération et de développement économiques (OECD), 2019) placent les apprenants marocains dans un rang inférieur aux normes. Le Maroc totalise un score moyen de 377 points en sciences, lui conférant une position en dessous de la moyenne de l'organisation de coopération et de développement économiques (489 points) et de deux pays arabes, le Liban (384 points) et la Jordanie (429 points) (OECD, 2019). Une diminution de 12 points par rapport à 2018 a été enregistrée pour la session 2022 avec un score moyen de 365 (OECD, 2023). En outre, le rapport de Sassi et al. (2018) a mis en relief des lacunes d'acquisition de connaissances des élèves en sciences. Concernant la huitième année (2ème année collégiale), le Maroc a occupé la 36ème place parmi 39 pays participants, scorant 393 points (Conseil supérieur de l`éducation (CSE), 2015). Un autre rapport illustrant les acquis des élèves du tronc commun de l'enseignement secondaire qualifiant dans les disciplines des SVT a montré des carences au niveau des connaissances et compétences de base prescrites par le curriculum. Les apprenants éprouvent d'énormes difficultés en sciences au niveau de la mobilisation de leurs prérequis dans des situations nouvelles (CSE, 2016). Par ailleurs, une étude évaluative des résultats après un examen normalisé de SVT en cycle secondaire collégial, a révélé des résultats des élèves en dessous des attentes (El Allaoui et al., 2016). Ces faibles résultats mettent en question les enseignements pratiques qui dépendent en grande partie de la disponibilité et de l'état de fonctionnalité du matériel expérimental des laboratoires scolaires.

Les recherches scientifiques sur le matériel expérimental des laboratoires de SVT au Maroc sont peu nombreuses. En effet, la performance des élèves en sciences varie en fonction du taux de disponibilité du matériel éducatif (Sassi et al., 2018). Houssaini et ses collaborateurs considèrent que le manque de réalisation d'expériences, est à l'origine de difficultés des apprenants en classe ce qui peut aboutir à une construction incomplète du savoir (Houssaini et all 2014) . Une autre étude rapporte de multiples difficultés liées à l'absence de matériel pour réaliser des manipulations ou expériences de géologie en classe (Najoui et Alami, 2017). Pour surmonter cet obstacle, les mêmes auteurs jugent nécessaire une mise à jour du matériel de laboratoire. En outre, le manque d'équipement pédagogique et de matériel de laboratoire dans les établissements scolaires influence les méthodes d'enseignement et s'avère parmi les raisons pour lesquelles les méthodes actives ne sont pas utilisées dans l'enseignement des sciences naturelles et des sciences physiques (Chafiqi et Alagui, 2011). En plus du manque de matériel dans les laboratoires scolaires, les problèmes de gestion, le manque d'autonomie des élèves, constituent des obstacles pour une mise en œuvre des expérimentations (Hassouni et al., 2014). Une dernière recherche conditionne l'amélioration du niveau des acquisitions en sciences avec la nécessité d'équiper les laboratoires scolaires en matériel et ressources adéquates pour assurer les activités pratiques d'apprentissage en classe (Giroux et al., 2020) Dans ce contexte, notre étude tente de décrire l'état des lieux du matériel des laboratoires scolaires des SVT dans les établissements d'enseignement secondaires en termes de disponibilité, d'usabilité et des règles de sécurité. La présente investigation tente d'obtenir une vision précise de la situation effective des laboratoires scolaires. Les résultats obtenus pourraient sans doute contribuer à formuler des recommandations mieux adaptées au contexte éducatif et plus efficaces pour améliorer la qualité des enseignements pratiques dans les laboratoires scolaires.

2.   Cadre conceptuel

Trois concepts clés sont traité dans ce travail de recherche : "laboratoire scolaire", "matériel" et "sécurité".

2.1.   Laboratoire scolaire

Un laboratoire scolaire peut être défini comme un local équipé de matériel, d'installations et de moyens humains destinés pour effectuer des manipulations et des expériences dans le cadre de l'enseignement scientifique et technique (Lanctôt, 2013). Au sein de ce lieu physique, les professeurs de sciences conduisent des expériences et d'autres activités pratiques en faveur des apprenants (Maduabum, 1992). Les laboratoires de sciences peuvent également être adaptés à différents niveaux

d'enseignement, tels que le primaire, le secondaire ou le supérieur (Lafontaine, 2017; Immel, 2018).

2.2.   Matériel

Le matériel didactique intègre la totalité des objets ou des instruments que les élèves exploitent dans un établissement. Le matériel didactique est un moyen matériel maniable utilisé dans le but d'organiser un enseignement dans une discipline donnée incluant par exemple une balance, une boussole, ou un thermomètre (MEN, 2008). Une autre définition indique que "matériel″ est un ensemble d'objets, d'instruments utilisés pour le bon fonctionnement d'un établissement ou d'une activité dans une usine, un service ou une exploitation.

Trois critères sont décrits pour classer le matériel des laboratoires des SVT. L'un consiste à classer le matériel par sujet d'étude dont chacun peut être reparti en sous domaine secondaire (Seymour, 1908). Un second critère repose sur la fonction que le matériel rempli au sein du laboratoire. Des appareils servent pour combiner des substances, d'autres pour mesurer des volumes ou supporter certaines classes d'instruments. Un dernier critère est le résultat d'une combinaison entre les deux premiers critères pour produire des classes de types, "appareils de mesures et de métrologie″, "cartes géographiques, géologiques, historiques″, "Matériel de géologie″ (MEN, 2019a). Face à la diversité des classes induites par ces critères, nous avons opté dans le cadre de ce travail une classification réduite incluant trois catégories de matériel : Le matériel d'observation (MOB) permettant de visualiser des éléments microscopiques ou non perceptibles à l'œil nu ; le matériel de manipulation (MMA) englobant les outils nécessaires pour expérimenter avec des substances et des échantillons ; le matériel de mesure (MME) comprenant les instruments utilisés pour mesurer des paramètres physiques, chimiques ou biochimiques (MEN, 2018; Moynier, 2021; Huitric, 2021).

La disponibilité d'un matériel scientifique au sein d'un laboratoire d'enseignement ne justifie pas son fonctionnement et par suite sa réponse efficiente et efficace aux besoins du programme scolaire (Secrétariat du Conseil du Trésor (SCT), 2008).

2.3.   Sécurité

La sécurité dans les laboratoires scolaires des SVT constitue une préoccupation majeure aussi bien pour les acteurs du laboratoire que les élèves. Il est essentiel que les préparateurs et les élèves portent des équipements de protection individuelle, tels que des lunettes de sécurité, des gants et des blouses de laboratoire, pour se protéger contre les dangers potentiels. Le stockage adéquat des produits chimiques dans des armoires de

sécurité résistantes au feu est crucial pour minimiser les risques d'incendie et d'explosion. De plus, la gestion des déchets dangereux doit suivre les réglementations locales et nationales. Par ailleurs, la littérature rapporte que parmi les mesures de sécurité courantes existent la formation des enseignants, des préparateurs et des élèves sur les bonnes pratiques de sécurité y compris l'utilisation correcte des équipements de protection individuelle, la manipulation correcte des produits chimiques et la gestion des déchets (Robert et al., 2010).

3.   Démarche méthodologique

L'étude envisage d'élaborer un état des lieux des laboratoires scolaires des SVT du point de vue matériel et conditions de sécurité. La méthodologie adoptée s'inscrit dans le cadre d'une recherche exploratoire qualitative. En effet, la recherche est qualitative dans la mesure où elle tente de saisir la réalité du terrain telle que la vivent les enseignants et les préparateurs à l'intérieur des laboratoires scolaires (Poisson, 1983) et vise à identifier des idées permettant de repérer un phénomène avant d'approfondir son étude (Legendre, 2005). À travers ce propos, nous cherchons à structurer les éléments décrits afin de formuler des conclusions éclairées, facilitant la réflexion et l'organisation de la situation éducative en laboratoire (Van der Maren, 2004). Enfin, les méthodes individuelles consistent à identifier les appareils les plus vulnérables et de choisir, pour chacun d'eux, les critères d'évaluation pour décrire leur disponibilité et leur fonctionnement au sein du laboratoire d'enseignement (Fantana et Pettersson, 2000).

3.1.   Population cible

À l'aide d'un échantillonnage aléatoire afin d'obtenir des résultats représentatifs, les personnes interrogées sont issues d'une population comprenant 46 acteurs éducatifs, dont 84,8 % sont des préparateurs et 15,2 % sont des enseignants responsables de laboratoires de SVT exerçant dans les établissements scolaires de la région de l'Oriental (Maroc). Selon le genre, les hommes sont légèrement plus nombreux (56,5 %) que les femmes (43,5 %).

3.2.   Echantillonnage de matériels

L'échantillon de matériels étudie est formé par trois catégories : matériel d'observation (MOB), matériel de manipulation (MMA) et matériel de mesure (MME). L'échantillon représentatif du matériel est extrait à partir du matériel des laboratoires scolaires des SVT au Maroc (Ministère de l`Education Nationale (MEN), 2019a; MEN 2019b) et dont une analyse comparative montre que le nombre d'équipements dans les laboratoires d'enseignement collégial (154) représente 70% de celui exigé en cycle

qualifiant (228). Douze (12) éléments ont été choisis parmi les outils identiques pour les deux cycles scolaires (Tableau 1) : MOB (microscopes, loupes binoculaires, lames et lamelles) ; MMA (verrerie, bec bunsen, bain marie, matériels de dissections), MME (thermomètre, balance, pH-mètre, ExAO, capteurs).

Tableau 1 : Liste de matériels étudiés

Nom du matériel	Catégorie
Microscopes	MOB[a]
Lames et lamelles	
Loupes binoculaires	
Verrerie	MMA[b]
Matériels de dissections	
Bec Bunsen	
Bain marie	
Balance	MME[c]
ExAO	
Capteurs	
pH-mètre	
Thermomètre	

a : matériel d'observation, b : matériel de manipulation, c : matériel de mesure

Le second échantillon est constitué de deux laboratoires choisis de manière aléatoire. Un premier laboratoire est affilié à un établissement du cycle collégial (LC) et un second affilié au cycle qualifiant (LQ). Pour ces deux laboratoires, on a étudié l'usabilité d'un seul matériel des trois catégories de matériels étudiées : la loupe binoculaire pour le MOB, le matériel de dissection pour le MMA et la balance pour le MME.

3.2. Outil de collecte des données

La présente recherche s'est basée sur un questionnaire et une observation directe. Le questionnaire est un instrument de prise d'information liée à une évaluation des performances de personnes, d'un fonctionnement, d'un système, ou d'une recherche (De Ketele et Roegiers, 2016; Pourtois et Desmet, 1988). Notre questionnaire comprend dix-sept (17) questions repartis en deux parties. La première partie traite la disponibilité du matériel expérimental et la seconde partie traite la présence des équipements de sécurité dans les laboratoires scolaires des SVT.

L'observation est un processus de collecte d'informations basé sur l'observation des personnes et des lieux sur un site de recherche. Un observateur non participant a pris des notes en enregistrant le phénomène étudié sans s'impliquer dans les activités (Creswell, 2013). Deux préparateurs stagiaires ont été impliqués dans la collecte des données sur les

deux sites (LC, LQ) en se basant sur une grille de 6 critères visant l'analyse de la conformité du matériel avec les exigences techniques (Tableau 2).

Tableau 2 : Critères d'évaluation de l'usabilité du matériel de laboratoire

Loupe binoculaire						
Critères	Éclairage LED intègre	Rotation de tête sur 360°	Écartement inter pupillaire réglable de 55 à 75 mm	Grossissement 20x	Champ d'observation : 10 mm	Distance de travail : 70 mm au minimum
Matériel de dissection						
Critères	Cuvette à dissection	Grand ciseau : inox	Petit ciseau	Scalpel : inox	Pince fine : inox	Sonde cannelée
Balance						
Critères	Précision (0.1g)	Bulle	Fonction tare	Pied de réglage	Notice	Alimentation

Une échelle simple à réponse binaire a été choisie. Oui (O) indique la présence de la caractéristique et non (N) son absence. Quant à la grille ciblant l'état du fonctionnement du matériel, nous avons relevé les quantités requises, disponibles, utilisables et celles qui peuvent être réparées (MEN, 2018).

4.   Résultats et discussion
4.1.   Disponibilité du matériel de laboratoire
4.1.1. Matériel d'observation (MOB)

Cette étude a révélé une forte abondance du matériel dans les laboratoires d'enseignement avec un taux de manque faible (3% -12,1%). La loupe binoculaire score une disponibilité de 48,5%.et seulement 39,4% des acteurs ayant déclaré une insuffisance de ce matériel pour assurer les activités pratiques, contre 12,1% qui ont signalé son absence. En ce qui concerne les microscopes, presque la moitié des répondants (51,5%) ont indiqué une suffisance au sein de leurs laboratoires (Figure 1). Cependant, 45,5% estiment leur insuffisante pour mener les activités pratiques, au moment où 3% signalent l'inexistence de ce matériel parmi les équipements d'enseignement. Pour les lames et lamelles, les résultats indiquent une disponibilité limitée. 19,4% de répondants les considèrent suffisants, contre 75% qui réclament leur insuffisance et 5,6% qui rapportent leur absence.
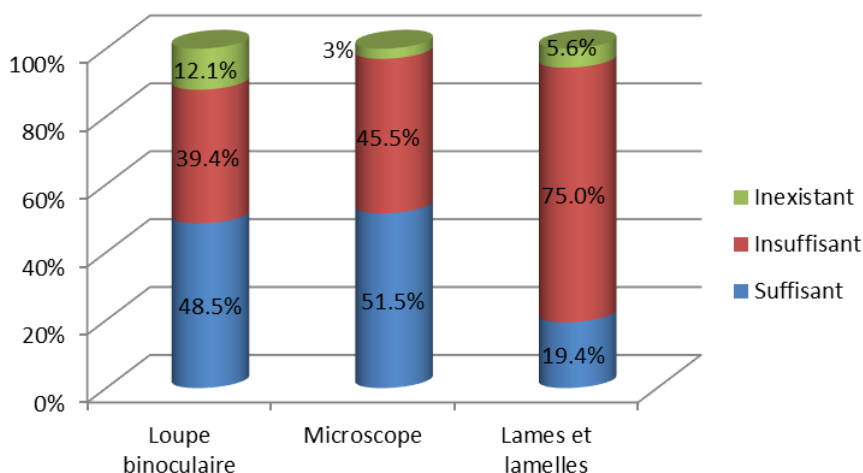
Figure 1 : Disponibilité du matériel d'observation (MOB)

La question de l'offre en MOB dans les laboratoires de SVT permet de connaître les conditions actuelles des établissements en matière d'observation durant la démarche expérimentale (Boulal, 2022). Malgré la disponibilité de ce type de matériels, selon les acteurs interrogés, le besoin enregistré dans certains laboratoires peut avoir un impact négatif sur l'évolution de la construction progressive des concepts scientifiques le long du parcours des élèves. Cette disparité territoriale en MOB dans les laboratoires scolaires de SVT ne favorise pas une confrontation directe et concrète des phénomènes à étudier avec le réel (CSE, 2009) et suscite par suite un redressement rapide.

4.1.2. Matériel de manipulation (MMA)

Le matériel de manipulation montre un taux de manque variant de 2,9% à 16,7% et est relativement supérieur à celui enregistré pour le MOB (Figure 2). De manière plus fine, plus de la moitié des acteurs (55,5%) font mention d'une insuffisante de la verrerie. En plus, l'effectif pléthorique des élèves peut compromettre la conduite des manipulations et des travaux pratiques en classe (Kaid Rassou et al. 2017). Par ailleurs, 5,6% des participants ont révélé une absence de la verrerie dans leurs laboratoires contre 55,5% qui ont déclaré son insuffisance, ce qui questionne la nature des spécifications techniques des équipements acquis (MEN, 2019a; MEN 2019b) et les pratiques efficaces du nettoyage après utilisation (Baricault, 2014).

Pour le bec bunsen, il enregistre le taux d'inexistence le plus élevé (16,7%) parmi le MMA. En outre, presque la moitié des participants (47,2%) a évoqué son insuffisante. La situation pour le bain marie parait plus délicate par rapport au bec Bunsen quant au taux de suffisance. En fait, le bain marie est déclaré suffisant, par 30,8% de l'échantillon étudié. Finalement, les

résultats obtenus pour le matériel de dissection montrent une forte abondance (97,1%) au sein des laboratoires de SVT.
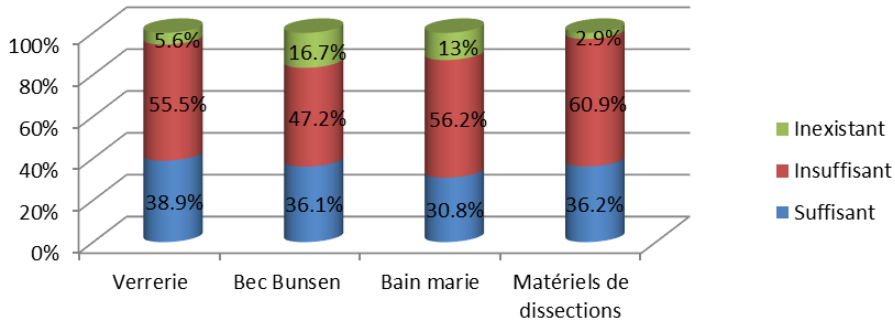

Figure 2 : Disponibilité du matériel de manipulation (MMA)

4.1.3. Matériel de mesure (MME)

La disponibilité du matériel de mesure montre des pourcentages de manque variant de 5% à 36,1% (Figure 3). Au niveau quantitatif, le matériel de l'Expérimentation assistée par ordinateur (ExAO) est perçu suffisant pour plus de la moitié des participants (58,3%), contre un tiers (36,6%) le qualifiant d'insuffisant. Concernant les capteurs de mesure, ils présentent le taux d'absence le plus élevé (36,1%) parmi cette catégorie de matériel et d'insuffisance pour 44,5% d'acteurs éducatifs. Pour le thermomètre, presque la moitié des participants (51,5%) déclare sa suffisance au sein du laboratoire, au moment où 39,4% annoncent son insuffisance. En plus, 9,1% des questionnées en déclarent l'inexistence. Pour la balance et le pH-mètre, 27,8% des questionnés rapportent que leurs laboratoires disposent ces instruments de mesure avec des quantités suffisantes contre 52,8% qui ont déclaré leur insuffisance.
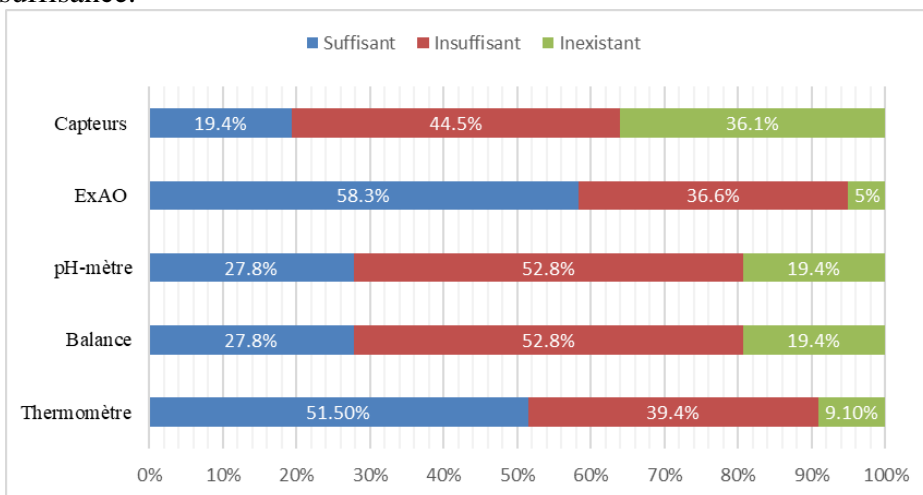

Figure 3 : Disponibilité du matériel de mesure (MME)

Une analyse minutieuse de ces résultats souligne des disparités notables dans la disponibilité du MME, suggérant la nécessité d'une évaluation approfondie des ressources disponibles pour garantir des conditions optimales d'apprentissage des élèves. En effet, le taux de manque du matériel est plus significatif pour les capteurs et décroit selon l'ordre suivant Capteurs > pH-mètre = Balance > Thermomètre > ExAO. Malgré la généralisation du matériel ExAO pour la majorité des laboratoires de SVT, les conditions effectives d'utilisation est confrontée à une rareté de capteurs permettant de transformer une grandeur physique observée en une autre exploitable (Annecca, 2019). En outre, la mobilisation des trois grandeurs (température, masse, pH) dans des activités expérimentales demeure être contrôlée par une déficience matérielle avec une insuffisance notable (52,8%) pour le pH mètre et la balance. Ainsi, les difficultés pratiques induites lors de l'utilisation de ces deux matériels semblent être deux fois plus grandes que celles liées au thermomètre. Ainsi, les laboratoires scolaires montrent une insuffisance et voir même l'inexistence du matériel de mesures adéquat malgré l'importance des mesures en SVT (Régent-Kloeckner et al., 2022).

La comparaison des résultats de la disponibilité globale des trois catégories de matériel étudiées a montré des taux de suffisance et d'insuffisance similaires (Figure 4).
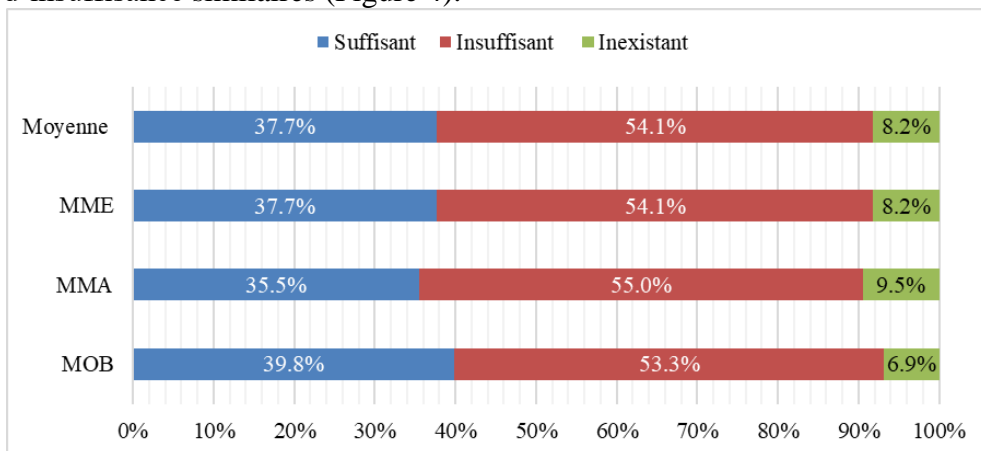

Figure 4 : Disponibilité des trois catégories de matériel (MOB, MMA et MME)

En effet, le manque le plus faible du matériel scientifique est obtenu pour le MOB (6,9%), Quant au MME et MMA, l'absence semble être plus importante et peut engendrer des problèmes de réalisation des manipulations et de mesure des grandeurs expérimentales au cours des travaux pratiques des SVT. En bref, les laboratoires de SVT enregistrent un manque de matériel susceptible d'influencer de point de vue technique la tenue de certains travaux pratiques et par la suite l'apprentissage des élèves en classe.

Cette situation déplorable limitée du matériel expérimental constitue, en plus des sureffectifs des élèves, un obstacle majeur de la mise en œuvre de la démarche expérimentale (Iraqi et al., 2020). Outre, l'appui des démarches pédagogiques nouvelles telle que la démarche d'investigation nécessite une mobilisation immédiate des ressources pour compenser ce manque de moyens, et particulièrement l'absence de matériels ou d'équipements expérimentaux (Cherkaoui et al., 2017). Malgré ces résultats, les laboratoires scolaires ont enregistré un meilleur taux de disponibilité marquant une avancée tangible par rapport la situation régnante dans ces structures pédagogiques caractérisées par un sous-équipement en matériel adéquat depuis environ une quinzaine d'années (CSE, 2009). À l'échelle africaine, cet état des lieux en ressources matérielles, parait très satisfaisant par rapport à celui enregistré au Nigeria où les étudiants sont rarement impliqués dans des activités pratiques (Olajide et al., 2017).

4.2.   Usabilité du matériel
La disponibilité du matériel dans les laboratoires scolaires ne confirme pas son utilisation pour enseigner les sciences aux élèves. Ainsi, les questions de conformité technique et d'état fonctionnel du matériel suscitent des développements.

4.2.1. Conformité avec les normes
D'emblée, la similarité des caractéristiques techniques définissant les normes de référence lors des achats de matériel de SVT pour les deux cycles scolaires (MEN, 2019a; MEN 2019b) indique une similitude entre les équipements. Toutefois, les résultats de leur conformité aux spécifications techniques révèlent une correspondance partielle (Tableau 3). En effet, l'absence d'éclairage LED sur les loupes binoculaires dans les deux laboratoires pourrait compromettre la qualité et la précision des observations, limitant la capacité des élèves à visualiser les détails anatomiques ou morphologiques. De plus, le fait que cet équipement au sein d'un collège ne soit pas muni d'une rotation de tête sur 360° pourrait entraîner une fatigue oculaire et restreindre la flexibilité dans l'observation des spécimens. Quant au matériel de dissection, il révèle une ressemblance des exigences normatives permettant d'assurer les mêmes conditions de manipulation pour tous les élèves des deux cycles d'enseignement.

Tableau 3 : Conformité du matériel avec les caractéristiques techniques

Loupe binoculaire						
Critères	Éclairage LED intègre	Rotation de tête sur 360°	Écartement inter pupillaire réglable de 55 à 75 mm	Grossissement 20x	Champ d'observation : 10 mm	Distance de travail : 70 mm au minimum
LC	*N	N	*O	O	O	O
LQ	N	O	O	O	O	O
Matériel de dissection						
Critères	Cuvette à dissection	Grand ciseau : inox	Petit ciseau	Scalpel : inox	Pince fine : inox	Sonde cannelée
LC	O	O	O	O	O	O
LQ	O	O	O	O	O	O
Balance						
Critères	Précision (0.1g)	Bulle	Fonction tare	Pied de réglage	Notice	Alimentation
LC	O	N	O	O	N	O
LQ	O	O	O	O	N	O

*O : Oui, *N : Non

Enfin, au collège, la balance montre un taux de non-conformité élevé (33,3%) par rapport à celle du laboratoire de type LQ (16,6%). En fait, une absence de la bulle d'air servant à la mise à niveau de la balance ("Manuel d'utilisation de la balance," 2014) peut exercer une influence sur la précision des pesées effectuées au laboratoire. En outre, le manque de la notice associée à la balance du laboratoire n'assure pas une disponibilité des informations nécessaires pour une utilisation correcte garantissant la sécurité et la maintenance du produit.

4.2.2. État du matériel

L'évaluation de l'état actuel du matériel de laboratoires scolaires de SVT a été effectuée sur la base de trois critères : la disponibilité, l'usabilité et la possibilité de réparation (Tableau 4). Concernant les quantités de matériel requises et disponibles, le fonctionnement des LC et LQ exige des quantités minimales identiques de loupes binoculaires et de matériel de dissection. Cependant, le nombre de balances requis au collège est deux fois plus grand que celui du lycée. L'analyse quantitative du matériel existant au sein des laboratoires d'enseignement, durant la réalisation de la mesure, permet de distinguer trois situations différentes : (i) un excès de 50% pour les loupes binoculaires et de 100% pour la balance au LQ ; (ii) un manque de matériel de dissection de l'ordre de 22,2% et 44,4% respectivement au LQ et LC, et un manque de loupes

binoculaires de 25% au LC ; (iii) le nombre de balances disponibles satisfait la quantité requise au LC. Le deuxième critère envisage un examen de l'usabilité du matériel disponible. Désormais, le taux d'utilisation du matériel a atteint 66,6% pour les loupes binoculaires au LC et 50% pour la balance au LQ. Les autres matériels ont culminé un taux d'utilisation maximum (100%). Enfin, le critère ciblant les pannes de matériel montre que l'ensemble du matériel s'avère être en bon état de fonctionnement. Aux yeux des participants, 90% du matériel est déclaré utilisable, contre 10% des appareils qui sont en panne. Les pannes les plus fréquentes sont enregistrées particulièrement au LC et ceci pour les loupes binoculaires (33,3%) et les balances (50%).

Tableau 4 : Données sur le matériel étudié

Matériel	Lieu	Quantité requise*	Disponible	Utilisable	En panne
Loupe binoculaire	LC	12	09	06	03
	LQ	12	15	15	00
Matériel de dissection	LC	09	05	05	00
	LQ	09	07	07	00
Balance	LC	02	02	01	01
	LQ	01	02	02	00

* Selon les livrets unifiés (MEN, 2019a; MEN 2019b)

L'hétérogénéité notée dans la répartition du matériel de laboratoire nécessite une mise en place de processus administratifs flexibles permettant la mobilité du matériel entre les différents laboratoires et ceci pour compenser le manque. En outre, les pannes non réparées stipulent l'instauration d'un système durable de réparation basé sur le recrutement et la formation de techniciens spécialisés, le recours aux contrats de maintenance des appareils et l'acquisition de pièces de rechange durant la livraison du matériel (Gaillard et Gaillard, 2006).

4.3.   Matériel de sécurité

L'analyse des indicateurs utilisés pour examiner les mesures de sécurité dans les laboratoires des SVT montre un manque global moyen de l'ordre de 69,5% de matériel (Figure 5). L'installation de hottes dans les laboratoires de SVT est un facteur important de protection contre l'exposition à des substances chimiques. Cependant, le taux de laboratoires des SVT équipés de hottes aspirantes est faible avec une valeur de l'ordre de 13,9% seulement. Ce taux reste supérieur à celui des sciences physiques et chimiques (5%) (Taoufik et al., 2016).
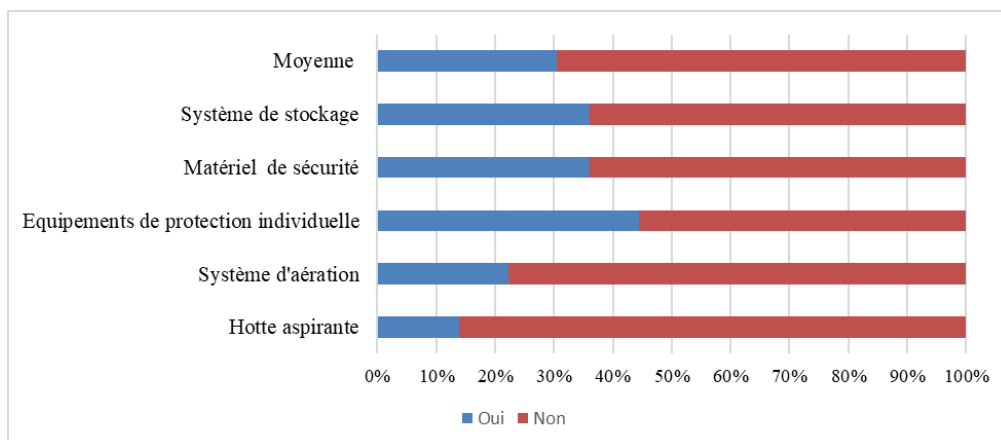
Figure 5 : Le matériel de sécurité dans les laboratoires

Par ailleurs, les systèmes forcés d'aération essentiels au contrôle des produits chimiques contenus dans l'air (Moran et Masciangioli, 2011), semblent être peu présents dans les laboratoires scolaires puisque 77,8% des interrogés déclarent leur absence. En outre, le taux de présence pour le matériel de sécurité (douche et extincteur), de l'ordre de 36,1%, n'est pas suffisant pour assurer une protection adéquate des acteurs pédagogiques et des élèves. Concernant les systèmes de stockage, ils sont présents seulement dans 36,1% des laboratoires. Par ailleurs, le matériel de protection individuelle, montre un taux de manque proche de 55,6%.

Les bonnes pratiques de sécurité visant à prévenir les risques et à garantir un fonctionnement optimal des laboratoires nécessitent des équipements et des installations appropriés (Moran et Masciangioli, 2011). Les constats révèlent un déficit en matériel de sécurité, ce qui pourrait compromettre la santé et la sécurité des préparateurs, des enseignants et des élèves. Ainsi, il est essentiel de renforcer l'acquisition d'équipements tels que les extincteurs et le matériel de protection individuelle, et d'améliorer les conditions de stockage, afin de promouvoir la sécurité collective.

Conclusion

L'intégration des travaux pratiques dans l'enseignement des sciences de la vie et de la terre au niveau secondaire revêt une importance cruciale pour la compréhension des concepts scientifiques des SVT. Cependant, la réussite de ces activités pratiques dépend étroitement de l'équipement adéquat des laboratoires scolaires en ressources matérielles appropriées. Les conclusions tirées de l'observation sur le terrain et d'une enquête auprès des préparateurs et des enseignants responsables des laboratoires de SVT dans la région orientale du Maroc mettent en lumière un manque important. En effet, Les résultats révèlent une disponibilité variable du matériel d'observation

biologique (MOB) et des taux d'absence et d'insuffisance du matériel de manipulation (MMA). L'étude du matériel de mesure (MME), a montré une rareté dans les capteurs de mesure ce qui pourra limiter l'utilisation de l'expérimentation assistée par ordinateur (ExAO). Cependant, cette recherche a révélé un taux d'usabilité élevé du matériel scientifique étudié. Par ailleurs, le manque criant d'équipements de sécurité, soulève des préoccupations sérieuses quant à la sécurité des acteurs éducatifs dans les laboratoires.

Pour remédier à cette situation, Il est essentiel de procéder régulièrement à une évaluation des besoins en équipement de laboratoire pour garantir que les instruments nécessaires à l'enseignement sont disponibles et fonctionnels. La priorité doit être accordée à la sécurité dans le laboratoire, avec l'installation d'équipements adéquats pour assurer la sûreté des activités pratiques. Une maintenance régulière est également cruciale pour assurer le bon état de fonctionnement de tout l'équipement. Enfin, un financement adéquat est nécessaire pour garantir que les laboratoires disposent de tous les équipements requis pour offrir un enseignement pratique de qualité.

References:
1. Annecca G. (2019). Capteurs «conditionnement des signaux», Instrumentation Industrielle. *Université de Lorraine*, 2-39. Retrieved from http://dptgeii.iutsd.univ-lorraine.fr/cours/lpsarii/IM/Cours/Capteurs.pdf,
2. Baricault A. (2014). Validation de nettoyage dans l'industrie pharmaceutique : cas pratique d'un projet de changement d'agent de nettoyage. *Université Bordeaux 2*, 28-42.
3. Boulal M. (2022). Transposition didactique des activités expérimentales et du savoir par les enseignants de biologie exerçant en collèges marocains : approche comparative avec les auteurs des manuels. *RDST. Recherches En Didactique Des Sciences et Des Technologies*, *25*, 33–68.

4. Carré E A. (2019). Analyse de l'activité d'élèves en travaux pratiques de Sciences de la Vie et de la Terre au lycée : effets de la mise en autonomie sur leur engagement et leurs apprentissages. *FDE. Faculté Education Montpellier*, *130*, 40-49.

5. Chafiqi F. & Alagui A. (2011). Réforme éducative au Maroc et refonte des curricula dans les disciplines scientifiques. Carrefours de l'éducation. *Carrefours de l'éducation*, *3*(1), 29-50.

6. Cherkaoui M., Cherkaoui R., El Aouad R., El Jai A., El Kissi N., El Manira A., Ghallab M., Ghazzali N., Ouazar D., Sasson A., Skalli W. & Smani M. (2017). Perspectives de l'enseignement des sciences au Maroc.

7. Creswell J W. (2013). *Educational research: Planning, conducting, and evaluating* (Matthew Buchholtz & Karen Mason, Eds.; 4th ed.).

8. CSE. (2009). Programme national d'évaluation des acquis PENA 2008, Fascicule des sciences. *Maroc*, 51–53.

9. CSE. (2015). l'enquête internationale TIMSS : Résultats des élèves marocains en mathématiques et en sciences dans un contexte international. *Conseil supérieur de l'éducation. Maroc*.

10. CSE. (2016). Le programme national d'évaluation des acquis des élèves du tronc commun (PNEA). *Instance Nationale d'évaluation du Système d'éducation, de Formation et de Recherche Scientifique (INE)*, 7-22. Retrieved from https://www.csefrs.ma/wp-content/uploads/2017/02/Resume-Rapport-PNEA-2016-Final.pdf

11. De Ketele J M. & Roegiers X. (2016). *Méthodologie du recueil d'informations, Fondements des méthodes d'observation, de questionnaire, d'interview et d'étude de documents* (Boeck sup, Ed.; 4th ed.).

12. El Allaoui A., Rhazi Filali F., El Hadri E., Fetteh K. & Bouhadi M. (2016). Etude évaluative d'examen normalisé de sciences de la vie et de la terre au cycle secondaire collégial. *European Scientific Journal*, *12*(1), 283-299.

13. Fantana N L. & Pettersson L. (2000). *Evaluer avec précision l'état des matériels électriques*. Lifetime Management.

14. Gaillard J. & Gaillard A- M. (2006). *Les laboratoires de recherche marocains, caractéristiques, fonctionnement et production*. In : Khelfaoui H. (ed.). L'intégration de la science au développement : expériences maghrébines. Paris (FRA) ; Lyon : Publisud ; ADEES, p. 124-166.

15. Giroux P., Monney N., Brassard I., Pépin A. & Savard V. (2020). *Laboratoires créatifs en milieux scolaires-Guide d'implantation*. Université du Québec à Chicoutimi.

16. Hassouni T., Ameziane N., Houssaini W I. & Lamri D. (2014). Place de la démarche d'investigation dans l'enseignement des sciences de la vie et de la terre aux collèges. *European Scientific Journal*, *10*(22), 286-298.

17. Houssaini W. I., Hassouni T., Echalfi F. & Ziali F.. (2014). Importance des expériences dans l'enseignement et l'apprentissage du systeme nerveux au collège. *European Scientific Journal*, *10*(28), 155-168.

18. Huitric S. (2021). Se parer en lycée : la lente construction de nouveaux établissements au xixe siècle. *In Situ Revue Des Patrimoines*, *44*.

19. Immel I. (2018). Les enjeux de communication et la gestion des conflits dans les établissements scolaires. *Revue Marocaine de Recherche En Management et Marketing*, *18*, 387-420.

20. Iraqi W., Oumhammed M., Guennoun Y. & Khay W. (2020). Perception de la démarche expérimentale par les enseignants des Sciences de la Vie et de la Terre. *International Journal of Innovation and Applied Studies*, *30*(3), 706-714.

21. Kaid Rassou K., Khir F., Benbrahim M., Tamraoui Y., Elberrani H. & Anfour M. (2017). Difficultés Relatives A L'enseignement-Apprentissage De La Géologie En Classes Secondaires Qualifiantes Cas De La Délégation d'Inzegane Ait Melloul. *European Scientific Journal, 13*(18), 294-313.

22. Lafontaine D. (2017). Quels sont les différents types de différenciation structurelle dans les écoles ou les établissements scolaires ? Que sait-on de leurs effets ? *CNESCO, Conférence de Consensus La Différenciation Pédagogique*, 3-24.

23. Lanctôt S. (2013). *Le rapport de laboratoire dans les classes de sciences et de technologies au secondaire : analyse d'un genre disciplinaire*. Université de sherbrooke.

24. Legendre R. (2005). *Dictionnaire actuel de l'éducation* (Guérin, Ed.; 3rd ed.).

25. Maduabum MA. (1992). *Teaching Biology effectively* (2e ed.). Owerri : Whyte and White Publishers.

26. Manuel d'utilisation de la balance. (2014). In Notices Balances. Retrieved from https://www.notices-balances.com

27. MEN Ministère de l'éducation nationale. (2019a). *livret unifié de classification et de spécifications techniques du matériel d'enseignement des SVT en cycle d'enseignement secondaire collégial*. Maroc.

28. MEN Ministère de l'éducation nationale. (2019b). *livret unifié de classification et de spécifications techniques du matériel d'enseignement des SVT en cycle d'enseignement secondaire qualifiant*. Maroc.

29. MEN, Ministère de l'Éducation nationale. (2018). *Note 126-18 : Guide de gestion des ressources pédagogiques*.
30. Ministère de l'éducation charge de l'enseignement préscolaire. (2008). *Projet de renforcement de l'enseignement des mathématiques, des sciences et de la technologie* [Module 5 Matériels Didactiques].
31. Moran L. & Masciangioli T. (2011). *La sécurité dans le laboratoire de chimie : Un Guide sur la gestion prudente des produits chimiques*. National academies press Washington. Retrieved from https://nap.nationalacademies.org/resource/21918/Chemical_Laborat ory _Safety _and _Security_FR.pdf
32. Moynier T. (2021). *L'archipel des sciences de la vie et de terre (collège et lycée)* (NOVABUREAU).
33. Najoui K. & Alami A. (2017). Importance of practical work in teaching earth sciences at the moroccan secondary qualifying schools. *American Journal of Innovative Research and Applied Science*, 230-239.
34. OECD (2019). Programme international pour le suivi des acques des élevés (PISA) 2018 Results: What Students Know and Can Do, PISA, OECD Publishing, Paris.
35. OECD (2023). PISA 2022 Results: Learning During – and From – Disruption, PISA, OECD Publishing, Paris.
36. Olajide S O., Adebisi T A. & Tewogbade T A. (2017). Assessment of laboratory resources, teachers' and students' involvement in practical activities in basic science in junior secondary schools in Osun state Nigeria. *Journal of Educational and Social Research*, *7*(3), 139.
37. Poisson Y. (1983). L'approche qualitative et l'approche quantitative dans les recherches en éducation. *Revue Des Sciences de l'éducation*, *9*(3), 369-378.
38. Pourtois J-P. & Desmet H. (1988). *Epistémologie et instrumentation en sciences humaines*. Bruxelles : Maradaga.
39. Régent-Kloeckner M., Maisch C. & Daussy C. (2022). *La mesure et le mesurage en biologie - Étude de travaux dirigés et pratiques en Licence* (Maha Abboud & Cécile de Hosson, Eds.; 1st ed.).
40. Robert H., Hill JR. & Finster D. (2010). *Laboratory safety for chemistry students* (John Wiley Sons, Ed.).
41. Sassi M., Chaibi A., Bouderga S., Lamgari M., Latifi M., Maadan H., Elasraoui A., El Mahmouhi N., Khalfouni M., Eddarouich S., Beabbou A., EL Mahir H., Konia F. & Hakkani A. (2018). *Le programme international pour le suivi des acquis des élèves (Une enquête qui mesure les performances des élèves de 15 ans dans les domaines de la lecture, des mathématiques et des sciences)*, Maroc.

42. SC Secrétariat du Conseil du Trésor. (2008). *Guide de gestion du matériel*. Canada. Retrieved from https://www.tbs-sct.canada.ca/pol-cont/doc/14671-fra.pdf
43. Seymour A. T. (1908). The classification of laboratory apparatus. *School Science and Mathematics*, *8*(8), 681–683.
44. Sibari H., El Hnot H., Cherai B. & Ben Said M. (2020). L'analyse des pratiques enseignantes liées aux sorties de terrain dans l'enseignement des sciences de la vie et de la terre. *European Scientific Journal*, *16*(86), 86-104.
45. Taoufik M., Abouzaid A. & Moufti A. (2016). Les activités expérimentales dans l'enseignement des sciences physiques : cas des collèges marocains. *European Scientific Journal*, *12*(22), 190-212.
46. Van der Maren J-M. (2004). *Méthodes de recherche pour l'éducation : éducation et formation Fondements* (Jean-Marie, Ed.). Canada.

Analyse empirique du potentiel productif et des déterminants de l'efficacité technique des productrices de laitue dans la ville de Korhogo en Côte d'Ivoire

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Résumé

L'urbanisation rapide observée en Côte d'Ivoire induit un besoin croissant en produits alimentaires. Dans ce contexte, l'agriculture urbaine et périurbaine de par sa spécialisation en production de fruits et légumes frais suscite beaucoup d'intérêts. L'objectif de cette étude est de faire une analyse diagnostique de la performance technique des productrices de laitue dans la ville de Korhogo en vue d'accroître leur niveau de productivité. Pour ce faire, une enquête a été réalisée auprès de 179 productrices reparties sur six (6) sites : Mongaha, Natio, Petit-Paris, Teguere, Naguin, Koko. La statistique descriptive et la méthode de l'Approche des Frontières Stochastiques ont été utilisées pour l'analyse des données. Des résultats montrent que le scores d'efficacités techniques des productrices sont compris entre 0,28 et 0,91 avec une moyenne de 0,47. L'analyse des déterminants de l'efficacité technique indique que le niveau d'instruction, l'accès à la formation technique et l'appartenance à un groupe d'entraide ou une association agricole influencent significativement et positivement la performance des productrices de laitue.

Alors, l'amélioration du potentiel productif des agricultrices passe par l'initiation des séances de formation et d'information sur les bonnes pratiques agricoles, le regroupement des agricultrices en coopérative ou en groupement informel d'entraide et enfin la promotion de l'alphabétisation en vue de faciliter une meilleure réceptivité des nouvelles techniques de production.

Empirical analysis of the productive potential and determinants of the technical efficiency of women lettuce growers in the town of Korhogo in Côte d'Ivoire

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Abstract

Rapid urbanization in Côte d'Ivoire is leading to a growing need for food products. In this context, urban and peri-urban agriculture, with its specialization in the production of fresh fruit and vegetables, is attracting a great deal of interest. The aim of this study is to carry out a diagnostic analysis of the technical performance of women lettuce growers in the town of Korhogo, with a view to increasing their level of productivity. To do this, a survey was carried out among 179 women growers at six (6) sites: Mongaha, Natio, Petit-Paris, Teguere, Naguin and Koko. Descriptive statistics and the Stochastic Frontier Approach were used to analyse the data. The results show that the technical efficiency scores of women producers range from 0.28 to 0.91, with an average of 0.47. Analysis of the determinants of technical efficiency indicates that the level of education, access to technical training and membership of a self-help group or agricultural association significantly and positively influence the performance of female lettuce growers.

Improving the productive potential of women farmers therefore involves initiating training and information sessions on good farming practices, grouping women farmers into cooperatives or informal self-help groups, and promoting literacy to make them more receptive to new production techniques.

Keywords: Technical efficiency; Lettuce; Stochastic Frontier Approach

Introduction

La croissance exponentielle de la population urbaine observée en Afrique tropicale et surtout dans les pays en développement, pose un problème d'approvisionnement alimentaire des villes (Olanrewaju et al., 2004). En Côte d'Ivoire par exemple, d'ici 2030, c'est près de 63% des habitants qui vivront

dans les villes. Evidemment, cette croissance urbaine va induire une demande croissante en produits alimentaires (MINAGRI, 2009).

Dans ce contexte, pour répondre aux demandes des consommateurs, l'agriculture urbaine, de par sa spécialisation en production de fruits et légumes, est aujourd'hui considérée comme une solution viable et durable pour contribuer à la sécurité alimentaire en milieu urbain et périurbain (Kouakou, 2017). Selon Temple et Moustier et al. (2004), l'agriculture urbaine assure, hormis les fonctions alimentaire et économique, des fonctions environnementale (recyclage des déchets, effets antiérosifs), d'amélioration du cadre de vie (maintien de zones vertes tampon face à une urbanisation trop dense), sécuritaire (utilisation, voire gardiennage, de lieux vacants). Elle contribue, aussi, à l'intégration et à la réduction de la pauvreté des populations venues des campagnes car elle est source de revenu (Olanrewaju *et al.,* 2004).

Dans la plupart des études menées en Afrique subsaharienne sur l'agriculture urbaine, le maraîchage apparaît comme la principale activité agricole qui permet de répondre à la demande alimentaire urbaine en légumes frais (Moustier *et al.,* 2004 ; Jenni et al.,2008). L'agriculture urbaine et péri-urbaine occupe 67% de la main d'œuvre féminine qui travaille principalement dans le maraicahage et assure 75% de la production alimentaire. Les cultures maraichères sont en général caractérisées par la production de légumes (légumes feuilles et légumes fruits) selon Djoumessi (2015). La consommation des fruits et légumes est recommandée dans plusieurs pays pour la protection contre des maladies telles que le cancer, l'obésité, les maladies cardio-vasculaires et les bienfaits de leurs fibres sont aussi reconnus dans le bon fonctionnement du transit intestinal (Berger *et al.,* 2010 ; Idogun *et al*., 2008). De ces deux types de légumes, les légumes feuilles sont les plus cultivés, et parmi celles-ci, la laitue est l'espèce la plus cultivée (kouakou *et al*., 2019). La laitue est une espèce cultivée sur toute l'étendue du territoire national à cause de sa durée de culture qui est de 30 jours, et est très appréciée par la population (Kouakou, 2009).

Au regard de l'importance de la laitue dans le régime alimentaire de la population ivoirienne, sa disponibilité en quantité suffisante devient donc une nécessité. Ainsi , des questions se posent sur la capacité et les performances des systèmes de productions actuels aux vues des difficultés auxquelles les productrices urbaines et péri-urbaines sont confrontées lors de la pratique de cette activité telles que la pression foncière, l'étalement des espaces agricoles ponctué de contrastes dans le mode d'occupation du sol, la taille réduite de la superficie de production , le capital réduit d'origine familiale, l'absence de qualification professionnelle des acteurs, l'utilisation abusive et sans normes des produits phytosanitaires et des engrais, l'utilisation de l'eau de qualité douteuse pour l'arrosage des plantes etc. En outre, en termes d'accès aux ressources, les femmes de Côte d'Ivoire ont des difficultés à accéder aux biens

économiques tels que la terre et les prêts. En effet, seulement 5% des femmes ont accès à la propriété foncière, alors qu'elles sont responsables de 75% de la production alimentaire de base (Abraham, 2010).

Par ailleurs, aucune étude empirique n'a encore été réalisée dans la ville de Korhogo sur les performances et déterminants de l'efficacité technique des productrices de laitue.

L'objectif général est d'évaluer la performance technique des productrices de laitue dans la ville de Korhogo.
Spécifiquement, l'étude vise des objectifs spécifiques suivants :
- Etablir le profil des productrices de laitue et de leur exploitation ;
- Estimer le niveau d'efficacité technique des productrices ;
- Identifier les déterminants potentiels de l'efficacité technique.

Méthodologie
Présentation de la zone d'étude
Situé entre le 8°26 et le 10°27 de latitude Nord et le 5°17 et le 6°19 de longitude Ouest, la ville de Korhogo, chef-lieu de la région du Poro se trouve à 600km de la ville d'Abidjan au nord de la Côte d'Ivoire.

Korhogo possède un climat de type soudanais marqué par une alternance de saisons à savoir, la saison sèche marquée par l'harmattan entre décembre et janvier et des pointes de chaleurs en mars et avril et la saison des pluies qui s'étend de mai à octobre avec des pluviométries maximales en juillet et Août. Sur le plan géologique, les sols sont ferralitiques et typiques à granites. La population de Korhogo est estimée à 748 393 habitants et est majoritairement agricole selon le Recensement Général de la Population et de l'Habitat de 2021. La Figure 1 présente la zone d'étude.
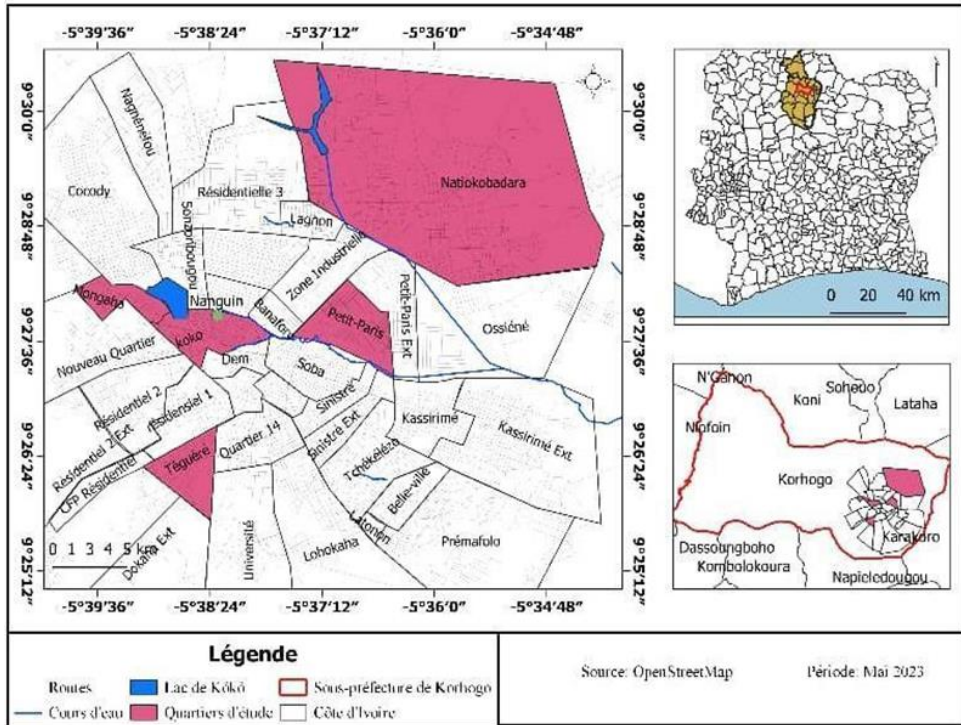
Figure 1 : Carte de la présentation du département de Korhogo

Collecte des données

Le choix de la commune de Korhogo est motivé par une longue pratique de l'agriculture urbaine et aussi l'existence de grandes surfaces urbaines de production de maraîchers. L'enquête par questionnaire a été administrée à cent soixante-dix-neuf (179) productrices échantillonnées de façon aléatoire sur la base du dixième du nombre des productrices de laitue au regard du nombre total des productrices recensées.

Selon la distribution géographique des sites prédéfinis, six (6) grands sites ont été choisis dans le cadre de cette étude. Dans la zone urbaine, il s'agit des sites de Natiokobadara, du barrage de Koko, Nanguin, de Teguere et Petit-Paris. Dans la zone périurbaine, il s'agit du site de Mongaha.
Le Tableau 1 présente la structure de l'échantillon.

Tableau 1: Répartition des productrices en fonction des sites

Site	Effectifs enquêtés
Natio	33
Koko	47
Nanguin	22
Petit Paris	27
Mongaha	35
Teguere	15
Total	**179**

Méthode d'analyse
Fonction de production de la laitue

      L'approche stochastique proposée par Aigner *et al*., (1977) a été utilisée dans cette étude. Cette approche économétrique suppose que l'erreur est composite d'un terme résiduel qui prend en compte les risques liés aux effets aléatoires et d'une composante qui représente l'inefficacité du producteur. L'approche de la frontière stochastique a été choisie pour tenir compte du fait qu'elle peut permettre de différencier l'inefficacité liée aux productrices de laitue et celle due aux effets aléatoires non contrôlables par celles-ci. Par le biais du logiciel STATA 2015, les élasticités de la frontière de production, les indices d'efficacité et les coefficients des déterminants ont été obtenus. L'estimation de la frontière de production s'est faite à l'aide d'une fonction transcendante logarithmique simplifiée. L'avantage de cette dernière est qu'elle est flexible, elle n'impose aucune hypothèse restrictive à l'égard de la constante ou des élasticités de la fonction de production (Donkoh *et al.*, 2013). En outre, elle permet de déceler si la combinaison entre deux facteurs de production a un effet significatif sur le niveau de production. Ainsi, la fonction peut s'écrire sous la forme suivante :

$$lnY_i = \beta_0 + \sum_{J=1}^{5} \boxed{} \beta_j \, ln \, ln \, X_{ij} + \sum_{l=1}^{5} \boxed{} \beta_{jl} lnX_{ij} lnX_l + \frac{1}{2} \sum_{J=1}^{5} \boxed{} \, (\, ln \, ln \, X_{ij} \,)^2 + V_i - U_i$$

Où

i : le producteur ;

Y_i : la production totale de laitue (Kg) ;

X_{ij} : le vecteur d'inputs utilisés ;

Cinq (5) inputs conventionnels définis respectivement par :

X_{1i} : la quantité de main-d'œuvre utilisée en homme-jour (hj) ;

X_{2i} : la quantité d'engrais utilisée (en kg) ;

X_{3i} : la quantité pesticide ;

X_{4i} : la superficie exploitée pour la laitue en hectare (ha) ;

X_{5i} : la quantité de semence utilisée (en kg) ;

V_i : les variables aléatoires hors du contrôle des productrices de laitue et qui sont supposées être indépendamment et identiquement distribuées selon une loi normale d'espérance mathématique nulle et de variance $\sigma v2 [Vi \approx N \, (0, \sigma v2)]$, indépendantes des U_{is};

U_i : les variables aléatoires d'inefficacité technique et supposées être indépendamment et identiquement distribuées comme des variables aléatoires non négatives, obtenues par une troncature à zéro, de la distribution de type $N \, (\mu, \sigma u2)$, $\mu \, et \, \sigma \, 2$ sont les paramètres à estimer au niveau de chacun de ces modèles.

Ces paramètres sont les coefficients de la frontière de production dont les résidus permettront de déterminer l'indice d'efficacité technique du producteur i dans un système de production donné, définie par $TE = exp(-Ui)$, tel que expliqué par Coelli et al. (1998).

Déterminants socio-économiques de l'efficacité technique

L'efficacité technique est expliquée par certains facteurs socioéconomiques (le niveau d'instruction, le nombre d'années d'expérience), techniques, ou institutionnels (la taille des superficies, le mode d'accès à la terre, appartenance à une organisation agricole). L'estimation des déterminants de l'efficacité technique permet d'identifier les facteurs susceptibles d'influencer l'efficacité des productrices de laitue **(Tableau 2).**

Tableau 2: Description des variables socio-économiques déterminant les niveaux d'inefficacité de différentes productrices

Variables	Natures des variables	Modalités	Signe attendus
Q_{1i} Age	Discrète	Variable quantitative	+/-
Q_{2i} Mode d'accès à la terre	Dichotomique	1=Locataire; 0=Propriétaire	+/-
Q_{3i} Niveau d'instruction	Dichotomique	1= scolarisé; 0= non scolarisé	+/-
Q_{4i} Accès à la formation	Dichotomique	1= oui 0= non	+/-
Q_{5i} Appartenance à une organisation	Dichotomique	1= oui; 0= non	+/-
Q_{6i} Année d'expérience	Discrète	Variable quantitative	+/-

Résultats
Profil sociodémographiques des productrices

Les productrices des sites d'étude sont relativement adultes (67,02% des productrices de l'échantillon ont un âge compris entre 31 et 55 ans). Aussi les productrices de laitue sont majoritairement analphabètes (78,90%).

En fonction du nombre d'année d'expérience, les productrices sont reparties en trois (3) groupes. Celles dont le nombre d'année d'expérience est inférieur à 15 ans (46,99%), celle dont le nombre d'année d'expérience est compris entre 16 et 30 ans (35,43%) et celles dont le nombre d'année d'expérience est supérieur à 30 ans (17,74%). La taille moyenne des ménages agricoles est de sept (7) membres.

La superficie moyenne de l'ensemble de l'échantillon est de 0,202 ha, avec des superficies oscillant entre 0,012 à 0,0742ha. La production de la laitue est pratiquée sur de petites superficies. A Korhogo, deux (2) modes d'accès à la terre ont été identifiées : la location de terre (81,19%) et l'héritage (18,81%). Une faible proportion des productrices appartient à une organisation

d'entraide ou une association de productrices (28%). La plupart des productrices pratique le maraichage sans aucune formation technique préalable en production de laitue (89,11%).

Estimation des modèles de frontière stochastique de production de la laitue

Vérification des hypothèses

Selon le Tableau 3, la statistique λ obtenue à partir de la fonction de vraisemblance et celle obtenue après l'estimation de la fonction Translog est égale à 28,82. Elle est supérieure à la valeur critique, ce qui permet de rejeter l'hypothèse nulle. La fonction Translog est donc plus appropriée pour cette étude. De plus, la valeur de la fonction de vraisemblance obtenue après estimation de la fonction translog par la méthode des Moindres Carrées Ordinaires (MCO) et celle obtenue après estimation par la méthode du maximum de vraisemblance permettent d'avoir la statistique λ égale à 258,94. Ces estimations sont faites en tenant compte uniquement des variables qui entrent dans la fonction de production. Le test conduit également à un rejet de l'hypothèse nulle. Pour le troisième test, le même principe que dans le deuxième est retenu mais cette fois-ci les estimations sont effectuées en considérant à la fois les variables qui expliquent la fonction de production et la fonction d'inefficacité. Les résultats obtenus aboutissent aussi à un rejet de l'hypothèse nulle.

Tableau 3: Test d'hypothèse

Hypothèse nulle	λ	Variable critique	Décision
H_{01}	28,82	17,67	H_{01} rejetée
H_{02}	258,94	2,7	H_{02} rejetée
H_{03}	357,3	16,27	H_{03} rejetée

Estimation de la fonction frontière de production

Les résultats de la régression montrent que le modèle est globalement significatif au seuil de 10% (Tableau 4). Ils portent sur l'ensemble des unités de production observées.

La valeur de gamma (0,75) indique que l'écart par rapport à la frontière de production est expliqué par l'inefficacité technique des unités de production à 75%. Cette valeur est significativement différente de zéro. Ceci indique l'existence des inefficacités productives. L'écart entre la production observée et celle potentielle des unités de production étudiées est en partie dû à leur inefficacité technique. De plus, la valeur de gamma (0,75) est significativement inférieure à 1, ce qui justifie l'importance du terme d'erreur stochastique v. Dans le cas précis de cette étude, environ 25% des écarts entre la production observée et la production potentielle sont alors liés à des effets aléatoires (la forte pluviosité qui crée un engorgement des sols ou autres aléas climatiques par exemple), et des erreurs de mesure.

La valeur de lambda (λ) est supérieure à un. Cela exprime un meilleur ajustement pour le modèle estimé et aussi l'exactitude de l'hypothèse de distribution déterminée par les termes d'erreur.

D'après les résultats de l'étude, seules les variables telles que « la superficie » et « la quantité de semence » sont respectivement significatives au seuil de 1% et 10%. Le coefficient de la superficie est négatif et significatif. Quant à la semence, elle a un effet positif et significatif sur le rendement. Cependant, la main-d'œuvre et l'application des pesticides ont des coefficients négatifs et non significatifs. L'application de l'engrais a un coefficient positif et non significatif. Toutefois, la fonction transcendante logarithmique a permis de pallier ce manquement en mettant en exergue d'autres relations significatives qui impliquent ces variables. Ainsi, la combinaison de la main-d'œuvre et de l'application des pesticides a un coefficient positif et significatif au seuil de 5%. La combinaison des variables « application d'engrais » et « la superficie » donne des coefficients positifs et significatifs au seuil de 10%.

Tableau 4: Résultats de l'estimation de la fonction de production stochastique

Variables	Paramètres	Coefficients
Constantes	β_0	4,908
LnX_1	β_1	-3,264
LnX_2	β_2	1.890
LnX_3	β_3	-5,109
LnX_4	β_4	-5,566***
LnX_5	β_5	5,226*
LnX_1LnX_2	β_6	-0,190
LnX_1LnX_3	β_7	1,483**
LnX_1LnX_4	β_8	0,380
LnX_1LnX_5	β_9	-1,585***
LnX_2LnX_3	β_{10}	-0,194
LnX_2LnX_4	β_{11}	0,427*
LnX_2LnX_5	β_{12}	0,436
LnX_3LnX_4	β_{13}	-0,369
LnX_3LnX_5	β_{14}	-0,325
LnX_4LnX_5	β_{15}	-0,65*
Sigma carre	σ^2	0,383***
Gamma	γ	0,75

* significativité à 10%, ** significativité à 5%, significativité à 1%

Analyse de l'indice d'efficacité technique

Aux regards des résultats consignés dans le Tableau 5, l'on peut noter que les plus faibles niveaux d'efficacité technique sont observés sur les sites de Mongaha (28%) et de Natio (29%). La valeur maximale d'efficacité technique obtenue à Nanguin (91%) montrent qu'il existe également des productrices très performantes car proches de la frontière de production.

Tableau 5: Statistique descriptive des indices d'efficacité technique

SITES Indice d'efficacité	Nanguin	Teguere	Koko	Natio	Petit-Paris	Mongaha
Moyenne	0,51	0,52	0,42	0,49	0,48	0,42
Ecart-Type	0,10	0,08	0,13	0,08	0,09	0,08
Minimum	0,31	0,39	0,33	0,29	0,40	0,28
Maximum	0,91	0,73	0,58	0,73	0,63	0,62

Distribution des fréquences d'indices d'efficacité technique

Le Tableau 6 révèle que seulement 11,89% des unités de production enquêtées réalisent un niveau d'efficacité technique supérieur à 60%. Par ailleurs, 62,37% des productrices de laitue ont un niveau d'efficacité oscillant entre 40% et 60%. Enfin, 25,74% ont un seuil en dessous de 40%.

Tableau 6: Distribution des niveaux d'efficacités techniques des productrices

Indice d'efficacité technique	Nombre de productrices	Efficacité technique %
[0,20; 0,40[	46	25,74
[0,40; 0,60[	112	62,37
[0,60; 0,80[	19	10,89
[0,80; 1,00[	2	0,99

Analyse des facteurs socio-économiques déterminant les niveaux d'efficacités des productrices de la laitue

Selon le Tableau 7, les variables « formation technique de la productrice » et « appartenance à une organisation agricole » ont respectivement une incidence positive et significative au seuil de 10% et 1% sur l'efficacité technique des productrices de laitue. Par ailleurs, la variable « niveau d'instruction » a un effet significatif et négatif au seuil de 5%. Enfin, les variables telles que l'âge des productrices, le mode d'accès à la terre, le nombre d'année d'expérience ne sont pas significatives.

Tableau 7: Déterminants socio-économiques de l'efficacité technique

Variables	Paramètres	Coefficient	P>|z|
Constante	δ_0	0,473**	0,001
Age	δ_1	0,0007	0,522
Mode d'accès à la terre	δ_2	-0,0229	0,404
Niveau d'instruction	δ_3	-0,0256**	0,043
formation	δ_4	0,0549***	0,083
Appartenance à une organisation	δ_5	0,1004*	0,000
Année d'expérience	δ_6	-0,0001	0,896

*significativité à 1%, ** significativité à 5%, *** significativité à 10%

Discussion

Les résultats de l'enquête ont montré que 78% des productrices de laitue sont analphabètes. Ce faible niveau d'instruction des productrices de maraîchers exprime le faible taux de scolarisation des filles dans cette partie

du Nord du pays à cause la tradition (Affou *et al.*, 2022). Cette même étude révèle également que la taille des ménages agricoles est en moyenne de sept (7) personnes. Ce résultat est sensiblement en accord avec celui du Recensement de l'exploitant et des exploitations Agricoles (REEA), mené par le Ministère de l'Agriculture et du Développement Rural (MINADER, 2017) qui a montré que la moyenne nationale du ménage agricole est de 7,2.

La superficie moyenne de l'ensemble des parcelles cultivées par les productrices de laitue est de 202 m^2 avec des superficies oscillant entre 12 m^2 (minimum) et 742 m^2 (maximum). Les productrices de laitue exploitent de petites portions de terre. Ce résultat est similaire à ceux de Silue *et al* (2022). En fait, la pression foncière due à l'urbanisation des villes peut expliquer l'étroitesse des parcelles exploitées (Aman et Koffi, 2021).

Deux modes d'accès à la terre ont été identifiés, à savoir la location (80% des productrices) et l'acquisition par héritage (19,33%). Ce résultat est en concordance avec celui de Koffi-Didia (2015), qui a montré que le mode d'accès à la terre le plus dominant dans le maraichage urbain est la location.

La valeur de γ montre que l'écart par rapport à la frontière est expliqué par l'inefficacité des productrices à 75%. Cette valeur est significativement différente de zéro. Ceci indique l'existence des inefficacités productives. Il est a noté dans cette étude que 25% des écarts entre la production observée et la production potentielle sont alors liés à des effets aléatoires (la forte pluviosité qui crée un engorgement des sols ou autres aléas climatiques par exemple), et à des erreurs de mesure. Kouakou (2017) et Idrissa *et al* (2022) ont trouvé des résultats similaires lors leur étude respective réalisée sur l'efficacité technique des exploitions maraichères en Côte d'Ivoire et au Niger.

Par ailleurs, toujours selon les résultats de l'étude, le coefficient de la main d'œuvre est négatif et non significatif. Ce résultat pourrait s'expliquer par la non qualification des productrices ou par une mauvaise allocation de la main d'œuvre. Ce résultat est contraire à celui de Nuama (2006) qui a montré que la main d'œuvre est un facteur déterminant pour l'efficacité technique.

Une augmentation de la superficie entraîne une réduction de la production de laitue. Cela s'explique par le fait que les petites parcelles requièrent d'efforts rationnels. Les entretiens se font correctement. Les activités se conduisent à temps alors qu'au niveau des grandes parcelles, il y a une dispersion des efforts liée à l'insuffisance de la main d'œuvre (Nuama, 2006).

De plus, pour celles qui sont mariées, leur obligation première est de s'occuper de la cellule familiale. La semence a un effet significatif et positif sur l'efficacité productive. On peut alors retenir que plus la semence est de bonne qualité plus la productrice est techniquement efficace (Kouakou, 2017). Les variables « quantité d'engrais », et « quantité de pesticide » ne sont pas significatives individuellement, mais, le sont lorsqu'elles sont combinées avec

d'autres variables. Ainsi, la combinaison entre la quantité de main-d'œuvre et la quantité de pesticide et celle entre la quantité d'engrais et la superficie exploitée ont un effet significatif et positif sur l'efficacité productive. Cela signifie que ces deux variables ont des effets complémentaires dans la production (Cheick *et al.,* 2014, Donkoh et al, 2013).

Il ressort aussi de cette étude que l'efficacité technique moyenne varient en fonction des sites et est faible (0,42). Idrissa *et al* (2022) et Savi (2009) ont obtenu des résultats semblables dans leurs différentes études.

La variable « niveau d'instruction » est significative mais a un effet négatif sur l'efficacité technique des productrices. Cela pourrait s'expliquer par le fait que les productrices instruites se détournent de l'activité agricole au profit d'autres secteurs ou la pratiquent à temps partiel, pour se concentrer sur des emplois plus rémunérateurs ou plus prestigieux. La production agricole constitue alors pour eux une activité secondaire. Ce qui fait qu'elles n'ont pas le temps nécessaire de s'occuper correctement de leur exploitation de laitue. Cette assertion est soutenue par les travaux de Gurgand (1999) et Kouakou (2017).

L'accès à la formation technique a une influence significative et positive sur l'efficacité technique. Des résultats semblables ont été trouvés par Seidou (2008). Selon lui, les exploitantes ayant reçu des services de vulgarisation étaient mieux informées sur les pratiques agricoles améliorées. Par conséquent, elles ont montré des niveaux d'efficacité technique plus élevés.

En ce qui concerne la variable « Appartenance à une organisation », elle est significative et influence positivement l'efficacité technique. Cela pourrait s'expliquer par le fait qu'une organisation communautaire peut résoudre les problèmes de main-d'œuvre et d'accès aux intrants qui sont des facteurs qui améliorent l'efficacité technique du paysan. Ce résultat est conforme à celui de Coelli et Fleming (2004) selon lequel l'organisation accroît le potentiel productif de la société en ce sens que les membres d'une organisation seraient favorisés dans l'accès à l'information mais aussi et surtout aux partenaires.

Conclusion

Cette étude analyse les performances techniques des productrices de laitue dans la ville de Korhogo en vue de favoriser l'amélioration du niveau de productivité.

Des résultats, il en résulte que les productrices de laitue exploitent de petites portions de terre.

La valeur de γ montre que l'écart par rapport à la frontière est expliqué par l'inefficacité des productrices à 75%. Le coefficient de la main d'œuvre est négatif et non significatif.

La superficie a un effet significatif mais négatif sur la productivité des agricultrices. La semence a un impact significatif et positif sur l'efficacité productive. De plus, les variables « quantité d'engrais », et « quantité de pesticide » ne sont pas significatives individuellement, mais, le sont lorsqu'elles sont combinées avec d'autres variables. L'efficacité technique moyenne est faible (0,42). Toutefois, elle varie en fonction des sites de production de laitue. Les déterminants de l'efficacité technique sont l'accès à la formation technique et l'appartenance à une organisation. Par contre, la variable « niveau d'instruction » est significative mais a un effet négatif sur l'efficacité technique des productrices. En réalité, l'organisation communautaire peut résoudre les problèmes de main-d'œuvre et d'accès aux intrants qui sont des facteurs qui améliorent l'efficacité technique du paysan, d'où son influence positive sur la productivité des agricultrices de laitue.

Au regard de ce qui précède, il convient de formuler quelques recommandations afin d'accroître la production de laitue :
- Initier des séances de formation et d'information sur les bonnes pratiques agricoles ;
- Faciliter le regroupement des agricultrices en coopérative ou en groupement informel d'entraide afin de partager des informations et bénéficier des expériences des autres productrices ;
- Promouvoir l'alphabétisation des productrices en vue d'une meilleure réceptivité des nouvelles techniques de production.

References:

1. Abraham O., 2010. Agriculture urbaine et stratégies de survie des ménages pauvres dans le complexe spatial du district d'Abidjan. Revue électronique en sciences de l'environnement, Vertigo, 10(2), 15p. https://journals.openedition.org/vertigo/10005
2. Affou S. W., Sebastien K. O., Emma F.A., Kablan TA., Rose K-N., 2013. Perception des risques sanitaires dans le maraîchage à Abidjan,

Côte d'Ivoire. Int. J. Biol. Chem. Sci. 7(5): 1829-1837. https://www.researchgate.net/publication/272337970_Perception_des_risques_sanitaires_dans_le_maraichage_a_Abidjan_Cote_d'Ivoire

3. Aigner D. J., Lovell C. A., Schmidt P., 1977. "Formulation and estimation of stochastic frontier production". Journal of Econometrics, 6 (1): 21-37. https://econpapers.repec.org/RePEc:eee:econom:v:6:y:1977:i:1:p:21-37

4. Aman A. H., Koffi B. C. Y., 2021. Impact de l'urbanisation du district d'Abidjan sur le maraichage periurbaine. DaloGeo, revue scientifique en Géographie 5(5) :125-140. https://www.revuegeo-univdaloa.net/sites/default/files/2022-01/AMAN%20et%20al.pdf

5. Berger CN, Sodha SV, Shaw RK, Griffin PM, Pink D, Hand P, Frankel G., 2010. Minireview: Fresh fruit and vegetables as vehicles for the transmission of human pathogens. Environ. Microbiol., 12: 2385-2397. https://pubmed.ncbi.nlm.nih.gov/20636374/

6. Cheikh A. B. N., 2014. Mesure de l'efficacité technique de production des riziculteurs de la vallée du fleuve Sénégal. Journées de Recherches en Sciences sociales en Angers, JRSS 2014, P 24. https://www.sfer.asso.fr/source/jrss2014/jrss-2014-ngom.pdf

7. Coelli T. J., Prasada Rao D. S., Battese G. E., 1998. An Introduction to Efficiency and Productivity Analysis, Kluwer Academic Publishers. Boston, 271 p. https://link.springer.com/book/10.1007/978-1-4615-5493-6

8. Coelli T., Fleming E., 2004. Diversification economies and specialisation effeciencies in a mixed food and coffe smallholder farming system in Papua New Guinea. Agricultural Economics, (31) : 229-23. https://www.researchgate.net/publication/4741157_Diversification_economies_and_specialisation_efficiencies_in_a_mixed_food_and_coffee_smallholder_farming_system_in_Papua_New_Guinea

9. Djoumessi F.Y., 2015. Analyse de l'efficacite des petits exploitants de legumes en zone de foret dans la region du sud-ouest cameroun. Mémoire pour l'obtention d'un diplôme de master II recherche, Universite de Younde II, Cameroun, 82p. https://mpra.ub.uni-muenchen.de/79371/

10. Donkoh S. A, S. Ayambila and S. Abdulai.(2013).Technical Efficiency of Rice Production at the Tono Irrigation Scheme in Northern Ghana, American Journal of Experimental Agriculture, 3(1): 25–42. https://www.researchgate.net/publication/336020796_Technical_Efficiency_of_Rice_Production_at_the_Tono_Irrigation_Scheme_in_Northern_Ghana

11. Guardand P. et Rouabah A., 1999. Efficacité et Performance des Banques en Europe : une Analyse "Stochastic Frontier" sur des Données en Panel". CREA Doc, Luxembourg, 24 p. https://www.bcl.lu/en/publications/Working-papers/3/BCLWP003.pdf

12. Idogun E. S., Famodu A. A., Olasunkanni L. A., Osilesi O., Adebawo O. O. , 2008. Effets of fruits and vegetables on electrolytes and blood pressure of hypertensive patients seen in Nigeria. African Journal of food Agriculture and Nutrition Development, 8(3) : 349-357. https://www.ajol.info/index.php/ajfand/article/view/19197

13. Idrissa G. M. D., Ali M., Soumana B., 2022. Efficacité technique des exploitations maraichères d'hivernage dans les communes d'Imanan et Tagazar au Niger. International journal of innovation and Applied Studies 36(3): 790-799. https://issr-journals.org/xplore/ijias/0036/003/IJIAS-22-101-04.pdf

14. Jenni, S. et Bourgeois G., 2008. Quantifying Phenology and Maturity in Crisphead Lettuce. Hort Technology 18(4): 553-558. https://www.researchgate.net/publication/286850629_Quantifying_Phenology_and_Maturity_in_Crisphead_Lettuce

15. Koffi-Didia A. M. , 2015. L'accès au foncier urbain et périurbain pour le maraîchage à Abidjan et ses environs. Revue de Géographie Tropicale et d'Environnement, (2) : 47-54. https://www.prodig.cnrs.fr/marthe-koffi/

16. Kouakou K. J, Yao K B, Sika A E, Gogbeu S. J, Koné L. S.P, Dogbo.O., 2019. Caractérisation de l'activité de maraîchage dans la commune de Port-Bouët (Abidjan, Côte d'Ivoire). Journal of Animal & Plant Sciences, 41 (1): 6747-6756. https://doi.org/10.35759/JAnmPlSci.v41-1.2

17. Kouakou K.J., 2009. Etude des métaux traces (Cd, Cu, Pb, Zn, Ni) dans les sols et les produits maraichers de deux sites d'agriculture dans la ville d'Abidjan (Côte d'Ivoire). Thèse de Doctorat unique de L'Université d'Abobo-Adjame, Abidjan, Côte d'Ivoire, 145p. https://www.scirp.org/reference/referencespapers?referenceid=1036420

18. Kouakou K. P-A, 2017. Analyse De La Performance Productive De L'agriculture Urbaine Dans Le District d'Abidjan. Europeen Scientific Journal 13(35) : 265-288. https://eujournal.org/index.php/esj/article/download/10333/9800

19. MINADER, 2017. Recensement des exploitants et exploitations agricoles 2015/2016. Rapport provisoire, 59p. https://agriculture.gouv.ci/uploads/SARA_2017-

Rapport_de_synth%C3%A8se_REEA_(recensement_des_exploitants_et_exploitations_agricoles).pdf

20. MINAGRI, 2009. Etat des ressources phytogénétiques pour l'alimentation et l'agriculture. Second rapport national, 65p. https://www.fao.org/3/i1500f/i1500f00.htm

21. MIRAH, 2013. Monographie du département de Korhogo : Abidjan le 29 juin 2013. https://www.careevaluations.org/wp-content/uploads/ETUDE-SUR-LES-FILIERES-ET-CHAINES-DE-VALEUR-PROMETTEUSES.pdf

22. Moustier P, Moumbélé M. et Huat J., 2004. La gestion concertée et durable des filières maraîchères urbaines. In Olanrewaju B, Moustier P, Mougeot LJA. et Fall A. Développement durable de l'agriculture urbaine en Afrique Francophone. Enjeux, concepts et méthode. Montpellier, France, CIRAD/CRDI : 66-95. https://publications.cirad.fr/une_notice.php?dk=518815

23. Nguetta E. A., 2012. Enquête épidémiologique sur les hémoparasitoes bovines transmises par les tiques dans le district des savanes. Mémoire, D.U.T., Université Pelefero Gon Coulibaly, Korhogo, Côte d'Ivoire, 36 p.

24. Nuama E., 2006. Mesure de l'efficacité technique des agricultrices de cultures vivrières en Côte d'Ivoire. Economie rurale 16p. https://www.cairn.info/revue-economie-rurale-2006-6-page-39.htm

25. Olanrewajou B.S., Moustier P., Mougeot L.J.A et Abdou F., 2004. Developpement durable de l'agriculture urbaine en afrique francophone. Enjeux, concepts et methodes. CIRAD, CRDI. 173 p. https://agritrop.cirad.fr/518651/1/document_518651.pdf

26. Savi A. D., 2009. Analyse de la rentabilité financière et de l'efficacité économique de la production du crincrin (Corchorus Olitoruius) dans la vallée du Mono. Mémoire pour l'obtention du Diplôme d'Etudes Approfondies (DEA), Faculté des Sciences Agronomiques, Université d'Abomey Calavi, 136p. https://www.academia.edu/7087525/Memoire_DEARentabilitproduction_Crincrinc

27. Seidou, A., 2008. Technical Efficiency of Rice Farmers in Northern Ghana, Working Papers 178, African Economic Research Consortium, 35p. https://ideas.repec.org/p/aer/wpaper/178.html

28. Silue D., Ettien A. A-M., Soro T. N., 2022. Diagnostic des connaissances traditionnelles et pratiques d'utilisation des plantes pesticides chez les producteurs du maraîcher de Korhogo (Côte d'Ivoire). Revue Espace, Territoires, Sociétés et Santé, 5 (10) : 229-244. https://www.retssa-ci.com/pages/Numero10/SILUE/SILUE%20Donakpo.pdf

29. Soro D., 2012. Couplage de procédés membranaire pour la classification et la concentration du jus de la pomme de cajou : Performance et impacts sur la qualité des produits, <u>Montpellier, Thèse SupAgro</u>**,** 215p. <u>http://www.theses.fr/2012NSAM0035</u>

30. Temple L., Moustier P., 2004. Les fonctions et contraintes de l'agriculture périurbaine de quelques villes africaines (Yaoundé, Cotonou, Dakar). Cahiers Agricultures (13) : 15-22. <u>https://agritrop.cirad.fr/519694/</u>

Balanced Scorecard (BSC) : Révolution Financière des Établissements Publics

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Résumé

Cet article explore le rôle central de la Balanced Scorecard (BSC) dans l'évaluation des stratégies de financement au sein des établissements publics à l'ère de la numérisation. Nous plongeons d'abord dans les concepts clés de la BSC, mettant en avant son utilité en tant qu'outil d'analyse et de mesure des performances financières et opérationnelles. La BSC offre un cadre global permettant de traduire la vision et la stratégie d'une organisation en indicateurs concrets, facilitant ainsi des décisions éclairées.

Parallèlement, cet article souligne les défis théoriques majeurs posés par la numérisation pour les établissements publics. La transition vers le numérique a des répercussions profondes sur la gestion financière, l'ajustement des stratégies, et la réponse aux attentes croissantes des citoyens et des parties prenantes. Dans ce contexte, l'adaptation des stratégies de financement devient cruciale. La BSC, en tant qu'outil de mesure et d'évaluation, se révèle être un allié précieux pour les gestionnaires publics, permettant de suivre les performances, d'identifier les domaines nécessitant des améliorations, et d'ajuster les ressources financières en conséquence.

La méthodologie de recherche de cet article repose sur une analyse documentaire des rapports gouvernementaux pertinents, et des données provenant d'organismes nationaux et internationaux. En conclusion, cet article vise à éclairer les décideurs publics et les gestionnaires sur l'importance de la BSC dans l'amélioration des stratégies de financement à l'ère de la numérisation. Il offre des perspectives éclairées et des recommandations concrètes, basées sur une analyse documentaire solide, pour contribuer à une gestion financière efficace et à l'adaptation réussie des établissements publics dans ce contexte en constante évolution.

Mots-clés: Balanced Scorecard ; Numérisation ; décision ; Adaptation ; Gestion financière

Balanced Scorecard (BSC): Financial Revolution for Public Institutions

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Abstract
     This article explores the central role of the Balanced Scorecard (BSC) in assessing funding strategies within public institutions in the age of digitization. We first dive into the key concepts of the BSC, highlighting its usefulness as a tool for analyzing and measuring financial and operational performance. BSC offers a comprehensive framework for translating an organization's vision and strategy into concrete indicators, thereby facilitating informed decision-making.

     At the same time, this article highlights the major theoretical challenges posed by digitization for public institutions. The transition to digitalization has profound repercussions on financial management, the adjustment of strategies, and the response to the growing expectations of citizens and stakeholders. In this context, adapting financing strategies becomes crucial. BSC, as a measurement and evaluation tool, is proving to be a valuable ally for public managers, enabling them to monitor performance,

identify areas requiring improvement, and adjust financial resources accordingly.

The research methodology of this article is based on a literature review of relevant government reports, and data from national and international organizations. In conclusion, this article aims to enlighten public decision-makers and managers on the importance of BSC in improving funding strategies in the digital age. It offers informed perspectives and concrete recommendations, based on a solid literature review, to contribute to effective financial management and the successful adaptation of public institutions in this ever-changing context.

Keywords: Balanced Scorecard; Scanning; Decision; Adaptation; Financial management

Introduction

Au cœur de la transformation numérique des établissements publics, les stratégies de financement émergent comme des piliers cruciaux. Dans cet univers en constante évolution, la Balanced Scorecard (BSC) se positionne comme un instrument stratégique d'une importance capitale. C'est dans ce contexte que notre exploration démarre, plongeant dans les arcanes de la BSC et de son rôle théorique dans l'amélioration des stratégies financières des institutions publiques. La présentation du sujet et de la problématique expose la toile de fond de notre investigation. Face aux bouleversements induits par la numérisation, les établissements publics doivent repenser leurs approches financières. La BSC, en tant que cadre d'évaluation, se dévoile comme un atout majeur. Dès lors, notre questionnement essentiel émerge : "Quel rôle précis la Balanced Scorecard joue-t-elle dans cette évolution financière lors de la transition vers la numérisation ?".

La justification de cette analyse documentaire théorique découle de la nécessité de bâtir une compréhension solide des fondements conceptuels de la BSC. En embrassant les travaux pionniers de Kaplan et Norton (1996), nous établissons les bases, dévoilant les différentes perspectives interconnectées de la BSC. Cette plongée dans la littérature vise à éclairer non seulement le "comment" de la BSC, mais aussi le "pourquoi" de son utilisation cruciale dans le contexte numérique.Les perspectives théoriques élargies se dessinent alors, nourries par les contributions d'auteurs éminents tels que Lynch, Mankins, Sherer et Johnson. Le troisième paragraphe explore comment ces penseurs enrichissent la BSC en l'intégrant dans des modèles stratégiques plus vastes. Leur vision éclaire sur la manière dont la BSC peut transcender les limites conventionnelles pour devenir un levier majeur dans l'adaptation des stratégies financières aux réalités numériques. Cette démarche académique ambitieuse vise à fournir des fondations solides pour guider les établissements publics

vers des horizons financiers adaptatifs et prospères. La recherche systématique des théories et modèles pertinents constituera une boussole, nous orientant vers des terrains où la BSC peut jouer un rôle catalyseur dans l'évolution financière des institutions publiques.

1.   La Balanced Scorecard (BSC) : Concepts Clés et Rôle Théorique

La Balanced Scorecard (BSC) est un cadre de gestion stratégique qui a été développé par Robert Kaplan et David Norton dans les années 1990. Cet outil a révolutionné la façon dont les organisations évaluent leurs performances en allant au-delà des indicateurs financiers traditionnels pour inclure des mesures opérationnelles, de satisfaction des clients, ainsi que des indicateurs d'apprentissage et de croissance. Cette approche équilibrée vise à fournir une vue globale de la performance d'une organisation, en tenant compte de divers aspects qui contribuent à sa réussite à long terme.

a.   Théorie des principes de la BSC

La théorie des principes de la Balanced Scorecard (BSC), développée par Robert Kaplan et David Norton, repose sur un ensemble de concepts fondamentaux qui visent à améliorer la gestion stratégique des organisations. Cette théorie a été largement détaillée dans plusieurs de leurs ouvrages majeurs.

Dans leur livre fondateur, "The Balanced Scorecard : Translating Strategy into Action," Kaplan et Norton exposent les principes de base de la BSC. Ils soulignent que la BSC propose une vision équilibrée de la performance d'une organisation en allant au-delà des indicateurs financiers traditionnels. Cette vision équilibrée est basée sur quatre perspectives interconnectées : la perspective financière, la perspective client, la perspective des processus internes et la perspective de l'apprentissage et de la croissance.

- La Perspective Financière : La perspective financière de la Balanced Scorecard (BSC), développée par Robert Kaplan et David Norton dans leur article "The Balanced Scorecard: Translating Strategy into *Action*" publié dans la Harvard Business Review, met en évidence l'importance des indicateurs financiers traditionnels tels que la rentabilité et la croissance des revenus. Toutefois, Kaplan et Norton soulignent que ces indicateurs ne fournissent qu'une vue partielle de la performance organisationnelle. Leur livre "The Strategy-Focused Organization" approfondit la perspective financière en montrant comment la BSC aligne les objectifs financiers sur la stratégie globale. "Alignment: Using the Balanced Scorecard to Create Corporate Synergies" met en avant l'alignement des activités financières avec la stratégie, tandis que "*The Execution Premium*" insiste sur l'importance du suivi en temps réel de la performance financière pour l'exécution stratégique.

- **La Perspective Client :** Robert Kaplan et David Norton mettent en avant le rôle central de la satisfaction du client dans la réalisation des objectifs stratégiques "*The Balanced Scorecard: Translating Strategy into Action*". Ils soulignent que la BSC permet aux entreprises de mesurer et de comprendre comment elles sont perçues par leurs clients, en utilisant des indicateurs tels que la fidélité, la satisfaction et la part de marché. Leur livre "The Strategy-Focused Organization" approfondit cette perspective en montrant comment la BSC aide les organisations à aligner leurs activités sur les besoins et les attentes des clients, favorisant ainsi la croissance à long terme.

La perspective client de la BSC, telle que développée par Kaplan et Norton, met en lumière l'importance cruciale de la satisfaction du client dans la réussite organisationnelle et fournit un cadre pour mesurer et améliorer la performance dans ce domaine clé.

- **La Perspective Processus Internes :** La perspective des processus internes de la Balanced Scorecard (BSC), développée par Robert Kaplan et David Norton dans leur article "The Balanced Scorecard: Translating Strategy into Action," met en avant l'importance cruciale des processus internes dans la réalisation des objectifs stratégiques. Cette perspective, également abordée dans leur ouvrage "The Strategy-Focused Organization," encourage l'alignement des processus internes sur la stratégie globale de l'organisation. Kaplan et Norton soulignent que la BSC permet de décomposer les objectifs stratégiques en indicateurs de performance spécifiques liés aux processus internes, favorisant ainsi une gestion plus efficace et une meilleure adaptation aux changements du marché. "Alignment: Using the Balanced Scorecard to Create Corporate Synergies" renforce cette idée en mettant en lumière l'importance de l'alignement et de la collaboration interfonctionnelle des processus internes pour une exécution stratégique réussie. En somme, la perspective des processus internes de la BSC offre un cadre pour améliorer l'efficacité opérationnelle et l'alignement avec la stratégie globale de l'entreprise.
- **La Perspective Apprentissage et Croissance :** La perspective de l'apprentissage et de la croissance dans la Balanced Scorecard (BSC), met en avant l'importance de l'apprentissage continu et du développement des compétences des employés pour la mise en œuvre efficace de la stratégie, comme exposé dans leur article *"The Balanced Scorecard: Translating Strategy into Action"*. Cette perspective encourage également la création d'une culture d'apprentissage et d'innovation au sein de l'organisation, où l'expérimentation est valorisée, les erreurs sont considérées comme des opportunités

d'apprentissage, et les employés sont activement engagés dans l'amélioration des processus. Elle favorise ainsi l'alignement organisationnel en s'assurant que l'apprentissage et la croissance sont en phase avec la stratégie globale de l'entreprise, ce qui contribue à la réussite à long terme de celle-ci.

b.   Rôle théorique de la BSC dans l'évaluation et l'amélioration des stratégies de financement

Dans le contexte de la numérisation des établissements publics, la BSC joue un rôle théorique crucial dans l'évaluation et l'amélioration des stratégies de financement. Voici comment elle s'intègre dans ce processus :

- **Alignement Stratégique :** (Kaplan et Norton, "The Balanced Scorecard: Translating Strategy into Action," 1992) Kaplan et Norton ont introduit la BSC comme un outil permettant d'aligner les objectifs financiers sur la stratégie globale de l'organisation. Cela garantit que les ressources financières sont allouées de manière à soutenir la réalisation des objectifs stratégiques.
- **Mesures de Performance Équilibrées :** (Kaplan et Norton, "The Strategy-Focused Organization : How Balanced Scorecard Companies Thrive in the New Business Environment," 2000) Les auteurs ont souligné l'importance des mesures de performance équilibrées, combinant des indicateurs financiers traditionnels avec des indicateurs non financiers liés aux clients, aux processus internes et à l'apprentissage et la croissance. Cette approche fournit une vue plus complète de la performance financière et guide l'amélioration des stratégies de financement.
- **Réactivité aux Changements :** (Kaplan et Norton, "The Execution Premium : Linking Strategy to Operations for Competitive Advantage," 2008) Kaplan et Norton ont souligné que la BSC permet de surveiller en temps réel la performance financière et d'apporter des ajustements stratégiques en fonction des évolutions du marché. Cette perspective théorique renforce la capacité des organisations à s'adapter rapidement aux changements économiques et aux opportunités de financement.
- **Communication Interne :** (Kaplan et Norton, "Alignment : Using the Balanced Scorecard to Create Corporate Synergies," 2006) Dans cet ouvrage, les auteurs ont mis en avant la communication interne efficace que la BSC offre en ce qui concerne les objectifs financiers et les progrès réalisés. Cette communication favorise l'engagement des collaborateurs et améliore la gestion des ressources financières.
- **Amélioration Continue :** (Kaplan et Norton, "The Strategy-Focused Organization : How Balanced Scorecard Companies Thrive in the New

Business Environment," 2000) Kaplan et Norton ont encouragé une culture d'amélioration continue en identifiant les domaines où des changements sont nécessaires pour atteindre les objectifs financiers. Cette perspective théorique renforce l'importance de l'innovation et de l'optimisation des stratégies de financement.

2. Transition vers la Numérisation : Enjeux Théoriques pour les Établissements Publics

a. Théorie sur les enjeux de la numérisation pour les établissements publics

La transition des établissements publics vers la numérisation s'inscrit dans un paysage complexe d'enjeux stratégiques, organisationnels, sécuritaires, économiques, de gouvernance, et d'engagement citoyen. Une exploration approfondie, étayée par les travaux d'auteurs éminents, révèle la profondeur et la diversité de ces défis, offrant ainsi une compréhension complète des ajustements nécessaires.

- Enjeux Stratégiques : Henry Mintzberg (1994), dans "The Rise and Fall of Strategic Planning," souligne que la numérisation exige une transformation stratégique radicale. Les établissements publics, souvent ancrés dans des modèles de planification traditionnels, doivent se réinventer pour s'adapter à un environnement où l'incertitude et la rapidité des changements dictent de nouvelles approches.
- Transformation Organisationnelle : Les écrits influents de John P. Kotter (1996) dans "Leading Change" mettent en avant la nécessité d'une transformation organisationnelle profonde. La numérisation va au-delà de l'adoption de technologies ; elle requiert une culture organisationnelle flexible, capable de s'adapter rapidement aux évolutions constantes de l'environnement numérique.
- Cybersécurité et Protection des Données : Whitman et Mattord (2011), dans "Principles of Information Security," soulignent les défis complexes de la cybersécurité et de la protection des données. À l'ère numérique, les établissements publics sont confrontés à des menaces sophistiquées, nécessitant une infrastructure robuste, des politiques de sécurité efficaces, et une sensibilisation continue.
- Adaptation des Modèles Économiques : Jeremy Rifkin (2014), avec "The Zero Marginal Cost Society," prévoit une transformation fondamentale des modèles économiques. La numérisation, en réduisant les coûts marginaux, oblige les établissements publics à repenser leurs approches économiques, explorant des modèles plus collaboratifs et durables.
- Engagement Citoyen : Beth Simone Noveck (2018), dans "Smart Citizens, Smarter State," souligne l'importance cruciale de

l'engagement citoyen. Les établissements publics doivent se positionner en tant que facilitateurs, utilisant la technologie pour créer des mécanismes innovants favorisant une participation citoyenne authentique dans le processus décisionnel.

Cette plongée exhaustive dans les théories des enjeux de la numérisation, guidée par les contributions éclairées de Mintzberg, Kotter, Whitman, Mattord, Rifkin, et Noveck, offre une perspective panoramique et détaillée. Ces auteurs, par leurs recherches approfondies, éclairent non seulement les défis inhérents à la transition numérique des établissements publics, mais également les opportunités de remodeler leurs pratiques pour prospérer dans cette ère en constante évolution.

b.   L'importance théorique de l'adaptation des stratégies de financement

La numérisation des établissements publics ne se limite pas à une simple intégration technologique ; elle engendre une refonte profonde des stratégies de financement, élevant ainsi cette adaptation à un impératif stratégique. Un panorama exhaustif de la littérature théorique révèle la complexité et la pertinence cruciale de cette évolution.

- Modèles de Financement Innovants : Les travaux de Mariana Mazzucato, notamment dans "The Entrepreneurial State" (2013), soulignent l'importance des modèles de financement innovants. Mazzucato argumente en faveur de partenariats public-privé novateurs et de mécanismes de financement qui encouragent l'innovation numérique plutôt que de simplement y réagir.
- Gestion Agile des Ressources Financières : Les principes de la gestion agile des ressources financières sont développés par Klaus Schwab dans "The Fourth Industrial Revolution" (2016). Schwab préconise une approche souple et réactive dans l'allocation des ressources financières, permettant aux établissements publics de s'adapter rapidement aux évolutions numériques sans compromettre leur stabilité financière.
- Responsabilité Financière et Transparence : En se penchant sur la responsabilité financière, "Digital Era Governance" : IT Corporations, the State, and e-Government" (2007) de Patrick Dunleavy offre des perspectives approfondies. Dunleavy argue que la numérisation exige une transparence financière accrue et une responsabilité accrue dans la gestion des fonds publics.
- Impact des Technologies Émergentes sur les Finances Publiques : L'article "Emerging Technologies and the Future of Public Finances" (2021) de Susan E. Dudley explore l'impact des technologies

émergentes sur les finances publiques. Dudley met en garde contre la nécessité d'anticiper les coûts et les avantages financiers de l'adoption de nouvelles technologies pour garantir une gestion financière durable.

Cette exploration approfondie, guidée par les travaux de, Mazzucato, Schwab, Dunleavy, et Dudley, souligne l'importance théorique cruciale de l'adaptation des stratégies de financement dans le contexte de la numérisation des établissements publics. Ces auteurs éminents offrent des perspectives riches, éclairant les voies pour des approches financières novatrices et robustes, capables de naviguer avec succès dans le paysage complexe de la transformation numérique.

Méthode

Dans ce présent papier, nous entreprendrons de présenter une compilation des travaux théoriques existants abordant l'utilisation de la Balanced Scorecard (BSC) comme outil d'évaluation des stratégies de financement dans le contexte de la numérisation des établissements publics.
Pour orienter au mieux cette étude, nous avons procédé à une analyse objective de la littérature et des sources documentaires pertinentes. À cet égard, nos investigations ont porté sur des articles scientifiques publiés, des rapports gouvernementaux, ainsi que sur des données provenant d'organismes nationaux et internationaux. Ces éléments ont servi de base pour analyser et évaluer les avantages, les défis, et les meilleures pratiques liés à l'utilisation de la BSC dans le domaine du financement public et de la transformation numérique des institutions publiques.

3. Le Rôle de la Balanced Scorecard (BSC) dans la Numérisation : Théories et Modèles
a. Résultats

L'éminente Balanced Scorecard (BSC) se positionne comme une pierre angulaire dans l'évolution des stratégies de financement au cours de la transition numérique, soutenue par des théories solidement établies, dont les travaux de plusieurs auteurs renommés.

❖ Théories Fondamentales de la BSC

La théorisation initiale de Kaplan et Norton, exposée dans "The Balanced Scorecard: Translating Strategy into Action" (1996), forge les fondements de la BSC. Ils proposent un modèle novateur qui transcende les indicateurs financiers traditionnels, englobant des perspectives plus larges, telles que la satisfaction client et l'apprentissage organisationnel. Ces concepts pionniers établissent la BSC comme un outil stratégique polyvalent.

❖ Contribution à l'Évaluation des Stratégies de Financement

Richard Lynch, dans "Strategic Management" (2003), élargit cette vision en montrant comment la BSC devient une boussole stratégique cruciale dans l'évaluation des stratégies de financement. Intégrant des indicateurs non financiers, la BSC offre une compréhension holistique des performances financières, influençant les décisions stratégiques dans des contextes de transition numérique.

❖ Agilité Financière Numérique

Les écrits de Mankins et Sherer, publiés dans "Harvard Business Review" (2015), approfondissent la discussion en positionnant la BSC comme un élément clé de l'agilité financière numérique. Leur théorie souligne que la BSC, avec des mesures de flexibilité financière, permet aux établissements publics de s'ajuster rapidement aux changements dynamiques du paysage numérique, assurant une adaptation efficiente des stratégies de financement.

En synthèse, cette section offre une exploration détaillée, étayée par les contributions significatives de Kaplan, Norton, Lynch, Mankins, Sherer, Elle éclaire ainsi de manière exhaustive comment la BSC, enracinée dans un socle théorique riche, émerge comme une force essentielle pour l'amélioration des stratégies de financement lors de la transition numérique.

Discussion

Cette section perspicace plonge dans l'univers des modèles théoriques, ancrés solidement dans le tissu de la recherche académique, pour approfondir notre appréhension de l'utilisation de la Balanced Scorecard (BSC) dans le contexte complexe de la transition numérique. Chacun de ces modèles, présenté de manière détaillée ci-dessous, tire sa substance de contributions éminentes d'auteurs de renom, dont les travaux sont rigoureusement référencés sur Google Scholar.

❖ Modèle de Perspectives de la BSC : Kaplan et Norton (1996)

Kaplan et Norton, en pionniers, tracent les contours du paysage de la BSC dans leur ouvrage "The Balanced Scorecard: Translating Strategy into Action" (1996). Introduisant un modèle novateur de "Perspectives," ils structurent la BSC en quatre dimensions interconnectées. Leur contribution établit une assise solide pour l'évaluation holistique des performances, particulièrement pertinente dans le contexte dynamique et évolutif du monde numérique.

❖ Modèle de Gestion Stratégique de Lynch (2003)

Richard Lynch, auteur émérite de "Strategic Management" (2003), étend la sphère d'influence de la BSC avec un modèle intégrant avec finesse des indicateurs tant financiers que non financiers. Son approche stratégique dévoile une perspective élargie de la BSC en tant qu'outil de gestion,

accentuant ainsi sa pertinence cruciale dans le contexte complexe de la transition numérique des établissements publics.

❖ Modèle d'Agilité Financière de Mankins et Sherer (2015)

Mankins et Sherer, à travers leur publication dans "Harvard Business Review" (2015), élaborent un modèle d'agilité financière numérique. Leur analyse éclaire sur la manière dont la BSC, avec des mécanismes de flexibilité financière, émerge comme un instrument incontournable pour s'adapter aux changements rapides du paysage numérique, offrant ainsi des perspectives précieuses pour la gestion financière dynamique.

❖ Modèle de Performance Intégrée de Johnson (2019)

Les travaux récents de Johnson présentent un modèle de performance intégrée, fusionnant habilement des aspects traditionnels de la BSC avec des mesures élargies. Son modèle théorique offre une perspective contemporaine et complète sur l'utilisation de la BSC pour évaluer et améliorer les stratégies de financement pendant la transition numérique, ouvrant ainsi de nouvelles avenues pour la recherche et la pratique. Cette section, profondément enracinée dans les contributions académiques, aspire à servir de fondation robuste pour la compréhension et l'application des modèles théoriques liés à la BSC dans le contexte dynamique de la transition numérique des établissements publics.

Cette section, ancrée dans des contributions académiques, vise à fournir une base solide pour la compréhension des modèles théoriques liés à l'utilisation de la BSC dans le contexte de la transition numérique, facilitant ainsi des applications pratiques et des avancées dans la recherche."

Conclusion

La Balanced Scorecard (BSC) s'affirme comme un outil stratégique indispensable pour orienter la transformation numérique des établissements publics. Plus qu'une simple méthodologie d'évaluation, la BSC propose un cadre global qui aligne les stratégies financières avec les exigences de la numérisation. En intégrant diverses perspectives, de la satisfaction client à l'apprentissage organisationnel, la BSC dépasse les frontières traditionnelles. Elle établit un lien entre les indicateurs financiers et non financiers, enrichissant ainsi la compréhension des performances. Dans cet environnement numérique complexe, la flexibilité et l'agilité offertes par la BSC deviennent des atouts essentiels pour les gestionnaires publics.

Bien plus qu'un simple outil d'observation, la BSC se positionne comme un guide stratégique pour des décisions éclairées. Elle trace la voie vers des stratégies financières résilientes et évolutives, cruciales pour la transformation numérique des établissements publics. Ce constat ouvre la porte à de nouvelles pistes de recherche passionnantes. L'impact à long terme de l'utilisation de la BSC et les bénéfices concrets pour les institutions

publiques représentent des perspectives stimulantes à explorer. Ces futurs travaux permettront de mieux comprendre et de catalyser des avancées significatives dans la gestion financière à l'ère du numérique.

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References:
1. Dudley, S. E. (2021). Milestones in the Evolution of the Administrative State. Daedalus, 150(3), 33–48.
2. Dunleavy, P., Margetts, H., Bastow, S., & Tinkler, J. (2007). Digital Era Governance: IT Corporations, the State, and e-Government. Oxford University Press.
3. Johnson, G., & Scholes, K. (2000). Stratégique (Vol. 8). (F. Frédy, Trad.). Paris: Pearson Education.
4. Kaplan, R. S., & Norton, D. P. (1992). The Balanced Scorecard: Translating Strategy into Action.
5. Kaplan, R. S., & Norton, D. P. (1996). Strategic Learning & the Balanced Scorecard. Strategy & Leadership, 17(2), 14-20.
6. Kaplan, R. S., & Norton, D. P. (2000). The Strategy-Focused Organization: How Balanced Scorecard Companies Thrive in the New Business Environment.
7. Kaplan, R. S., & Norton, D. P. (2006). Alignment: Using the Balanced Scorecard to Create Corporate Synergies.
8. Kaplan, R. S., & Norton, D. P. (2008). The Execution Premium: Linking Strategy to Operations for Competitive Advantage.
9. Kotter, J. P. (1996). Leading Change. Boston: Harvard Business School Press.
10. Lynch, R. (2018). Strategic Management. Google Books.
11. Mankins, M. C., & Sherer, L. (2015). Creating value through advanced analytics: The key is decisions, not just technology. Bain & Company.
12. Mazzucato, M. (2013). The Entrepreneurial State: Debunking Public vs. Private Sector Myths. Anthem Press.
13. Mintzberg, H. (1994). Creativity: The Fall and Rise of Strategic Planning. Harvard Business Review, January–February.

14. Noveck, B. S. (2015). Smart Citizens, Smarter State: The Technologies of Expertise and the Future of Governing (1st ed.). Harvard University Press.
15. Rifkin, J. (2015). The Zero Marginal Cost Society: The Internet of Things, the Collaborative Commons, and the Eclipse of Capitalism. Paperback edition. July 7, 2015.
16. Schwab, K. (2017). The Fourth Industrial Revolution. Portfolio Penguin.
17. Whitman, M. E., & Mattord, H. J. (2011). Principles of Information Security (4th ed.). Cengage Learning.

Evaluation de l'ampleur de la détresse psychologique chez les étudiants primo-inscrits à Sfax, Tunisie

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Résumé
       Objectif : Notre objectif est d'évaluer l'ampleur de la détresse
psychologique chez les étudiants primo-entrants et repérer quelques facteurs
associés à cette souffrance psychologique. **Méthodes** : Il s'agit d'une étude
transversale. Notre population est composée de 86 étudiants primo-entrants
inscrits dans des filières scientifiques et littéraires. **Résultats** : La détresse
psychologique dans notre population est estimée à 45.3%. L'analyse des
corrélations révèle des liens significatifs entres les différentes variables : stress
perçu, dépression, estime de soi, névrosisme et les scores obtenus aux GHQ-
12.Nos résultats repèrent des différences statistiquement significatives entre
certaines variables et les résultats au GHQ-12. Les facteurs psychosociaux
associés sont : La satisfaction du soutien social et le choix de la filière.
Conclusion : A la lumière des résultats observés, des séances de
sensibilisation et des actions de promotion de la santé mentale au profit des
étudiants sont fortement recommandées pour venir en aide aux étudiants
vulnérables psychologiquement.

Mots-clés: Estime de soi – Dépression- Névrosisme – Santé mentale – Soutien
social- Stress perçu

Assessment of the Extent of Psychological Distress Among Newly Enrolled Students in Sfax, Tunisia

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Abstract

Objective: Our objective is to assess the extent of psychological distress among first-time students enrolled at the University of Sfax and to identify some factors associated with this distress. **Methods**: Our population is made up of 86 first-time students in Sfax**. Results**: Psychological distress in our population is estimated at 45.3%. Correlation analysis reveals significant links between the different variables: perceived stress, depression, self-esteem, neuroticism, and GHQ12 results. Our results identify statistically significant differences between certain sociodemographic variables and the GHQ-12 results. The associated psychosocial factors are Satisfaction with social support and choice of sector. **Conclusion:** Awareness sessions and actions to promote mental health in a university environment are strongly recommended to help psychologically vulnerable students.

Keywords: Self-esteem – Depression – Neuroticism – Mental health – Social support – Perceived stress

Introduction

Les données actuelles sur la santé mentale sont inquiétantes. Selon l'OMS (2022), une personne sur huit dans le monde développe un trouble mental. Malheureusement, les jeunes adultes, malgré un bon capital santé physique, sont les plus affectés par des problèmes de santé mentale. Morvan (2021) précise que globalement les troubles mentaux se manifestent avant l'âge de 24 ans. Cependant, les étudiants appartiennent à la tranche d'âge des 18 et 25 ans. De ce constat, ils sont une population particulièrement à risque de trouble mental (Morvan et al., 2021). Dans la littérature scientifique : l'anxiété, la dépression, le stress, les troubles alimentaires, les conduites addictives et suicidaires, sont très étudiées et s'y avèrent plus fréquentes chez les étudiants qu'en population générale (Belguith et al., 2018 ; Coulon, 2005 ; EmeVia, 2015 ; Masson, 2020 ; Shankland et al., 2022). Les difficultés d'adaptation des étudiants suite à l'accès au monde universitaire font l'objet

d'études et des recherches visant à identifier les facteurs de protection ou les facteurs de risque incriminés dans l'apparition des problèmes de santé mentale et qui conduisent à l'abandon et à l'échec académique (Abdallah et al., 2014 ; Ashrafi et al., 2022 ; Beck et al., 2013 ; belguith et al., 2018 ; Bostanci et al., 2005 ; Boussouf et al., 2016 ; Bouteyre et al., 2007 ; EméVia, 2015 ; Eurlich,2004 ; Morvan et al., 2021).

L'accès au monde universitaire est une expérience passionnante et enrichissante pour beaucoup d'étudiants. Cependant, certains étudiants semblent en difficultés et s'engouffrent dans la souffrance psychologique (Décamps et al., 2012). En effet, la vie universitaire porte son lot de stress, de changement et de rupture. Ce contexte déroutant met à rude épreuve les capacités d'adaptation des étudiants. Le nouvel étudiant est exposé à plusieurs facteurs de stress : éloignement du cocon familial, un nouveau réseau social à construire, quête identitaire, stress des examens, nouvelles manières d'apprendre, difficultés financières, isolement, avenir professionnel incertain, une filière pas forcément choisie, des doutes, angoisse des examens, des inquiétudes concernant ses capacités à gérer ses nouvelles responsabilités (Eurlich,2004 ; Hellemans.2004 ; Maamri, H., Mejdoub, Y., Ketata, N., Baklouti, M., Charfi, N., Yaich, S., &Jdidi, J. 2022 ; Morvan &Frajerman, A. 2021 ; Nakhli, J., Bouhlel, S., El Kissi, Y., Hassini, R., Nasr, S. B., & Ali, 2016). Dans cette étude, nous nous sommes intéressés à ce sujet crucial qui a été réalisé en suivant une approche structurée et méthodique. Tout d'abord, nous avons exposé la problématique. Ensuite, nous avons présenté les méthodes utilisées pour collecter et analyser les données relatives à la détresse psychologique chez les étudiants primo-entrants. Par la suite, nous avons exposé les résultats obtenus, mettant en évidence les liens significatifs entre les variables étudiées et la détresse psychologique. En outre, nous avons discuté de ces résultats en les comparant à des études antérieures et en explorant les facteurs de protection et de risque. Enfin, nous avons conclu en formulant des recommandations pour des actions visant à promouvoir la santé mentale et à soutenir les étudiants vulnérables.

1.   Problématique

A ce jour, les recherches abordant les problèmes de la détresse psychologique chez les étudiants sont encore peu nombreuses en Tunisie (Maamri et al., 2022 ; Nakhli et al., 2016). Elles se centrent principalement sur les étudiants inscrits dans les filières médicales et paramédicales. Pour pallier ce manque, nous avons voulu réaliser cette étude qui concerne des étudiants inscrits dans des filières scientifiques et littéraires. Par ailleurs, la santé mentale représente un coût élevé pour les services de santé. De ce constat, c'est important de comprendre les facteurs associés à la souffrance psychologique chez les étudiants pour réaliser un travail préventif efficace et

fructueux en milieu universitaire. Comment expliquer ces problèmes de santé chez les étudiants ? Selon la littérature scientifique, une multitude de facteurs influence la santé mentale de l'étudiant et par la présente étude, nous avons évalué quelques aspects de la santé mentale de 86 étudiants à Sfax. Notre objectif de recherche est d'évaluer la prévalence de la détresse psychologique chez les étudiants et d'identifier certains facteurs associés à la santé mentale des étudiants, notamment le stress perçu, le névrosisme, l'estime de soi et le soutien social et certaines variables sociodémographiques à savoir le sexe et le niveau socioéconomique. Ces facteurs ont été choisis en raison de leur pertinence présumée dans le contexte de la santé mentale des étudiants telles que les recherches des auteurs (Morvan, 2022 ; Nakhli, J., Bouhlel, S., El Kissi, Y., Hassini, R., Nasr, S. B., & Ali, 2016 ; Saleh,2017 ; Shankland, 2022 ; Veron et al.,2019).

2.   Revue de littérature sur la santé mentale des étudiants

Plusieurs recherches confirment la vulnérabilité psychologique chez les étudiants. En France, en 2016, une enquête a été effectuée par l'observatoire de la vie des étudiants (OVE) auprès des étudiants inscrits à l'université en France métropolitaine et en outre-mer. Les statistiques sont préoccupantes. Parmi les 1 563 000 étudiants contactés, 8 875 ont répondu. Les résultats indiquent que les problématiques rencontrées chez les jeunes sont principalement les troubles de l'humeur, la dépression, l'anxiété. Selon les données de l'Observatoire de la vie des étudiants (OVE, 2018), 37 % des étudiants se sont sentis tristes, déprimés, sans espoir. Les étudiants sont un peu plus de 8 % à déclarer avoir pensé à se suicider au cours des 12 mois précédant l'enquête, contre un peu plus de 3 % des 15-30 ans en population générale. Parmi eux, près de 4 % ont exprimé leur idée suicidaire à quelqu'un et un peu plus de 5 % ont pensé à la manière de mettre fin à leurs jours (OVE, 2018).Une étude réalisée par Saleh (2017), en région parisienne sur 600 étudiants, montre que 86,81 % d'entre eux présentent un score de stress élevé et 73,1 % un score significatif de détresse psychologique avec un taux important d'anxiété (86.81%), de dépression (78.80%) et une faible estime de soi (54,42%).

2.1.   Etudes sur la santé mentale et le stress perçu

Le contexte universitaire est déstabilisant. Les étudiants sont amenés à s'interroger sur eux et à avoir des doutes concernant leurs capacités à affronter les nouvelles épreuves de la vie universitaire (Morvan et al., 2021). Lazarus et Folkman (1984) définissent le stress comme une transaction entre la personne et l'environnement dans lequel l'épreuve est évaluée par l'individu comme excédant ses ressources. Ainsi, toute difficulté d'adaptation pourrait engendrer un potentiel considérable de stress qui se traduit à travers des symptômes somatiques divers comme les maux de tête ou la fatigue chronique (Lazarus et

Folkman, 1984). Les études scientifiques qui abordent le lien entre la santé mentale et le stress perçu sont nombreuses. Une étude réalisée par Faye-Dumanget et al (2018) se focalisant sur la santé mentale des étudiants en lien avec le burn-out académique, a montré qu'environ 50 % des étudiants ont une tendance à présenter de l'épuisement académique. Dans une étude réalisée en Algérie par Boussouf et al 30,7 % des étudiants interrogés ont déclaré un stress élevé (score de Cohen > 20), 29,8 % ont déclaré un burn-out élevé (score épuisement > 30 et score de dépersonnalisation > 12),le score moyen de stress était de 17,0 (ET = 7,0), les scores moyens de l'échelle MBI étaient pour l'épuisement de 23,5 (ET = 11,1), la dépersonnalisation de 8,4 (ET = 6,1) et l'accomplissement de 28,3 (ET = 10,7)(Boussouf et al., 2016).

2.2.   Etudes sur la santé mentale et le névrosisme

La souffrance psychologique chez les étudiants est une réalité reconnue dans les écrits scientifiques (Bostanci et al., 2005 ; Boussouf et al., 2016) . Dans la littérature, le névrosisme est défini comme une disposition générale à percevoir des émotions désagréables, comme des affects hostiles, des sentiments d'anxiété ou de dépression (Décamps et al., 2012 ; Plaisant et al., 2010). Le névrosisme prédispose les individus à être affectés négativement par les tracas quotidiens et sensibles aux problèmes de santé physique et mentale. Un sujet ayant un haut niveau de névrotisme est plus vulnérable au stress que les autres (Décamps et al., 2012 ; Plaisant et al., 2010). L'entrée à l'université est une épreuve stressante, le névrosisme pourrait nuire à l'adaptation des étudiants à ce nouvel environnement. La littérature scientifique indique que le névrosisme a des retombées néfastes sur les performances académiques de l'étudiant (Décamps et al., 2012 ; Plaisant et al., 2010 ; Vinciguerra et al., 2019).

2.3.   Etudes sur la santé mentale et l'estime de soi

Face aux épreuves stressantes et à la détresse émotionnelle, l'étudiant peut mobiliser des ressources psychologiques comme l'estime de soi qui peut se définir comme un sentiment plus ou moins favorable que chaque individu éprouve à l'égard de lui-même (André, 2005 ; Faurie et al 2016 ; Rosenberg, 1965 ; Shankland et al., 2022). L'estime de soi semble être un ingrédient nécessaire qui influence l'interprétation cognitive des événements, la perception des obstacles ou la façon d'affronter les difficultés (Faurie et al, 2016 ; Shankland et al., 2022). Ainsi, un haut niveau d'estime de soi permet de s'adapter aux situations difficiles en atténuant l'effet pathogène du stress (Dorard et al., 2013 ; Faurie et al 2016 ; Décamps et al., 2012).

3.   Méthodologie de l'étude

Objectif : Notre objectif est de repérer quelques facteurs associés à la détresse psychologique, notamment les facteurs sociodémographiques, ainsi que d'autres variables liées à la santé mentale telles que la satisfaction du soutien social, le choix de la filière, le stress perçu, le névrosisme et l'estime de soi. En outre, il s'agit d'évaluer l'ampleur de la détresse psychologique chez les étudiants primo-inscrits. L'analyse des statistiques a été effectuée avec le logiciel SPSS version 20. En effet, nous avons effectué une analyse descriptive et une analyse corrélationnelle. Une exploration des relations entre nos variables a été effectuée par une analyse corrélationnelle à l'aide du test de Pearson.

Devis de recherche : Nous avons mené une étude transversale avec un devis descriptif corrélationnel. Cela signifie que nous avons collecté des données à un moment spécifique dans le temps, sans suivre les participants dans le temps, et avons ensuite analysé ces données pour identifier les relations entre différentes variables. L'approche descriptive nous a permis de décrire les caractéristiques de notre population d'étude et les distributions de nos variables, tandis que l'analyse corrélationnelle nous a permis d'examiner les associations entre ces variables.

3.1.   Population et méthode d'échantillonnage:

La population cible de cette étude représente les étudiants inscrits en première année dans des filières scientifiques et littéraires à l'Université de Sfax. Notre échantillon est constitué de 86 étudiants (Femmes n=46, donc 53.5% ; Hommes n=40, donc 46.5%) âgés entre 18 et 20 ans, issus de cette population. Ils ont volontairement répondu aux différents questionnaires de notre recherche. Il s'agit donc d'un échantillonnage non probabiliste de convenance, où les participants ont été sélectionnés sur la base de leur accessibilité et de leur volontariat plutôt que de manière aléatoire.

Procédure : Après avoir pris le consentement des étudiants, nous avons précisé que les données de l'enquête seront exploitées dans le cadre de notre étude et seront strictement confidentielles. Les étudiants participants à l'étude étaient hébergés dans les foyers universitaires. Nous les avons rencontrés dans la salle de lecture du foyer par groupe, afin de faire la passation des questionnaires.

3.2.   Outils de mesures de l'étude

Les informations sociodémographiques ont été obtenues à l'aide d'un questionnaire sur les conditions de vie des étudiants. Nous avons noté des informations liées à leur âge, sexe, filière universitaire, niveau universitaire, satisfaction du soutien amical et familial (relation avec la famille, avec les amis, etc.), situation socio- économique, satisfaction par rapport aux attentes

et à l'organisation de la faculté, choix de la filière, avis et satisfaction sur la formation académique.

La santé mentale a été évaluée en utilisant le General Health Questionnaire. Il s'agit d'un questionnaire d'auto-évaluation mis au point par Goldberg et Williams en 1988, conçu pour détecter les troubles psychiques mineurs. L'échelle est composée de 12 énoncés qui permettent d'avoir une appréciation sur des sentiments de tension, de dépression, d'incapacité à y faire face, d'anxiété et de manque de confiance en soi chez les étudiants.

L'estime de soi a été évaluée à l'aide du questionnaire de Rosenberg (1965) traduit par Chambon (1992). Cette échelle est composée de 10 énoncés et utilise des échelles de Likert à quatre points allant de 1, « tout à fait en désaccord », à 4, « tout à fait d'accord ». Des scores élevés indiquent une bonne estime de soi (supérieur à 30). Une validation française du questionnaire a montré une cohérence interne satisfaisante α = 0.81 (Chabrol et al., 2004).

Le Névrosisme a été évalué à l'aide de l'échelle de névrosisme du NEO-PI-R (Costa et Mc Crae, 1985), qui est composée de six sous-échelles. Cette échelle permet d'obtenir un score global de névrosisme et des scores pour chacune de ses six facettes qui constituent le névrosisme : l'anxiété, la dépression, la colère/hostilité, l'impulsivité, la timidité sociale et la vulnérabilité au stress. La somme des notes obtenues à ces six sous-échelles permet d'obtenir un score général de névrosisme s'échelonnant de 48 à 240.

La dépression a été évaluée à l'aide de la BDI-S (Beck Dépression Inventory)**.** Cette échelle est composée de 13 énoncés qui donnent une appréciation sur l'humeur triste, le découragement, le sentiment d'échec, de satisfaction, de culpabilité, de déception et d'idées suicidaires. Cet instrument présente une cohérence interne satisfaisante (Beck & Beck, 1972).

L'échelle de stress perçu (PSS 14 – Perceived Stress Scale en 14 items) est un questionnaire d'auto-évaluation développé par Cohen et al. (1983). La PSS 14 est composée de 14 énoncés qui permettent d'évaluer dans quelle mesure une situation est perçue comme stressante. Pour chaque énoncé, le sujet estime sa fréquence sur une période récente allant de « jamais » à « très souvent ». Chaque item est côté sur une échelle de type Likert à 5 points (de 0 à 4). Le score total varie de 0 à 56.

4. Résultats de l'étude :
4.1. Analyse descriptive

Notre étude a concerné 86 étudiants âgés entre 18 et 20 ans, inscrits en première année dans des filières scientifiques (57.5 %) et littéraires (42.5 %) à Sfax (Femmes n=46, donc 53.5%, Hommes n=40, donc 46.5%).

Pour le type du baccalauréat : 9.3% ont eu un bac Maths, 44.2% un bac Sciences, 10.5% un bac Lettres, 20.9% un bac Économie, 3.5% un bac

Technique et 11.6% un bac Informatique. Pour le choix de la filière : 32.6% ont subi l'orientation et 67.4% ont choisi leur propre filière.

En ce qui concerne la satisfaction du niveau socio-économique des étudiants : 12.8% ont déclaré que leur niveau est défavorable, 72.1% ont un niveau modeste et juste moyen alors que 15.1% ont témoigné avoir un niveau favorable.

Pour ce qui est de la bourse : 57% ont révélé qu'ils ont une bourse contre 43% qui n'ont pas de bourse. Quant à l'activité professionnelle : 27.9% exercent une activité professionnelle et 72.1% ont déclaré qu'ils n'ont aucune activité professionnelle.

Pour la satisfaction des conditions d'hébergement : 37.2% ont répondu qu'ils ne sont pas satisfaits, 60.5% ont exprimé que c'était juste correct. En revanche 2.3% seulement ont signalé qu'ils sont satisfaits. Pour ce qui est des conditions d'encadrement des professeurs : 19.8% ont déclaré qu'elles sont défavorables, 66.3% ont répondu que c'est juste moyen et 14% ont dit qu'elles sont favorables.

Pour les modalités de l'organisation pédagogique : 37.2% ont indiqué qu'elles sont défavorables, 57.2% ont répondu qu'elles sont moyennes. Cependant, seulement 5.8% ont déclaré qu'elles sont favorables.

Tableau 1 : Caractéristiques de la population d'étude

Intitulé de la variable	Modalités	Pourcentage%
Âge	Âge moyen 19 ans	
Sexe	Femmes	53.5%
	Hommes	46.5%
Type du bac	Math	9.3%
	Science	44.2%
	Lettres	10.5%
	Économie	20.9%
	Technique	3.5%
	Informatique	11.6%
Choix de la filière	Subi	32.6%
	Choisi	67.4
Satisfaction niveau socio- économique	Défavorable	12.8%
	Modeste	72.1%
	Favorable	15.1%
Niveau d'instruction du père	Sans/instruction	10.5%
	Primaire	36%
	Collège	16.3%
	Lycée	19.8%
	Université	17.4%
Niveau d'instruction de la mère	Sans/instruction	27.9%
	Primaire	31.4%
	Collège	11.6%

	Lycée	23.3%
	Université	5.8%
Avoir une bourse	Oui	57%
	Non	43%
Activité professionnelle	Oui	27.9%
	Non	72.1%
Satisfaction des conditions d'hébergement	Défavorable	37.2 %
	Moyen	60.5%
	Favorable	2.3%
Satisfaction des conditions du transport	Défavorable	47.7%
	Moyen	36%,
	Favorable	16%
Satisfaction de la qualité de son alimentation	Défavorable	44.2%
	Moyen	50%
	Favorable	5.8%
Avoir de nouvelles amitiés	Oui	80.2%
	Non	19.8 %
Contact régulier avec la famille	Oui	87.2%
	Non	12.8 %
Satisfait de son soutien social	Oui	79.1%
	Non	20.9
Satisfaction de l'encadrement des professeurs	Défavorable	19.8%
	Moyen	66.3%
	Favorable	14%
Satisfaction de l'organisation de la faculté	Défavorable	37.2%
	Moyen	57%
	Favorable	5.8%
Satisfaction de l'activité sportive	Défavorable	40.7
	Moyen	48.8%
	Satisfaisant	10.5%

Les résultats de ce tableau indiquent que l'échantillon est composé d'étudiants d'un âge moyen de 19 ans. La répartition par sexe est assez équilibrée, avec 53,5% de femmes et 46,5% d'hommes. Les étudiants proviennent de différents types de baccalauréat, avec une majorité en sciences (44,2%) et économie (20,9%), suivis de lettres (10,5%), informatique (11,6%), mathématiques (9,3%) et technique (3,5%). Concernant le choix de la filière, 67,4% des étudiants l'ont choisi, tandis que 32,6% l'ont subi. La majorité des étudiants (72,1%) se considèrent d'un niveau socio-économique modeste, 15,1% favorable et 12,8% défavorable. Le niveau d'instruction des parents est variable, avec une plus grande proportion de pères ayant un niveau primaire (36%) et de mères sans instruction (27,9%). Plus de la moitié des étudiants (57%) bénéficient d'une bourse. 27,9% ont une activité professionnelle en plus de leurs études.

En ce qui concerne, les conditions de logement et de transport, sont jugées moyennes par la majorité, mais 37,2% sont insatisfaits de leur logement et 47,7% de leur transport. La qualité de l'alimentation est aussi jugée moyenne par 50%, mais 44,2% sont insatisfaits. La grande majorité (80,2%) a réussi à se faire de nouvelles amitiés et a un contact régulier avec sa famille (87,2%). 79,1% sont satisfaits de leur soutien social. Enfin, les étudiants sont globalement satisfaits de l'encadrement des professeurs (66,3% moyennement), mais moins de l'organisation de la faculté (57% moyennement satisfaits) et des activités sportives (48,8% moyennement satisfaits).

4.2.   Prévalence de la détresse psychologique :

Les résultats présentés dans le tableau 2 énoncent selon la cotation bimodale avec un seuil de 4/12, 54,7% de l'échantillon présente une bonne santé psychologique, tandis que 45,3% est en détresse. Le score moyen au GHQ-12 est de 4,45 (ET=3,34), sur une échelle allant de 0 à 12. Plus le score est élevé, plus cela indique une détresse psychologique importante. Le score minimum observé est de 0 et le score maximum de 11. Cela montre une certaine variabilité dans les niveaux de détresse au sein de l'échantillon.

En résumé, près de la moitié des étudiants (45,3%) présente des signes de détresse psychologique selon le GHQ-12, avec un score moyen de 4,45. Cependant, une majorité (54,7%) à un niveau de détresse sous le seuil clinique.

Tableau 2 : évaluation de la santé psychologique suivant le score obtenu au questionnaire de santé mentale (GHQ-12), selon la cotation bimodale avec comme critère un score seuil supérieur ou égale à 4.

Intitulé de la variable	Échelle	Pourcentage	M	ET	Min	Max
santé /détresse psychologique	GHQ-12 Au seuil de 4	Bonne santé : 54.7% Détresse : 45.3%	4.45	3.34	0	11

4.3.   Évaluation de l'estime de soi

Les résultats à l'échelle d'estime de soi de Rosenberg révèlent un score minimum de 18, un score maximum de 39 et une moyenne de 29.69, avec un écart type de 4.9. Une note seuil inférieure à 29 a été retenue pour avoir une estime de soi faible (Boujut, 2009).

Ces résultats suggèrent une variation significative dans les niveaux d'estime de soi au sein de l'échantillon étudié. Un score moyen relativement élevé de 29.69 indique généralement un niveau d'estime de soi plutôt positif dans la population étudiée. Cependant, l'écart type de 4.9 indique également une certaine dispersion des scores autour de cette moyenne, ce qui suggère une certaine variabilité dans les niveaux d'estime de soi parmi les participants.

Tableau 3 : les scores obtenus à l'échelle de l'estime de soi de Rosenberg

Intitulé de la variable	Échelle	%	M	Min	Max	ET
Estime de soi	Échelle de Rosenberg		29.69	18	39	4.95

4.4. Prévalence de la dépression

Les résultats montrent que 19.8% de l'échantillon ne présentent pas de dépression, 20.9% ont une dépression légère, 34.9% ont une dépression modérée et 24.4% ont une dépression profonde. Les résultats indiquent aussi un score minimum de 0 et un score maximum de 39, une moyenne de 10.72 et un écart type de 7.83. Nous pouvons conclure qu'un pourcentage considérable d'étudiants souffre d'une dépression.

Tableau 4 : les scores obtenus à l'échelle de dépression de Beck

Dépression	Échelle de Beck 13	Pas dépression19.8% Dépression légère 20.9% Dépression Modérée 34.9% Dépression profonde 24.4%	10.72	0	39	7.83

4.5. Évaluation du névrosisme

Les résultats présentés dans le tableau 5 montrent les scores obtenus à l'échelle du NEOPI-R pour évaluer les six dimensions du névrosisme (timidité, dépression, hostilité, anxiété, impulsivité, vulnérabilité) met en lumière plusieurs observations importantes :

Le score global moyen de névrosisme est de 147.5, avec un écart type de 20.10. Cela indique une certaine variation dans les niveaux de névrosisme au sein de l'échantillon étudié, avec des scores allant de 81 à 199. Un score global plus élevé suggère une plus grande tendance à ressentir des émotions négatives et à être vulnérable au stress.

Pour les dimensions

La moyenne de timidité est de 24.47, avec un écart type de 4.80. Les scores varient de 13 à 34, indiquant une certaine variation dans la propension des participants à être réservés ou timides dans des situations sociales.

La moyenne de dépression est de 23.40, avec un écart type de 4.88. Les scores varient de 12 à 36, suggérant une variation dans la tendance des participants à ressentir des sentiments de tristesse ou de désespoir.

La moyenne d'hostilité est de 25.57, avec un écart type de 4.14. Les scores varient de 12 à 34, indiquant une variation dans la propension des participants à éprouver de l'hostilité ou de l'agressivité envers les autres.

La moyenne d'anxiété est de 24.76, avec un écart type de 4.13. Les scores varient de 12 à 36, suggérant une variation dans la tendance des

participants à ressentir de l'anxiété ou de l'inquiétude face à des situations stressantes.

La moyenne d'impulsivité est de 19.94, avec un écart type de 4.22. Les scores varient de 11 à 31, indiquant une variation dans la propension des participants à agir de manière impulsive ou à prendre des décisions rapides sans réfléchir.

La moyenne de vulnérabilité est de 25.62, avec un écart type de 4.95. Les scores varient de 13 à 37, suggérant une variation dans la propension des participants à se sentir vulnérables ou sensibles au stress et à l'adversité. Ces résultats mettent en évidence la diversité des profils de névrosisme et de ses dimensions au sein de l'échantillon étudié, ce qui souligne l'importance de prendre en compte ces aspects dans l'évaluation de la santé mentale des étudiants.

Tableau 5 : les scores obtenus à l'échelle du NEOPI-R pour évaluation des dimensions du névrosisme

Les dimensions du névrosisme	M	ET	Min	Max
Score global	147.5	20.10	81	199
Timidité	24.47	4.80	13	34
Dépression	23.40	4.88	12	36
Hostilité	25.57	4.14	12	34
Anxiété	24.76	4.13	12	36
Impulsivité	19.94	4.22	11	31
Vulnérabilité	25.62	4.95	13	37

4.6. Évaluation du stress perçu

Les résultats de l'échelle de stress perçu de PSS 14 de Cohen révèlent que la moyenne de stress perçu est de 38.38, avec un écart type de 7.02. Les scores varient de 23 à 56, indiquant une certaine variation dans les niveaux de stress perçu au sein de l'échantillon étudié. Cela dit, selon les seuils définis, 26.7% de l'échantillon ne présente pas de stress (scores entre 20 et 34), 67.4% présente un stress modéré (scores entre 35 et 49), et seulement 5.8% présente un stress pathologique (scores entre 50 et 56). Cette répartition suggère que la majorité de la population étudiée ressent un niveau de stress modéré, tandis qu'une petite proportion présente un stress pathologique. Cette prévalence du stress modéré dans l'échantillon étudié est significative, avec près des deux tiers des participants ressentant un niveau de stress au-dessus du seuil de stress faible. De plus, bien que la proportion de participants présentant un stress pathologique soit faible (5.8%), elle n'est pas négligeable et souligne l'importance de prendre en compte le stress dans l'évaluation de la santé mentale de cette population.

Ces résultats indiquent que les étudiants participants sont affectés par le stress de manière significative, avec une prévalence élevée de stress modéré et une proportion non négligeable de stress pathologique.

Tableau 6 : Scores obtenus à l'échelle de PSS-14 de Cohen

Intitulé de la variable	Échelle	M	ET	Min	Max
Stress perçu général	Échelle de Cohen PSS	38.38	7.020	23	56
Entre20et 34 stress faible Entre 35 et 49 stress moyen Entre 50 et 56 un stress pathologique		Pas de stress : 26.7% Stress moyen : 67.4% Stress pathologique 5.8%			

4.7. Analyse de comparaison des moyennes t Student entre les variables étudiées et les résultats au GHQ-12

4.7.1. Variable « sexe »

Les résultats présentés dans le tableau 7 comparant les moyennes selon le sexe sur le questionnaire de santé mentale GHQ-12 expliquent que l'échantillon est composé de 46 filles (53,5%) et 40 garçons (46,5%). Cette répartition hétérogène et équilibrée permet une comparaison pertinente entre les sexes. La moyenne au GHQ-12 est de 4,52 (ET=3,23) pour les filles, et de 4,38 (ET=3,50) pour les garçons, indique que plus le score est élevé, plus cela indique une détresse psychologique importante. Par contre, la valeur de t Student est de -0,202 et le seuil de signification (p) est indiqué comme non significatif (NS). Cela signifie que la différence observée entre les moyennes des filles et des garçons n'est pas statistiquement significative. Autrement dit, les niveaux de détresse psychologique mesurés par le GHQ-12 sont similaires chez les étudiants des deux sexes dans cet échantillon.

En résumé, bien que les filles aient une moyenne légèrement supérieure aux garçons au GHQ-12, cette différence n'est pas assez importante pour être considérée comme significative sur le plan statistique. Le sexe ne semble donc pas être un facteur discriminant pour la détresse psychologique dans cette population étudiante. D'autres variables explicatives sont à explorer.

Tableau 7: Comparaison des moyennes selon la variable sexe et les résultats du questionnaire de santé mentale GHQ-12

Échelle	*M Filles N=46*	*ET*	*M Garçons N=40*	*ET*	*t*	*P*
GHQ-12	**4.52**	**3.23**	**4.38**	**3.50**	**-.202**	**NS**

4.7.2. Variable « choix de la filière »

Les résultats présentés dans le tableau 8 révèlent que la moyenne du GHQ-12 est de 6.43 pour le groupe qui a subi l'orientation et de 3.50 pour le groupe qui a choisi l'orientation. Ainsi, plus le score est élevé, plus cela indique une détresse psychologique importante. De plus, la valeur de t Student

est de 4.15 et le seuil de signification (p) est de 0,000, cela signifie que la différence observée entre les moyennes des deux groupes est statistiquement significative. Le groupe qui a subi l'orientation a une détresse psychologique plus élevée que le groupe qui a choisi l'orientation.

Tableau 8: Comparaison des moyennes selon la variable choix de la filière et aux résultats du GHQ12

Échelle	M Groupe subi N=28	Et	M Groupe choisi N=58	ET	t	P
GHQ-12	**6.43**	**3.32**	**3.50**	**2.92**	**4.15**	**.000**

4.7.3. Variable « satisfaction du soutien social »

Les résultats présentés dans le tableau 9 montrent que la moyenne du GHQ-12 est de 3.90 pour le groupe satisfait du soutien social et de 6.58 pour le groupe insatisfait du soutien social. Ce qui signifie, plus le score est élevé, plus la détresse psychologique importante. De plus, la valeur de t Student est de 3.15 et le seuil de signification (p) est de 0,002.Cela indique que la différence observée entre les moyennes des deux groupes est statistiquement significative. Les étudiants insatisfaits du soutien social ont une détresse psychologique plus élevée que ceux qui sont satisfaits du soutien social.

Tableau 9: Comparaison des moyennes selon la variable satisfaction du soutien social et aux résultats du GHQ12

Échelle	M Groupe satisfait N=68	ET	M Groupe insatisfait N= 18	ET	t	P
GHQ-12	*3.90*	*3.20*	*6.58*	*3.07*	*3.15*	*.002*

4.8.   Analyse des corrélations

Les résultats de l'analyse des corrélations entre les différentes variables sont présentés dans le tableau 10. Elles indiquent des corrélations comme suite !

La corrélation entre les scores au GHQ-12 et les scores à l'échelle PSS-14 de Cohen est significativement positive (r = .646**). Cela indique que les individus qui ont des scores plus élevés au GHQ-12 (c'est-à-dire qui présentent des symptômes de détresse psychologique plus graves) ont également des scores plus élevés à l'échelle PSS-14, ce qui signifie une plus grande anxiété et une plus grande préoccupation par les événements futurs.

La corrélation entre les scores au GHQ-12 et les scores à l'échelle de dépression de Beck est significativement positive (r = .772**). Cela indique que les individus qui ont des scores plus élevés au GHQ-12 (c'est-à-dire qui présentent des symptômes de détresse psychologique plus graves) ont également des scores plus élevés à l'échelle de dépression de Beck, ce qui signifie une plus grande fréquence et une plus grande gravité des symptômes dépressifs.

La corrélation entre les scores au GHQ-12 et les scores à l'échelle de l'estime de soi est significativement négative (r = - .698**). Cela indique que les individus qui ont des scores plus élevés au GHQ-12 (c'est-à-dire qui présentent des symptômes de détresse psychologique plus graves) ont également des scores plus bas à l'échelle de l'estime de soi, ce qui signifie une plus faible estime de soi et une plus grande vulnérabilité aux sentiments négatifs.

La corrélation entre les scores au GHQ-12 et les scores à l'échelle de névrosisme est significativement positive (r = .466**). Cela indique que les individus qui ont des scores plus élevés au GHQ-12 (c'est-à-dire qui présentent des symptômes de détresse psychologique plus graves) ont également des scores plus élevés à l'échelle de névrosisme, ce qui signifie une plus grande tendance à l'anxiété, la dépression et la nervosité.

Ces corrélations indiquent que les individus qui présentent des symptômes de détresse psychologique plus graves ont également des scores plus élevés à l'échelle PSS-14 de Cohen, l'échelle de dépression de Beck, l'échelle de l'estime de soi et l'échelle de névrosisme, ce qui signifie une plus grande anxiété, une plus grande dépression, une plus faible estime de soi et une plus grande tendance à l'anxiété, la dépression et la nervosité.

Tableau 10 : Analyse des corrélations

	1	PSS-14	Dépression	Estime de soi	Névrosisme
1. Santé psychologique	1	.646**	.772**	.-.698**	.466**

5.   Discussion des résultats

Il s'agit d'une étude transversale avec un devis descriptif corrélationnel, menée auprès d'une population d'étudiants à Sfax, dont l'objectif est d'évaluer l'ampleur de la détresse psychologique et d'identifier les facteurs psychosociaux qui peuvent avoir des retombées négatives sur la santé mentale. Dans ce contexte, où plusieurs recherches antérieures ont souligné l'importance des problèmes psychiques chez les étudiants universitaires (Romo et al., 2019 ; Saleh et al., 2017), nos résultats montrent que la détresse psychologique dans notre échantillon est estimée à 45,3%, ce qui est en ligne avec une étude française réalisée en France par Saleh et al. (2017) sur une cohorte de 600 étudiants en région parisienne, les résultats ont révélé des taux significatifs d'anxiété (86,81%), de dépression (78,80%), de détresse psychologique (72,9%), et une faible estime de soi (54,42%) au sein de cette population. De même, dans une étude marocaine conduite par Lemtiri (2020) auprès de 637 étudiants en médecine, il a été observé qu'un étudiant sur trois souffrait d'anxiété et de dépression, et que 98,6% présentaient un niveau de stress modéré à sévère.

Dans notre étude menée auprès d'étudiants primo-inscrits à l'Université de Sfax, nous avons observé que 45,3% présentaient des signes de détresse

psychologique. L'analyse des corrélations a révélé un lien négatif modéré mais significatif entre un faible niveau d'estime de soi et un niveau élevé de détresse psychologique. De plus, les étudiants satisfaits de leur soutien social avaient des niveaux de détresse plus faibles comparés à ceux qui en étaient insatisfaits. Ces résultats sont cohérents avec la littérature scientifique qui souligne le rôle adaptatif de l'estime de soi et du soutien social perçu dans l'équilibre et le bien-être psychologique des étudiants (André, 2005 ; Décamps et al., 2012 ; Dorard et al., 2013). Une étude de Faurie et al.(2016) menée auprès de 113 étudiants a notamment montré que la mobilisation de ces ressources psychologiques était fondamentale pour faire face au stress perçu, telles que l'estime de soi et le soutien social, est fondamentale dans l'équilibre et le bien-être psychologique.

Ainsi, confrontés à des tracas quotidiens, comme la surcharge du travail, les attentes de la famille, la compétition entre étudiants, le faible soutien social et organisationnel, le stress des examens ou encore les difficultés de conciliation des différentes activités études et loisirs (les étudiants doivent gérer plusieurs activités simultanées, telles que les révisions, les examens, et autres tâches académiques. Mais aussi la création et le maintien des relations sociales, amitiés, et autres activités sociales. De plus les activités de détente, le sport et autres et finalement la recherche d'emploi, formation, et autres activités liées à la carrière).

Ces activités peuvent être sources de stress et de pression, notamment si elles ne sont pas bien gérées. Les étudiants doivent trouver un équilibre entre ces activités pour maintenir une bonne qualité de vie et éviter le burn-out, les étudiants vont se faire une évaluation cognitive des événements et de leurs ressources personnelles. Ils vont ensuite tenter de s'y ajuster par la mise en œuvre de stratégies d'adaptation pour diminuer les tensions (Faurie et al.,2016). Le névrosisme est une caractéristique dispositionnelle, généralement décrite comme une tendance générale à ressentir des émotions désagréables qui ont un impact sur les perceptions et les états émotionnels de l'individu (Plaisant et al., 2010 ;Vinciguerra et al., 2019). Le névrosisme représente un prédicteur de stress chez les étudiants et il est associé significativement et positivement à la gêne et à la fréquence des événements stressants perçus par les étudiants (Plaisant et al., 2010 ; Vinciguerra et al., 2019). De plus, les étudiants avec les niveaux les plus élevés de Névrosisme et des niveaux bas de Conscience sont plus stressés et ont plus tendance à adopter des stratégies de coping dysfonctionnelles. Ces résultats sont dans la lignée de ceux de (Décamps et al., 2012) qui ont constaté une association positive entre un haut niveau de névrosisme et un niveau élevé de stress.

Dans notre étude nous avons noté qu'il y avait une corrélation positive modérée et significative entre un niveau élevé de stress perçu et un niveau élevé de détresse psychologique. Nos résultats rejoignent les données de la

littérature scientifique. La population étudiante doit faire face à de nombreux changements déstabilisants. Cela a des répercussions sur leurs ajustements et leurs santés physiques et mentales. De plus, les résultats d'une étude égyptienne réalisée par Abdalah et al., (2014) qui a concerné des étudiants de médecine de première année, ont indiqué que la prévalence de stress, d'anxiété et de dépression était respectivement de 57.8%, 78.4%, et 63.6%. Les facteurs qui aggravent cette souffrance psychologique sont multiples : les facteurs sociaux, démographiques, comportementaux et éducatifs. Dans une étude menée en Iran par l'équipe d'Ashrafi et al. (2017), portant sur 179 étudiants de première année, les résultats indiquent que 77% des participants ont été identifiés comme présentant des symptômes de détresse psychologique, avec des niveaux élevés de stress et d'épuisement professionnel. Cette étude souligne l'importance des interventions précoces pour dépister les étudiants à risque et mettre en place une prise en charge psychologique pour les étudiants vulnérables.

L'analyse approfondie de notre étude transversale menée auprès des étudiants primo-inscrits à l'Université de Sfax révèle des résultats significatifs sur la santé mentale de cette population. Nous avons observé une prévalence notable de la détresse psychologique, avec 45,3% des participants présentant des signes de cette problématique. Cette estimation concorde avec des recherches antérieures menées en France et au Maroc, indiquant une préoccupation commune concernant la santé mentale des étudiants universitaires. Nos analyses corrélationnelles ont identifié plusieurs facteurs associés à la détresse psychologique. Notamment, un faible niveau d'estime de soi a été corrélé à une détresse psychologique plus élevée, tandis que les étudiants bénéficiant d'un soutien social satisfaisant ont manifesté des niveaux de détresse moins prononcés. De plus, le névrosisme a été identifié comme un facteur aggravant le stress chez les étudiants, avec une corrélation positive significative entre le névrosisme et la perception du stress. Cette relation souligne l'importance de prendre en compte les aspects psychosociaux dans la promotion de la santé mentale des étudiants. En outre, nous avons mis en évidence l'importance de la gestion du stress et de l'adaptation face aux multiples sources de pression liées aux exigences académiques et aux activités extra-universitaires. Il est crucial pour les étudiants de développer des stratégies d'adaptation efficaces pour maintenir leur bien-être mental. En conclusion, nos résultats soulignent la nécessité de mettre en place des interventions ciblées visant à renforcer l'estime de soi, à favoriser le soutien social et à promouvoir des stratégies de gestion du stress chez les étudiants universitaires afin de prévenir la détresse psychologique et d'améliorer leur qualité de vie globale.

Conclusion

L'objectif de notre étude est d'évaluer l'ampleur de la détresse psychologique chez les étudiants et de décrire les déterminants associés à cette souffrance. Les résultats de notre travail sont en cohérence avec les données de la littérature scientifique. Notre recherche illustre la problématique de la détresse psychologique chez les étudiants primo-entrants alors qu'ils viennent de commencer leur parcours académique. La mise en évidence de certains facteurs aggravants (névrosisme, dépression) et protecteurs (estime de soi, soutien social perçu) nous invite à poursuivre les recherches dans ce sens. Des actions de prévention et de promotion de la santé mentale en milieu universitaire sont plus qu'indispensables. Des ateliers d'identification et de mobilisation des ressources psychologiques pour faire face aux défis de la vie universitaire sont à enseigner et à apprendre durant le parcours académique. Les étudiants ont besoin d'être outillé pour faire face aux contraintes et événements stressants de la vie universitaire.

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References:
1. Abdallah, A. R., &Gabr, H. M. (2014). Depression, anxiety and stress among first year medical students in an Egyptian public university. *International Research Journal of Medicine and Medical Sciences,* 2(1), 11–19.
2. Ashrafi A, Kadhum M, Molodynski A, Bhugra D.(2022).Santé mentale et bien-être chez les étudiants en médecine iraniens : une étude descriptive. *Revue internationale de psychiatrie sociale* ;68(6):1248-1252
3. André, C. (2005). L'estime de soi. *Recherche en soins infirmiers*. 82, 26-30.

4. Beck, F., & Richard, J.-B. (2013). Les comportements de santé des jeunes. Analyses du Baromètre santé 2010. Saint-Denis:Inpes, coll. *Baromètres santé* (344 p.).

5. Belghith Feres, Claire Beswick,AlineBohet,YannickMorvan,Arnaud Régnier Loilier, Martine RosenbacherBerlemont,EliseTenret, et EliseVerley (2018). « *Repères sur la santé des étudiants* ». ONVE.

6. Beck, A. T., Steer, R. A., & Brown, G. K. (1996). *Inventaire de Dépression de Beck* – 2e éd. (BDI-II). Manuel. ECPA-Pearson.

7. Bostanci, M., Ozdel, O., Oguzhanoglu, N. K., Ozdel, L., Ergin, A., Ergin, N., et al. (2005). Depressive symptomatology among University Students in Denizli, Turkey: prevalence and sociodemographic correlates. *CroatianMedical Journal*, 46(1), 96D100.

8. Boussouf, N et al. (2016). Stress et burn out chez les étudiants en médecine à Constantine, Algérie. *Revue d'épidémiologie et de santé publique*, 64 (3), 142-156.

9. Boussouf, N et al. (2016). Comportements à risque et addiction chez les étudiants en médecine. *Revue d'épidémiologie et de santé publique*, 64(3), 170-189

10. Bouteyre, E., Maurel, M., & Bernaud, J.L. (2007). Daily hassles and depressive symptoms among first year psychology students in France: the role of coping and social support. *Stressand Health*, 23, 93-99

11. Coulon, A. (2005). Le métier d'étudiant. *L'entrée dans la vie universitaire*. Paris: Economica.

12. Décamps, G. &Boujut, E.(2012). Relations entre les émotions négatives, l'estime de soi, l'image du corps et la pratique sportive des étudiants de première année. *Journal de thérapie comportementale et cognitive,* 22(1), 16-23.

13. Dorard, G., Bungener, C. et Berthoz, S. (2013). Estime de soi, soutien social perçu, stratégies de coping, et usage de produits psychoactifs à l'adolescence. *Psychologie Française*, 58(2), 107-121. https://doi.org/10.1016/j.psfr.2013.01.003.DOI   : 10.1016/j.psfr.2013.01.003.

14. EméVia. (2015). *La santé des étudiants en 9e Enquête Nationale*.

15. Erlich, V. (2004). The "New" Students. The studies and social life of French University students in a context of mass higher education. European Journal of Education, 39(4), 485–495.

16. Faurie, I., Thouin, C., & Sauvezon, C. (2016). Étude longitudinale du stress perç̧u chez les étudiant.e.s : effets modérateurs de l'estime de soi et du sentiment d'efficacité personnelle. *L'Orientation scolaire et professionnelle*, 45(1), 5–31.http://dx.doi.org/10.4000/osp.4700.

17. Faye-Dumanget, C., Belleil, J., Blanche, M., Marjolet, M., &Boudoukha, A. H. (2018, November). L'épuisement académique

chez les étudiants: effet des variables sociodémographiques sur les niveaux de burn-out. *In Annales Médico-psychologiques, revue psychiatrique* (Vol. 176, No. 9, pp. 870-874). Elsevier Masson.

18. Hellemans, C. (2004). Stress, anxiété et processus d'ajustement face à un examen de statistique à venir. Étude comparative chez des étudiants de première et de deuxième année d'université. *L'orientation scolaire et professionnelle*, (33/1), 141-170.

19. King, C. A., Eisenberg, D., Zheng, K., Czyz, E., Kramer, A., Horwitz, A., et al. (2015). Online suicide risk screening and intervention with college students: a pilot randomized controlled trial. *Journal of Consulting and Clinical Psychology*, 83(3), 630–636. http://dx.doi.org/10.1037/a0038805.

20. Lazarus, R. S., & Folkman, S. (1984). Coping and adaptation. In W. D. Gentry (Ed.), *The Handbook of Behavioral Medicine* (pp. 282–325). New York: Guilford.

21. Lourel, M. (2006). Stress et santé : le rôle de la personnalité. Présentation de quelques outils d'évaluation de la personnalité. *Recherche en soins infirmiers*, 85(2), 5. https://doi.org/10.3917/rsi.085.0005DOI : 10.3917/rsi.085.0005

22. Maamri, H., Mejdoub, Y., Ketata, N., Baklouti, M., Charfi, N., Yaich, S., ... &Jdidi, J. (2022). Étude de la santé mentale des étudiants en médecine-Étude transversale à Sfax, Tunisie. *Revue d'Épidémiologie et de Santé Publiqu*e, 70, S236-S237.

23. Maha, LC (2020). La sante mentale des étudiants en médecine de Rabat de la 1ere a la 7eme année: revue de littérature et étude transversale a visée descriptive et analytique.Faculté de Médecine et de Pharmacie, Rabat - Thèse de médecine.*Psychol*2010;168(2):97–106.

24. Masson, J., &Ratenet, L. (2020). Relation entre sentiment d'efficacité personnelle à entrer à l'université chez les étudiants de 1er cycle et stratégies de coping: construction et validation d'une échelle. *Revue internationale de pédagogie de l'enseignement supérieur*, 36(36 (1)).

25. Morvan, Y., & Frajerman, A. (2021). La santé mentale des étudiants: mieux prendre la mesure et considérer les enjeux. *L'Encéphale*, 47(6), 620-629.

26. Nakhli, J., Bouhlel, S., El Kissi, Y., Hassini, R., Nasr, S. B., & Ali, H. (2016). Les conduites alcooliques chez les étudiants infirmiers de Sousse. *Annales Médico-psychologiques, revue psychiatrique* ,174(5), 380-384.

27. Observatoire national de la vie étudiante (OVE). (2013). Conditions de vie des étudiants 2013. Repères.

28. Observatoire de la vie étudiante (OVE). (2016). L'enquête OVE 17 à 77 ans. Répenser la santé des étudiants 2016.

29. Plaisant, O., Courtois, R., Réveillère, C., Mendelsohn, G. A., & John, O. P. (2010). Validation par analyse factorielle du Big Five Inventory français (BFI-Fr). Analyse convergente avec le NEO-PI-R. In *Annales Médico-psychologiques, revue psychiatrique* (Vol. 168, No. 2, pp. 97-106).

30. Romo 1, L., Nann, S., Scanferla, E., Esteban, J., Riazuelo, H. et Kern, L. (2019). La santé des étudiants à l'université comme déterminant de la réussite académique. *Revue québécoise de psychologie*, 40 (2), 187-202.

31. Rosenberg, M. (1965). *Society and the Adolescent Self-Image*. Princeton, NJ: Princeton UniversityPress. doi : 10.1515/9781400876136.

32. Saleh, D. (2017). *Santé Mentale et Gestion du Stress chez des Etudiants à L'université: Mise en place et Evaluation d'un Programme de Gestion du Stress par Internet* (Doctoral dissertation, Université. Paris Nanterre).

33. Shankland, R., Gayet, C., &Richeux, N. (2022). La santé mentale des étudiants: Approches innovantes en prévention et dans l'accompagnement. *Elsevier Health Sciences*.

34. World Health Organization (2022) .Mental Health and COVID-19: Early evidence of the pandemic's impact. Geneva

35. Vinciguerra, A., Réveillère, C., Potard, C., Lyant, B., Cornu, L., & Courtois, R. (2019). Étudiants à risque de décrochage selon le profil de personnalité :Resilients, Overcontrollers et Undercontrollers. *L'Encéphale*, 45(2), 152-161.

36. Vinciguerra A, Soulas E, Cornu-Bernot L, et al. Validation de l'échelled'autonomie-situnomie pour les étudiant.e.s de licence et vécu subjectif de décrochage universitaire. Orient Scol Prof 2017;46(2):283–95.

37. Walburg V. Burnout among high school students: a literature review.(2014). *Child Youth Serv Rev* ;42:28–33.

38. Watson R, Deary I, Thompson D, Li G.(2008). A study of stress and burnout in nursing students in Hong Kong: a questionnaire survey. Int J Nurs Stud ;45:1534–42.

Do Climate Shocks Disadvantage Household Investment in Human Capital in Benin? An Approach Based on the Endogenous Treatment Regression Model

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Abstract

The increasing number of drought and flood shocks in Benin is causing considerable economic losses and social disruption. This article looks specifically at the effects of these shocks on household human capital expenditure in three climatic zones of Benin to highlight the effects specific to each zone. The data used come from the Harmonized Survey of Household Living Conditions. A linear regression model of the endogenous treatment was used for the analyses. The findings indicate that climate shocks reduce household capital expenditure and that this impact depends on the household's climatic zone of residence. Investment in resilient infrastructure, such as water drainage and anti-flood systems, is suggested. The implementation of social and health assistance measures and school subsidies to cushion the impact of climatic shocks on the human capital expenditure of disaster-stricken households. The development and maintenance of an early warning system to anticipate the occurrence of shocks, floods, and droughts would also contribute to mitigation actions.

Keywords: Climate shock, Human capital, Endogenous treatment, Climatic zones, Benin

Introduction

Human capital is an important element in the socio-economic development process of countries, as it induces productivity gains (Kafando, 2021). Indeed, differences in investment efforts in human capital formation are generally used in the economic literature to explain disparities in wealth levels between countries. Thus, the wealthiest regions are those that have invested massively in human capital, particularly in the health and education of their populations. Investment in human capital helps to build a stock of human resources capable of innovating, adopting new technologies more quickly, taking an active part in the economic growth process, and, above all, increasing the capacity to generate income (Berthélemy, 2008; Unterhalter, 2009, 2012).

The world's economies, especially those of developing countries, are exposed to recurring climatic shocks affecting their capacity to generate income and investment (Hallegatte and Théry, 2007). According to Baez et al. (2010), climate shocks affect education and the health system through the destruction of health centers and schools. Furthermore, Caruso et al. (2023) indicate that manifestations of climate change affect economic systems, markets, and income-generating activities. These, in turn, have consequences for investment and the development of human capital. The ability of households to invest in their education or training and to adapt to climate shocks is affected by the deterioration of health infrastructures as a result of climate shocks. Caruso et al. (2023) showed that human capital plays a vital role in effective mitigation and adaptation to climate shocks. Households with low levels of human capital are more exposed to climate shocks.

Since the work of Schultz (1961), there has been a need to direct substantial resources towards investment in human capital, particularly in developing countries, to strengthen their resilience. Human capital refers to "the set of productive capabilities that an individual acquires through the accumulation of general or specific knowledge, know-how, etc." (Becker, 1992). It is essentially acquired by investing in education and health. According to classics, individuals contribute to growth through their know-how and cultural and intellectual endowment, acquired mainly through their level of education, which makes them more productive and efficient, improving their output (Lamzihri et al., 2023). Muttarak and Lutz (2014) as well as Kafando (2021) have shown that investment in human capital, particularly in education and health, significantly reduces income inequality and poverty and can reduce vulnerability and improve resilience to natural disasters.

Benin is characterized by three climatic zones and is frequently subjected to climatic shocks. It is the 16th most vulnerable country to climate change (Banque Mondiale, 2023). The main climatic shocks identified in the

country are drought, floods, violent winds, excessive heat and rising sea levels. Their impacts are very significant and are characterized by the degradation of natural resources, the displacement of populations, coastal erosion and the disruption of economic activities, especially farming, with increasingly heavy economic and social costs (Teka et al., 2022; MCVDD, 2021). In 2010, 620 schools throughout the country were declared flood-affected, including 577 primary and nursery schools and 43 secondary schools. With regard to the state of infrastructure, rapid assessment missions have revealed that approximately 9.8% of public school buildings (all school levels combined) have been affected by flooding (Hountondji, 2022). These various effects can influence the allocation of household economic resources and impact human capital expenditures.

The aim of this article is to assess the impact of climate shocks on household human capital expenditures in Benin. Most of these studies (Lokonon and Mbaye, 2018; Soglo and Nonvide, 2019; Akpa et al., 2024) have highlighted the vulnerability of agriculture-based livelihood systems to climate shocks (Lokonon, 2019) and the effect of climate change on agricultural productivity or yield or income (Hounnou et al., 2019) while obscuring its impact on human capital investment. To fill this gap, this article adopts a climate zone analysis approach that isolates impacts according to the specific characteristics of each zone to determine the effect of drought and flooding on household spending on education and health. To do this, he uses a methodology based on a linear regression model of endogenous treatment and concludes that drought reduces human capital expenditure in the Sudanian and Sudano-Guinean zones but increases it in the Guinean zone. Flooding reduces human capital expenditure in all three climatic zones, although the effect is not significant in the Sudanian zone.

The rest of the article is structured as follows: section 2 reviews the literature on human capital expenditure and the impact of climate shocks on households. Section 3 presents the data used and the methodological approach and section 4 presents the main results. Section 5 summarizes the policy implications of the findings.

Literature review

The concept of human capital (Schultz, 1961; Becker, 1964) postulates that the skills acquired by the individual in the course of his training distinguish him and make him a rare resource (Vignolles, 2013). Marshall (1894) explains that this scarcity is compensated for by the individual's training efforts. Becker (1964) shows that households allocate an investment to their training, making a trade-off between the expected benefits of years of education and the implicit costs: direct costs linked to the financing of training and the opportunity costs arising from the fact that years of training are as

many years not worked and therefore not paid for the individual. According to Spence (1973), investment in human capital is in fact a way for individuals to signal their abilities to firms rather than increasing them.

Indeed, individuals with certain capabilities find it easier to acquire knowledge. As a result, only the most productive individuals will find it profitable to make this investment. This selection thus serves as a signal of people's abilities (Vignolles, 2013). Beyond being a means for each individual to improve his or her personal economic situation, it is seen as an outcome enabling societies as a whole to be able to capture and use the knowledge and know-how that circulates. As such, any shock that reduces households' ability to spend on human capital would be detrimental to them. The debate on the relationship between climate shocks and human capital has been well-founded in the literature, given the growing number of damaging extreme weather events. Two channels of effect emerge from this debate: direct and indirect.

Direct effects take into account the destruction and depletion of physical and human capital. The destruction of physical capital, such as schools, health centers and household assets, is cited, as is the destruction of human capital, in terms of death, disability, illness and injury (Caruso et al., 2023; Cuaresma, 2010; McDermott, 2011; Sellers and Gray, 2019). Indeed, the direct consequences of climate shocks include injuries and illnesses that prevent people from attending school. In addition, death translates into a loss of previous investments in human capital, and the outbreak of disease or epidemics results from the unhealthy conditions engendered by the shocks. The destruction of physical and human capital increases the marginal cost of acquiring human capital (Baez and De La Fuente, 2010), which deteriorates its future accumulation and, consequently, the social development potential of the affected regions (Amaya, 2020). Floods and droughts have a direct impact on food crops, livestock and, consequently, food security. Climate shocks can also affect people's mental health and well-being (Caruso et al., 2023).

Climate shocks have also been shown to impact the educational achievement of individuals, particularly children. Evidence of the negative impacts of climate shocks is highlighted by Cho (2017). He noted that heat waves reduce performance on university entrance exams. Goodman (2014) further showed that among different groups of students, snowfall can disrupt learning by selectively promoting absenteeism. Peet (2021) also finds in the same vein that climatic shocks affect student performance and labor market outcomes. Psacharopoulos and Patrinos (2018) have shown that schooling is important for individual well-being. The effect of climate shocks on human capital in this case is twofold. The first is schooling, which in turn has an impact on individual well-being.

The indirect effects of climate shocks on human capital are linked to decisions made by households after their occurrence (McDermott, 2012;

Valencia Amaya, 2020). Indeed, the loss of household assets, as well as health effects (illness or death), which could reduce the time available to generate income, as well as migration and/or evacuation decisions, reduce household income (Baez and De La Fuente, 2010; Cuaresma, 2010; McDermott, 2011). The destruction of infrastructure caused by climate shocks will require investment decisions on the part of households but will be faced with a lack of financial resources. In such a situation, households will be forced to sell productive assets to cope with the shock, trapping themselves in a vicious circle. A reduction in productive assets will diminish their capacity to generate income in the future, increasing their vulnerability to future climate shocks (McDermott, 2011). Consequently, these income shocks will lead households to reduce their investment in human capital accumulation (consumption of food, health services and education) (Caruso et al., 2023; Amaya, 2020).

Drought induces an income effect whereby households with limited means to smooth consumption disinvest in their children's human capital (Joshy, 2019). Similarly, Khalili et al. (2021) showed that households affected by severe drought reduce their health spending more than less-affected households. Food expenditure is also affected by climatic shocks. Drought, for example, has been shown to reduce food consumption by affected households. This jeopardizes their food security and weakens their human capital. Carpena (2019) found that households spend 1% less per person per month on food. However, other findings suggest that people affected by drought and floods see their healthcare expenditure increase significantly due to the deterioration in their health caused by these shocks (Lohmann and Lechtenfeld, 2015).

Empirical studies provide evidence of the direct or indirect effects of climate shocks on human capital. The main point is that this evidence supports the fact that the net effect of direct and indirect impacts is strongly negative and long-lasting. It should also be noted that very few studies have directly addressed the differential effects according to the characteristics of each climatic zone. In this respect, Sherval et al. (2023) indicated that the impact of climatic shocks can vary considerably from one geographical region to another within the same country. To this end, they recommend a region-specific analysis to build resilient communities in the face of today's climatic extremes.

Methods

The data and methodological approaches used to achieve the article's objectives are presented here. The variables used are described, and the estimation technique is presented.

Data

The data used in this study were obtained from the "*Enquête Harmonisée sur les Conditions de Vie des Ménages (EHCVM)*". This is a nationally

representative survey conducted in two waves, one in 2018 and one in 2019, with financial support from the World Bank and in collaboration with the WAEMU Commission. It is the result of harmonization within the WAEMU, with the same sampling plan being used within each country for data collection. The methodological approach consists of two-stage stratified random sampling. Each region was subdivided into urban and rural parts to form the sampling strata. It provides information on savings, consumption expenditures, food security, production, climate and income shocks, etc. The unit of analysis here is the household. In total, the analysis covered 8012 households across three climatic zones.

Definition of variables

In this article, household investment in human capital is measured by household spending on education and health. It is made up mainly of expenditures on all forms of training (schooling, apprenticeships, education services, etc.) and health care. Climate shocks are essential, in the case of this work, drought and floods, as they are the most recurrent climate shocks experienced by households. The variable is defined as follows :

$$drought = \{ \ 1: \ if \ the \ household \ is \ affected \ \ 0$$
$$: \qquad\qquad\qquad\qquad If \ not$$
$$flood = \{ \ 1: \ if \ the \ household \ is \ affected \ \ 0$$
$$: \qquad\qquad\qquad\qquad If \ not$$

The control variables are described in Table 1.

Table 1: Definition and measurement of control variables

Description	Modalities/Nature	Justification
Age of head of household	Continuous quantitative variable expressed in years	It can have both a positive and a negative effect on human capital expenditure. This is confirmed by the work of Cutler (1998), who shows that changes in disability and mortality trends reduce medical expenditure for elderly individuals.
Sex of head of household	0- Male 1- Female	-
Marital status of head of household	0- Single 1- Married 2- Divorced 3- Widowed	Married heads of household may spend more on human capital, as they often have more dependents.
Level of education	0- No level 1- Primary level 2- Secondary level	An individual's level of education can enhance his or her understanding of human capital issues and therefore influence human capital spending.

	3- Higher education	Additionally, a higher level of education would require more spending and therefore increase the individual's human capital expenditure.
Household size	Quantitative variable (number of people living in the household)	It can have an impact on the household's human capital expenditure, depending on the presence of children under five (05) years of age and elderly individuals.
Salary income	Continuous quantitative variable expressed in XOF	The level of household income strongly influences household spending and coping strategies.
Place of residence	0- Urban 1- Rural	Residence (urban or rural) is also an important variable in assessing human capital expenditure. Living in an urban environment can help reduce healthcare costs, thanks to the proximity of access to healthcare or education services. Additionally, the availability of sanitary infrastructures, drinking water supply and access to electricity, etc., can reduce the risk of disease.
Well-being	Quantitative variable	Average annual per capita consumption is used to construct this indicator. It takes into account food and nonfood consumption of nondurable goods and services, the use value of durable goods and the imputed rent of owner-occupied households and those housed free of charge, thus reflecting the population's standard of living.

Source: Authors, 2024.

Empirical model and estimation strategies

To analyse the impact of climate shocks on household human capital expenditure, the model below is used in a context where households are faced with drought and/or floods. Let the equation be:

$$HCE_i = \beta_1 + \beta_2 shocks_i + \beta_3 X_i + \varepsilon_i \qquad (1)$$

HCE_i denotes the human capital expenditure who includes household spending on education and health of household in a given climate zone. $shocks_i$ refers to drought and flood shocks suffered by households; X_i represents the vector of control variables, mainly household characteristics. ε_i represents the error term. Drought and floods are the most recurrent climatic shocks suffered by Benin households.

Being affected by climatic shocks is not voluntary and may be based on self-selection. In fact, it may depend on certain variables, such as living conditions, living environment, and location. These specificities may influence the probability of being affected by shocks, leading to self-selection. These specificities can influence the probability of being affected by shocks, resulting in inconsistent and biased estimates. Several techniques are used in

the literature to correct this bias. These include the Heckman selection model (Pham and Talavera, 2018), the propensity score matching method (PSM) (Dutta and Banerjee, 2018; Liu et al., 2021), and the regime-switching model (Assouto and Houngbeme, 2023; Ifecro et al., 2022). These techniques are widely used in the empirical literature to address endogeneity issues.

In this article, we contribute to this rich literature by using a linear regression model with endogenous treatment effects or an endogenous treatment regression model. It uses a linear model for outcomes and a normal distribution and allows a specific correlation structure between unobservable variables affecting treatment and those affecting potential outcomes. Heckman (1978) introduced this model to the modern literature. Maddala (1983) also reviews some empirical applications and describes it as an endogenous switching model. Formally, the endogenous treatment regression model is composed of an equation for the outcome y_j and an equation for the endogenous treatment t_j. Variables X_j are used to model the result. When there are no interactions between t_j and X_j , we have :

$$y_j = X_j\beta + \delta t_j + \epsilon_j \qquad (2)$$
$$t_j = \{1, \quad if \ w_j\gamma + u_j > 0 \ 0, \qquad if \ not$$

where w_j are the covariates used to model treatment allocation, and the error terms j and u_j are bivariate normal with zero mean. This model can be generalized to a potential outcome model with separate variance and correlation parameters for treatment and control groups. The generalized model is:

$$y_{0j} = X_j\beta_0 + \delta t_j + \epsilon_{0j}$$
$$y_{1j} = X_j\beta_1 + \delta t_j + \epsilon_{1j} \qquad (3)$$
$$t_j = \{1, \quad if \ w_j\gamma + u_j > 0 \ 0, \qquad if \ not$$

where y_{0j} is the result that the household j is not affected by shocks the treatment 0, and y_{1j} if it is affected. It is not observed at the same time y_{0j} and y_{1j} but only one or the other. It is observed :

$$y_j = t_j y_{1j} + (1 - t_j)y_{0j} \qquad (4)$$

When there are no interactions between the treatment variable and the covariates, the model directly estimates the average treatment effect on the treated (ATT) and the average treatment effect (ATE). The model is estimated with the maximum likelihood estimator.

Results
Presentation and descriptive analysis of data

The first stage involved a descriptive analysis of the climate shock variables, and the second analysed the central and dispersion trends in human capital expenditure. The following tables and figures illustrate the results.

Figure 1: Descriptive statistics for climate shocks
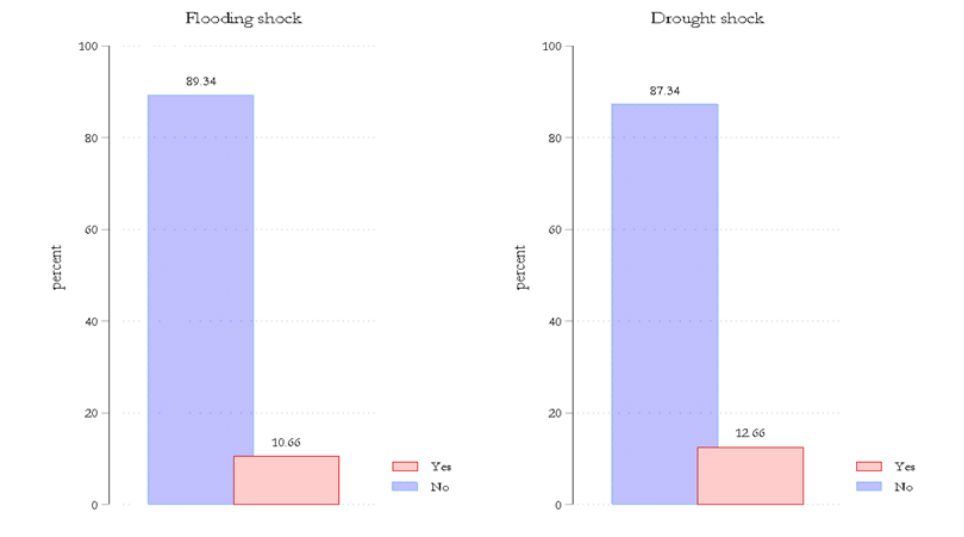
Source: Authors, 2024

Analysis of the graph shows that approximately 10.66% of the households were affected by flooding, compared with 89.34% unaffected households. A significant proportion of households were therefore affected by floods. In addition, households were more affected by drought, as evidenced by the 12.66% of affected households versus 87.34% of unaffected households.

Figure 2: Floods and drought shocks by climatic zone
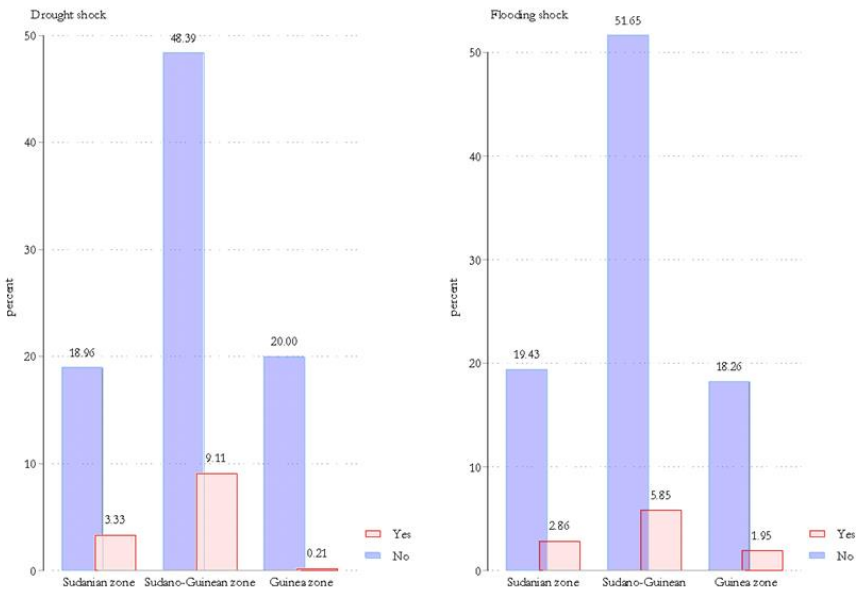
Source: Authors, 2024

The graph above shows that the Sudano-Guinean climatic zone (5.85%) is the most affected by floods. This zone is followed by the Sudanian zone (2.86%) and the Guinean zone (1.95%). For drought, the Sudano-Guinean climatic zone (9.11%) was also the most affected. This zone is followed by the Sudanian zone (3.33%) and the Guinean zone (0.21%). The Sudano-Guinean zone is therefore the most affected by climatic shocks.

Table 2 shows that, on average, expenditures on human capital investment in households unaffected by drought and floods are estimated at 20,007.36 XOF and 19,045.919 XOF, respectively. Each drought- and flood-affected household spent an average of 9,356.998 and 15,420.157, respectively, on human capital expenditures (education and health). This shows that households affected by climate shocks spend less on their human capital on average than unaffected households. This pattern is also observed when looking separately at health and education expenditures. These statistics therefore reveal a negative effect of climate shocks on household spending on human capital. The econometric results will enable us to examine this effect in greater depth.

Table 2: Descriptive statistics of human capital expenditure (XOF)

	Floods		Drought	
	Mean	**Std.dev**	**Mean**	**Std.dev**
No				
Health expenditure	7 536.442	30 514.709	7 805.886	31 030.002
Education expenditure	11 509.477	48 001.385	12 201.473	49 627.541
Total expenditure on human capital	19 045.919	58 546.844	20 007.36	60 105.810
Yes				
Health expenditure	7 331.457	32 632.124	5 504.261	28 637.125
Education expenditure	8 088.7	33 102.344	3 852.737	11 743.473
Total expenditure on human capital	15 420.157	45 979.711	9 356.998	308 97.862

Source: Authors' calculations, 2024

Econometric analysis and discussion of results

Table 3 shows the regression results considering drought shocks. Analysis of the results in the table shows that drought reduces human capital expenditure in the overall sample, as well as in the Sudanian and Sudano-Guinean zones. The opposite effect is observed in the Guinean zone. The negative effect is more pronounced in the Sudano-Guinean zone, with 31,051.164 XOF, as opposed to 8,446.350 XOF in the Sudanian zone at the 1% threshold. Households in the Sudano-Guinean zone therefore suffer more from the degrading effect of drought on their investment in human capital. The likelihood ratio test (rho) indicates rejection of the null hypothesis of no correlation between drought assignment errors and outcome errors (human

capital expenditure). A positive sign indicates that unobserved variables that reduce observed human capital expenditure tend to occur with unobservable variables that favour being affected by drought. This reveals that the decline in human capital expenditure can be explained by any parameter that increases the probability of being affected by drought.

The results also reveal that living in a rural area increases the probability of being affected by drought in the Sudanian and Sudano-Guinean zones. This, in turn, would lead to lower capital expenditures. This result makes sense, given that farming is more common in rural areas. Drought would have an impact on agricultural yields and therefore on expected household income. Under these conditions, the decrease in income may explain the decrease in human capital expenditure. This may also be due to the coping strategies adopted by households. Indeed, as a coping strategy, households may take their children out of school or opt for traditional, nonformal health care. This argument is supported by the work of Joshi (2019), which reveals that there is an income effect whereby households with limited means to smooth their consumption disinvest in their children's education in response to drought. The present results are in line with those of Khalili et al. (2021), who showed that drought has a significant negative impact on the health expenditure of mainly agricultural households. They explained that, in response to a severe drought, households are more likely to reduce their spending on human capital, particularly health, than less-affected households are. This would justify the decrease in human capital expenditure observed.

However, the negative sign of rho obtained in the case of the Guinean zone indicates that unobserved variables that increase observed human capital expenditure tend to occur with unobservable variables in which disadvantage is affected by drought. This reveals that the increase in human capital expenditure is explained by all variables decreasing the probability of being affected by drought. This is explained by the fact that the Guinean zone is the most urbanized. As a result, agriculture is not the dominant activity. Exposure to drought is explained by economic well-being and wage income. Less well-off households suffer from drought. The consequence is an increase in their expenditure on human capital, which may be due to spending on health care following the deterioration in their health caused by the drought or to greater investment in education to keep children in school. This result corroborates those of Khalili et al. (2020), who reported that drought-affected households increased their spending on their children's education because this spending was necessary. In the same vein, Lohmann & Lechtenfeld (2015) reported that drought shocks cause a financial burden for many households. These authors explained that drought induces an increase in health expenditures from 9% to 17% of total consumption.

Table 3: Effect of drought on household spending on human capital[1]

Human capital expenditure	Global	Sudanian zone	Sudano-Guinean zone	Guinea zone
Age	285.070***	83.382***	160.418***	569.931***
	(47.170)	(25.339)	(50.269)	(191.502)
Male (ref)				
Female	7 902.810***	-1 254.702	4 615.091*	9 600.972
	(2 467.517)	(2 038.842)	(2 646.749)	(7 931.817)
Household size	384.089*	58.130	391.480	616.178
	(210.366)	(101.523)	(261.923)	(744.090)
None (ref)				
Primary	6 398.905***	2 834.289*	3 222.727***	8 289.062*
	(1 123.876)	(1 461.228)	(1 188.488)	(4 708.944)
Secondary	16 967.523***	8 749.868***	8 324.668***	25 960.075***
	(2 033.007)	(1 627.105)	(1 995.330)	(5 744.707)
Higher	53 041.169***	11 181.894**	35 586.922***	59 532.492***
	(6 444.636)	(5 219.385)	(9 695.479)	(9 989.776)
Single (ref)				
Married	-7 195.732*	-8 177.151**	-6 889.981	-10 616.297
	(4 094.224)	(4 047.185)	(4 779.772)	(9 242.725)
Divorced	-6 182.240	-6 984.527*	-5 986.651	-4 321.281
	(4 689.661)	(3 737.558)	(5 399.062)	(12 179.373)
Widowed	-6 573.333	-5 854.163	-9 501.361*	105.933
	(5 030.825)	(3 827.682)	(4 978.010)	(13 844.704)
Flooding	**- 47 417.336***	**- 8 446.350***	**- 31 051.164***	**135 948.545***
	(6 497.866)	(1 381.320)	(6 614.668)	(19 685.033)
Flooding				
Well-being	-0.000***	-0.000***	-0.000***	-0.000**
	(0.000)	(0.000)	(0.000)	(0.000)
Rural	0.433***	0.346***	0.296***	0.118
	(0.038)	(0.083)	(0.047)	(0.101)
Salary income	-0.000***	0.000	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
athrho	0.446***	0.207***	0.383***	-2.721***
	(0.070)	(0.034)	(0.074)	(0.454)
lnsigma	10.954***	9.717***	10.705***	11.481***
	(0.058)	(0.069)	(0.092)	-2.721***
Constant	7 242.714	10 797.182**	12 524.342**	-1 523.210
	(4 723.156)	(4 266.702)	(5 554.626)	(12 133.742)

Robust standard errors in parentheses
*** p<0.01 ** p<0.05 * p<0.1
Source: Authors, 2024.

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[1] The table shows the average treatment effect on treated (ATT), which is the same as the average treatment effect (ATE) in this case because the treatment indicator variable did not interact with any of the outcome covariates.

Like drought, floods have a negative impact on human capital expenditure. Table 4 shows that the flood shock reduced human capital expenditure in all three climatic zones. However, the effect was not significant in the Sudanian zone. The negative effect is more marked in the Guinean zone, amounting to 46,282.635 XOF, as opposed to 19,706.145 XOF in the Sudano-Guinean zone. Households in the Guinean zone therefore suffer more from the degrading effect of flooding on their investment in human capital. Taken together, these results corroborate the trends revealed by the descriptive statistics, which showed that, on average, households affected by drought and flood shocks spend less on their human capital than unaffected households.

Table 4: Effect of floods on household human capital expenditure[2]

Human capital expenditure	Global	Sudanian zone	Sudano-Guinean zone	Guinea zone
Age	252.400***	85.293***	168.767***	693.206***
	(37.085)	(25.639)	(50.874)	(209.452)
Male (ref)				
Female	6 287.393***	-1 228.964	4 260.072	14 053.651
	(1 809.365)	(2 061.053)	(2 686.280)	(8 581.699)
Household size	169.770	36.730	255.904	1 619.531
	(180.568)	(103.091)	(262.830)	(994.498)
None (ref)				
Primary	7 309.973***	2 951.606**	3 608.221***	6 986.012
	(1 104.953)	(1 458.952)	(1 177.451)	(4 572.709)
Secondary	17 309.996***	9 051.640***	9 169.954***	28 211.053***
	(1 606.690)	(1 628.210)	(1 978.863)	(5 911.612)
Higher	48 133.999***	11 613.161**	36 928.195***	67 223.185***
	(5 968.198)	(5 256.511)	(9 614.423)	(10 727.967)
Single (ref)				
Married	-7 101.317**	-8 470.872**	-7 445.980	-13 550.399
	(3 595.880)	(4 047.181)	(4 722.079)	(10 513.524)
Divorced	-5 753.350	-7 177.493*	-6 308.635	-6 440.541
	(3 928.736)	(3 747.248)	(5 415.164)	(14 053.173)
Widowed	-5 300.141	-5 989.607	-9 572.293*	-4 401.452
	(4 070.787)	(3 839.277)	(4 915.835)	(15 521.706)
Flood	**84 193.017***	**- 1 729.376**	**- 19 706.145***	**- 46 282.635**
	(4 740.850)	(2 149.874)	(5 701.173)	(19 367.217)
Flood				
Well-being	0.000	0.000	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
Rural	0.061***	0.118	0.493***	-0.118

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[2] The table shows the average treatment effect on treated (ATT), which is the same as the average treatment effect (ATE) in this case because the treatment indicator variable did not interact with any of the outcome covariates.

Human capital expenditure	Global	Sudanian zone	Sudano-Guinean zone	Guinea zone
	(0.021)	(0.086)	(0.057)	(0.130)
Salary income	-0.000***	-0.000*	-0.000***	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
athrho	-1.280***	0.061	0.216***	0.284***
	(0.148)	(0.045)	(0.054)	(0.093)
lnsigma	11.024***	9.711***	10.685***	11.479***
	(0.057)	(0.069)	(0.088)	(0.077)
Constant	-4 994.433	10 022.812**	10 183.197*	-5 546.909
	(3 646.638)	(4 236.988)	(5 341.810)	(12 767.835)

Robust standard errors in parentheses
*** p<0.01 ** p<0.05 * p<0.1
Source: Authors, 2024.

To sum up, this article has shown that drought and flood shocks reduce household spending on human capital. Specifically, drought negatively impacts human capital expenditure in the Sudanian and Sudano-Guinean zones but positively impacts human capital expenditure in the Guinean zone. The greatest negative effect is recorded in the Sudano-Guinean zone. This implies that households in the Sudano-Guinean zone suffer more from the degrading effect of drought on their investment in human capital. Floods have a negative impact on human capital expenditure in all three climatic zones, although the effect is not significant in the Sudanian zone. The greatest negative effect is felt in the Guinean zone, implying that households in the Guinean zone suffer more from the degrading effect of floods on their human capital investment. The results also confirm the endogeneity of climate shock variables, thus justifying the method employed.

Conclusion

Improving the resilience and well-being of rural households is highly important for achieving the sustainable development goal of building resilience by reducing exposure and vulnerability to climate-related extreme events, as well as to other economic, social and environmental shocks. Given the frequency of climatic extremes, this article examines the impact of climatic shocks on household human capital expenditure across climatic zones based on the context of Benin. It estimates a linear regression model of the endogenous treatment applied to data from the Harmonized Survey of Household Living Conditions.

Analysis of the estimation results shows that drought and floods have a reducing effect on human capital expenditure. A disaggregated analysis according to climatic zone indicates that households in the Sudano-Guinean zone suffer more from the degrading effect of drought on their capacity to invest in human capital, while the effect is more pronounced in the case of

flooding in the Guinean zone. Based on these results, it would not be an exaggeration to conclude that climate shocks are detrimental to human capital investment, at least in Benin. Several economic policy implications can be formulated to strengthen household resilience for increased investment in human capital.

These include the need for public authorities to invest in resilient infrastructure, such as water drainage and anti-flood infrastructure; to introduce social and health assistance measures and school subsidies to cushion the impact of these shocks on the human capital expenditure of disaster-stricken households; and to develop and maintain an early warning system to anticipate the occurrence of flood and drought shocks. It is also important to map the areas at greatest risk of flooding and drought to develop effective adaptation policies, especially in rural areas where agriculture is the main activity. Furthermore, diversifying households' economic activities to reduce their dependence on agriculture and increase their resilience to climate shocks can mitigate the effect of shocks on their income and, consequently, on their investment in human capital.

This article has a few limitations that are important to highlight. In particular, food expenditures are not taken into account in the analyses. Indeed, food is an important aspect of human capital that contributes to the health dimension. This article could also decompose human capital expenditures to analyse the likely differential effects that might exist. The construction of an index of climatic shocks taking into account households that have suffered several shocks at the same time in the same year would also enable us to determine the extent of the consequences on household investment in human capital. All these aspects represent prospects for future research.

References:
1. Akpa, A. F., Amegnaglo, C. J., & Chabossou, A. F. (2024). Climate change adaptation strategies and technical efficiency of maize producers in Benin, West Africa. International Journal of Productivity and Performance Management, 73(4), 1071-1087.
2. Amaya, V. M. G. (2020). Climate shocks and human capital: The impact of the natural disasters of 2010 in Colombia on student

achievement. Cuadernos de Economía, 39(79), 303–328. https://doi.org/10.15446/cuad.econ.v39n79.56830

3. Assouto, A. B., & Houngbeme, D. J.-L. (2023). Access to credit and agricultural productivity: Evidence from maize producers in Benin. Cogent Economics & Finance, 11(1). https://doi.org/10.1080/23322039.2023.2196856

4. Baez, J., & De La Fuente, A. (2010). Do Natural Disasters Affect Human Capital? An Assessment Based on Existing Empirical Evidence.

5. Bahinipati, C. S., Rajasekar, U., Acharya, A., & Patel, M. (2017). Flood-induced Loss and Damage to Textile Industry in Surat City, India. Environment and Urbanization ASIA, 8(2), 170–187. https://doi.org/10.1177/0975425317714903

6. Becker, G. (1964). Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education (University of Chicago Press., Ed.).

7. Berthélemy, J.-C. (2008). Les relations entre santé, développement et réduction de la pauvreté. Comptes Rendus Biologies, 331(12), 903–918. https://doi.org/10.1016/j.crvi.2008.08.004

8. Carpena, F. (2019). How do droughts impact household food consumption and nutritional intake? A study of rural India. World Development, 122, 349–369. https://doi.org/10.1016/j.worlddev.2019.06.005

9. Caruso, G. D., Marcos, I. de, & Noy, I. (2023). Climate Changes Affect Human Capital. SSRN Electronic Journal. https://doi.org/10.2139/ssrn.4422849

10. Cho, H. (2017). The effects of summer heat on academic achievement: A cohort analysis. Journal of Environmental Economics and Management, 83, 185–196. https://doi.org/10.1016/j.jeem.2017.03.005

11. Cuaresma, J. C. (2010). Natural Disasters and Human Capital Accumulation. The World Bank Economic Review, 24(2), 280–302. https://doi.org/10.1093/wber/lhq008

12. Dutta, A., & Banerjee, S. (2018). Does microfinance impede sustainable entrepreneurial initiatives among women borrowers? Evidence from rural Bangladesh. Journal of Rural Studies, 60, 70–81. https://doi.org/10.1016/j.jrurstud.2018.03.007

13. Goodman, J. (2014). Student absences and snow days as disruptions of instructional TIME. http://www.nber.org/papers/w20221

14. Hallegatte, S., & Théry, D. (2007). Are the economic impacts of climate change underestimated? Revue d'Economie Politique, 117(4), 507–522. https://doi.org/10.3917/redp.174.0507

15. Heckman, J. J. (1978). Dummy Endogenous Variables in a Simultaneous Equation System. Econometrica, 46(4), 931. https://doi.org/10.2307/1909757

16. Hounnou, F. E., Dedehouanou, H., Zannou, A., Bakary, S., & Mahoussi, E. F. (2019). Influence of climate change on food crop yield in Benin republic. Journal of Agricultural Science, 11(5), 281-295.

17. Hountondji, F. (2022). Evaluation des plans, politiques et directives liées à la gestion à long terme des inondations et de la sécheresse dans la portion béninoise du bassin de la volta.

18. Ifecro, M., Aminou, F., & Acclassato Houensou, D. (2022). Pluriactivité et risque de perte de métier : Exploration du cas des agriculteurs au Bénin. Alternatives Managériales Economiques, 4(2), 783–803. https://revues.imist.ma/?journal=AME

19. Joshi, K. (2019). The impact of drought on human capital in rural India. Environment and Development Economics, 24(04), 413–436. https://doi.org/10.1017/S1355770X19000123

20. Kafando, B. (2021). Analyse des effets du capital humain sur le revenu et la pauvreté dans les pays en développement. Université de Sherbrooke.

21. Khalili, N., Arshad, M., Farajzadeh, Z., Kächele, H., & Müller, K. (2020). Effect of drought on smallholder education expenditures in rural Iran: Implications for policy. Journal of Environmental Management, 260, 110136. https://doi.org/10.1016/j.jenvman.2020.110136

22. Khalili, N., Arshad, M., Farajzadeh, Z., Kächele, H., & Müller, K. (2021). Does drought affect smallholder health expenditures? Evidence from Fars Province, Iran. Environment, Development and Sustainability, 23(1), 765–788. https://doi.org/10.1007/s10668-020-00608-1

23. Lamzihri, O., Bari, Y., & El Kamli, M. (2023). Éducation et capital humain : une analyse régionale par économétrie spatiale pour le cas du Maroc Education and human capital: a regional analysis by spatial econometrics for the case of Morocco. Revue Française d'Economie et de Gestion, 3(11), 33–48. www.revuefreg.com

24. Liu, T., He, G., & Turvey, C. G. (2021). Inclusive Finance, Farm Households Entrepreneurship, and Inclusive Rural Transformation in Rural Poverty-stricken Areas in China. Emerging Markets Finance and Trade, 57(7), 1929–1958. https://doi.org/10.1080/1540496X.2019.1694506

25. Lohmann, S., & Lechtenfeld, T. (2015). The Effect of Drought on Health Outcomes and Health Expenditures in Rural Vietnam. World

Development, 72, 432–448. https://doi.org/10.1016/j.worlddev.2015.03.003

26. Lokonon, B. O. K. (2019). Farmers' vulnerability to climate shocks: Insights from the Niger basin of Benin. Climate and development, 11(7), 585-596.

27. Lokonon, B. O., & Mbaye, A. A. (2018). Climate change and adoption of sustainable land management practices in the Niger basin of Benin. In Natural Resources Forum (Vol. 42, No. 1, pp. 42-53). Oxford, UK: Blackwell Publishing Ltd.

28. Maddala, G. S. (1983). Limited-Dependent and Qualitative Variables in Econometrics. . Cambridge: Cambridge University Press.

29. McDermott, T. K. J. (2011). Disasters and Development: Natural Disasters, Credit Constraints and Economic Growth. SSRN Electronic Journal. https://doi.org/10.2139/ssrn.1843494

30. McDermott, T. K. J. (2012). The Effects of Natural Disasters on Human Capital Accumulation. SSRN Electronic Journal. https://doi.org/10.2139/ssrn.2011768

31. MCVDD. (2021). Contribution déterminée au niveau national actualisée du bénin au titre de l'accord de Paris.

32. Peet, E. D. (2021). Early-life environment and human capital: evidence from the Philippines. Environment and Development Economics, 26(1), 1–25. https://doi.org/10.1017/S1355770X20000224

33. Pham, T., & Talavera, O. (2018). Discrimination, Social Capital, and Financial Constraints: The Case of Viet Nam. World Development, 102, 228–242. https://doi.org/10.1016/j.worlddev.2017.10.005

34. Psacharopoulos, G., & Patrinos, H. A. (2018). Returns to investment in education: a decennial review of the global literature. Education Economics, 26(5), 445–458. https://doi.org/10.1080/09645292.2018.1484426

35. Schultz, T. W. (1961). Investment in human capital. Amercian Economic Review, , 51(1), 1–17.

36. Sellers, S., & Gray, C. (2019). Climate shocks constrain human fertility in Indonesia. World Development, 117, 357–369. https://doi.org/10.1016/j.worlddev.2019.02.003

37. Sherval, M., Askew, L. E., & McGuirk, P. M. (2023). Human Cost of Drought. In Encyclopedia of Quality of Life and Well-Being Research (pp. 3274–3280). Springer International Publishing. https://doi.org/10.1007/978-3-031-17299-1_4157

38. Soglo, A. M., & Assouto, B. (2023). Benefits of Membership in a Labor Organization in Benin. Journal of Economics and Development Studies, 11(1), 41–54. https://doi.org/10.15640/jeds.v11n1a5

39. Soglo, Y. Y., & Nonvide, G. M. A. (2019). Climate change perceptions and responsive strategies in Benin: the case of maize farmers. Climatic Change, 155(2), 245-256.
40. Spence, M. (1973). Job Market Signaling. The Quarterly Journal of Economics, 87(3), 355. https://doi.org/10.2307/1882010
41. Teka, O., Alohou, E., Agani, A. O., Hodonou, A., & Alagbe, K. L. (2022). Plan national d'adaptation aux changements climatiques du Bénin.
42. Unterhalter, E. (2009). Education. In S. Deneulin (Ed.), An Introduction to the Human Development and Capability Approach. Routledge. https://doi.org/10.4324/9781849770026
43. Unterhalter, E. (2012). Inequality, capabilities and poverty in four African countries: girls' voice, schooling, and strategies for institutional change. Cambridge Journal of Education, 42(3), 307–325. https://doi.org/10.1080/0305764X.2012.706253
44. Vignolles, B. (2013). Le capital humain : du concept aux théories. Regards Croisés Sur l'économie, n° 12(2), 37–41. https://doi.org/10.3917/rce.012.0037.

Technical Progress and Endogenous Growth: An Econometric Analysis Using Panel Data on the MENA Region

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Abstract
From the dawn of the Christian era until the Industrial Revolution, the
standard of living saw little to no change and remained relatively stable during
this period. However, since the Industrial Revolution, living standards have
experienced sustained growth up to the present day. The Solow model
attributes this growth to technical progress, but where does this progress come
from? To truly understand economic growth, we must therefore go beyond the
Solow model and attempt to explain technical progress itself. ***The objective of
this work is to identify and specify the factors that may explain technical
progress (in other words, what causes growth in A (PGF)?).*** To this end,
initially, we relied on a set of theoretical works ((Romer, 1990; Lucas, 1988;
Barro, 1990; Aghion, Blundell, Griffith, Howitt, & Prantl, 2009), among
others) which led us to a set of recommendations. Therefore, in a second step,
we proceed to an empirical analysis using panel data to ***test the significance***

of the impact of this set of recommendations on technical progress in the Middle East and North Africa (MENA) region. Our econometric results show that there is still much to be done in the MENA region to catch up with the United States, Sweeden, Switzerland, Japan, Germany or France: the establishment of a research and innovation system based on the needs of economic and social development, an increase in the budget allocated to research, massive investment by the private sector in universities, the strengthening and creation of institutions, etc.

Keywords: Technical progress, growth. policy harmonization, panel data, MENA

1.   Introduction

Technical progress and endogenous growth are central concepts in contemporary economic theory, providing a powerful analytical framework for understanding the dynamics of economic development. While traditional neoclassical theory primarily emphasized the accumulation of physical capital as the driver of economic growth (Solow, 1957), endogenous growth theories have enriched this perspective by including technological progress as an essential and intrinsic element of long-term growth (Barro, 1990; Romer, 1990; Lucas, 1988). These theories have highlighted the crucial role of innovations, knowledge accumulation, and positive externalities in the economic growth process. In short, to truly understand economic growth, one must go beyond the Solow model and attempt to explain technical progress itself.

**Fig. 1:** The Global Innovation Index (2021)
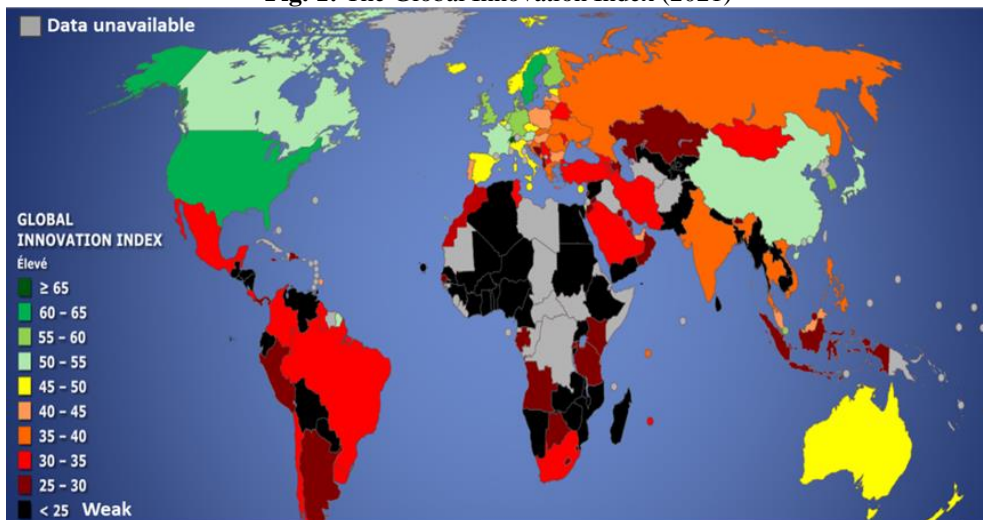
Source: ATLASOCIO.COM

The current state of technical progress in the world reflects a diversity of trends and dynamics across different regions and economies. Figure 1 clearly illustrates this differentiation with the Global Innovation Index 2020, which shows significant disparities between countries in terms of innovation capacity. Western European countries, North America, and some parts of East Asia display high scores, indicating strong performance in innovation. In contrast, many regions in Sub-Saharan Africa and some countries in South Asia have relatively low scores, highlighting the challenges they face in integrating innovation into their economic growth models (see Fig. 1).

In developed countries such as the United States, Germany, and Japan, which have the highest indices, massive investments in research and development (R&D) characterize these nations, stimulating technological innovation. In 2021, R&D expenditures represented 3.46%, 3.14%, and 3.30% of their GDP, respectively, with a strong concentration in advanced sectors such as artificial intelligence, biotechnology, and renewable energy, which are considered essential drivers of economic growth in these countries. Moreover, investment in education and vocational training plays a crucial role in maintaining a highly skilled workforce capable of adopting and developing new technologies.

Fig. 2: R&D spending as a percentage of GDP by country (2021)
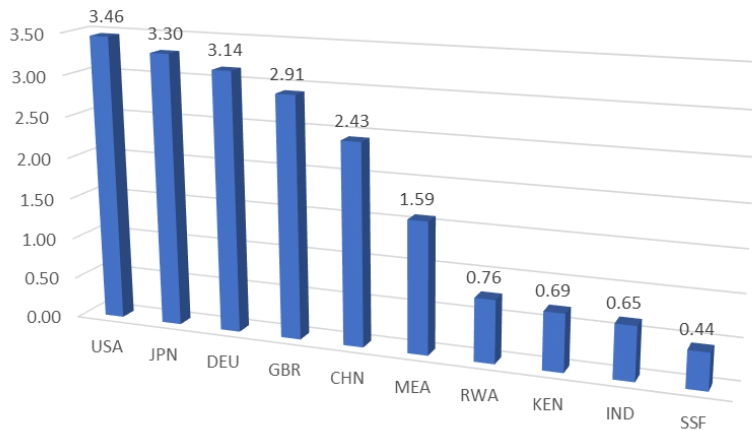
Source: World Bank Global Development Indicators

Regarding emerging countries, nations like China and South Korea have made remarkable progress in terms of technical advancement. Through government policies favoring innovation, industrialization, and infrastructure improvement, these countries have dramatically transformed their economies. Additionally, the rapid adoption of digital technologies has also contributed to accelerating economic growth in many emerging countries, facilitating access to global markets and increasing the efficiency of production processes.

Fig. 3: Public spending on physical infrastructure as a % of GDP
(gross fixed capital formation)
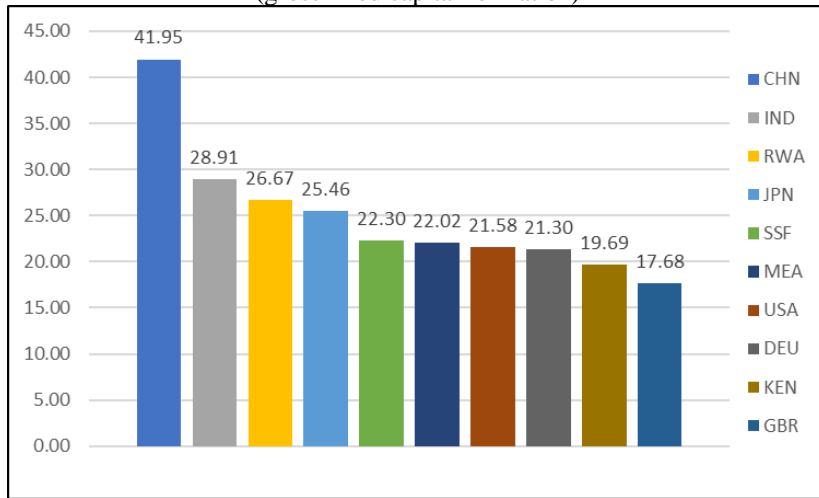
Source : World Bank Global Development Indicators

For developing countries, particularly in Sub-Saharan Africa, numerous structural challenges hinder technical progress. These challenges include inadequate infrastructure, limited access to quality education, and unstable economic environments. Despite these social and economic obstacles, some of these countries are beginning to see promising innovative initiatives emerge. Countries like Rwanda and Kenya are investing heavily in improving the quality of their institutions, considering this an essential factor that must be addressed before any other policy. The results of these efforts are clearly visible in both countries, especially in Rwanda (see Fig. 4).

Fig. 4 : Evolution of the innovation index, Government effectiveness and GDP per capita between 2011 and 2021 for RWA and Ken
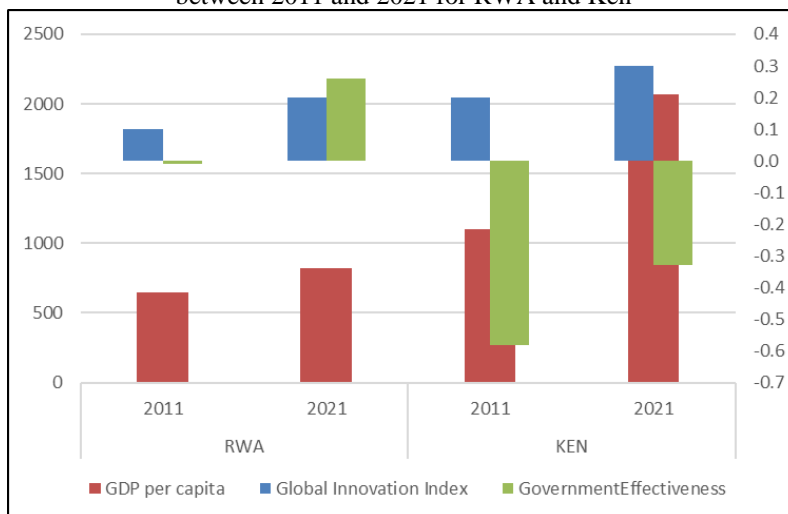
Source: World Bank Global Development Indicators and CNUCED

In the specific context of the MENA region (Middle East and North Africa), characterized by a diversity of economic structures, abundant natural resources, but also significant socio-economic challenges and large heterogeneities among its countries, the issue of technical progress is of particular importance. Understanding the determinants of technical progress in this region and their impact on long-term economic growth is crucial for guiding public policies and promoting sustainable and inclusive economic development.

The present study, conducted from this perspective, proposes an econometric analysis using panel data on the MENA region covering the period 2000-2021**, to identify the main determinants of technical progress in the region**. To this end, the remainder of the document is organized as follows: a brief review of the theoretical and empirical literature introduces the objective of the second section, while the third section highlights the results of the basic model estimation, preceded by the presentation of the model used and the description of the database. Finally, we conclude with economic policy recommendations.

2.   Review of theoretical literature

Technological progress, as defined by (Blanchard & Cohen, 2020) as "the set of inventions applied in the form of innovations," is explained by various incentive factors. These factors can be grouped into two main categories (Agnès Bénassy-Quéré, 2017): institutions and policies.

2.1.   Institutions

An important incentive dimension is the legal, regulatory, and social organization of productive activities, which can be grouped under the generic term of institutions. There are numerous types of institutions that influence growth. (Subramanian & Rodrik, 2003) propose four general categories of economic institutions:

➢ Market-generating institutions that protect property rights ensure contract enforcement, minimize corruption, facilitate judicial procedures, and generally uphold the rule of law. In the absence of these institutions, markets may not exist or may function poorly; conversely, strengthening them can contribute to fostering innovation and, thus, growth. Examples include independent judiciary, effective policing, and enforceable contracts.

➢ Market regulation institutions manage market failures such as information imperfections and economies of scale. They limit the power of monopolies and promote competition to stimulate innovation. Examples include independent competition authorities (such as France's Autorité de la concurrence), regulatory agencies

(such as the Autorité de Régulation des Communications électroniques et des Postes—ARCEP), the European Commission, and courts of justice.

➢ Macroeconomic stabilization institutions guarantee low inflation, minimize economic instability, ensure fiscal stability, and prevent financial crises. Central banks, exchange rate systems, finance ministries, and fiscal and budgetary regulation are part of market stabilization institutions.

➢ Legitimization institutions provide social protection, emphasize redistribution, and manage conflicts to encourage risk-taking and exploration of new production sectors. Examples include pension systems, unemployment insurance systems, social benefit programs, and other social funds.

Empirical studies have sought to construct institutional quality indicators and link them to GDP per capita changes. (Word Bank, s.d.) maintains a governance database comprising six indicators:

➢ Quality of representative democracy (PSV).
➢ Efficiency of administration (GE).
➢ Quality of regulation (RQ).
➢ Voice and Accountability (VA).
➢ Control of corruption (CC).
➢ Rule of law (RL).

Based on this data, the IMF (2003) highlighted a positive and robust relationship between institutional quality and GDP per capita, suggesting that institutional improvements can stimulate growth. (Cœuré 2017) also finds a very strong correlation in Europe between GDP per capita in 2015 and the ranking in 2008 in global governance indicators. Fig. 6 illustrates the correlation, for the year 2021, between GDP per capita, the quality of regulation, the rule of law, the efficiency of administration, and the quality of representative democracy.

Fig. 5: Institutions as drivers of economic growth
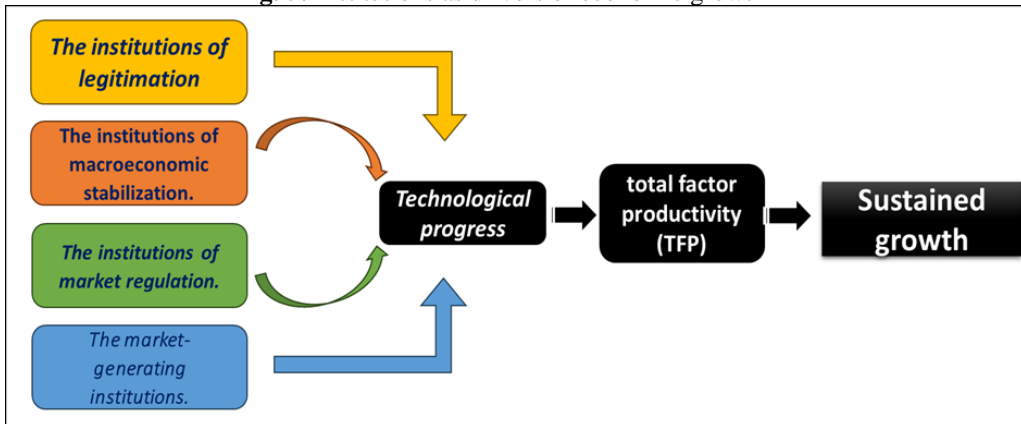
Therefore, to ensure sustained long-term growth of technological progress and thus ensure sustainable growth, it is essential, first and foremost, to ensure that the legal and regulatory framework in which economic activities take place is conducive to private initiative (an independent legal system ensuring contract security, absence of corruption, simplicity of administrative procedures, transparency of economic information, etc.). Secondly, effective market regulation is necessary (antitrust authority, appropriate banking regulation, consumer protection). Finally, achieving macroeconomic stability is crucial (through, for example, an independent central bank and stable budgetary rules). And all of this can only be achieved through a set of institutions that ensure the fulfillment of these tasks in the best possible way.

2.2.   Policies

Public policies play an essential role in fostering and stimulating productivity. They can be direct (through public financing) or indirect (through incentives given to private agents). Three main government policies stimulate productivity (Fig. 7 and Table. 1):

➤ **Infrastructure construction (Barro, 1990):**

Researchers studying the impact of infrastructure and public spending on economic growth, pioneered by (Barro, 1990), show that strong economic productivity growth requires adequate infrastructure such as schools, hospitals, roads, railways, airports, dams, electricity and telecommunication networks, water supply, waste collection, and treatment. For instance, constructing roads and schools enables children to access education, acquire knowledge, and contribute to productivity growth. Initially, these infrastructures are funded by the state or international aid and gradually, as countries become wealthier and improve their financial markets, by the private sector.

➢ **Increasing human capital (Lucas, 1988)** :

The knowledge and skills that workers acquire through education and training programs have a significant impact on productivity (Lucas, 1988) . For example, scientists require many years of study and laboratory experience before they can develop new technology. Countries with higher levels of education thus experience higher growth rates than those with lower levels of education. According to this approach, promoting growth involves increasing education spending, the number of teachers, literacy rates, the number of secondary and higher education graduates, etc.

At the econometric level, the link between education performance and productivity per capita has been established since the seminal study by (Nelson & Phelps, 1966). (Barro R. J., 2001) found that an additional year of education raises medium-term growth rates by 0.44 percentage points, all else being equal. Other studies, particularly those by (Aghion, Blundell, Griffith, Howitt, & Prantl, 2009), show that a one percentage point increase in the proportion of graduates in the active population increases medium-term TFP growth by around 0.1 percentage points.

Therefore, policymakers should invest heavily in the education sector to improve their countries' technological progress (innovation), which plays a crucial role in growth. Recent studies by the World Bank (Patrinos & Psacharopoulos, 2018; Montenegro & Patrinos, 2014) clarify three essential points that policymakers must take into account:

- The highest social return is on primary education in developing countries and on higher education in developed countries.
- The private return on education is higher than the social return, as the latter takes into account all direct costs of education and the opportunity cost of public funding.
- The return on female education is the highest.

➢ **Encouraging Research and Development (Romer, 1990):**

According to (Romer, 1990), technology plays a crucial role in economic growth, suggesting that countries can improve their standard of living by investing more in research and development (R&D). Governments can promote R&D in three main ways:

- Public spending on R&D:

Governments can directly increase R&D by engaging in research and development in government facilities. For example, many technological innovations have come from government laboratories, including nuclear energy, jet aircraft, and the electronic computer. Governments also provide grants to universities and private researchers for fundamental research through agencies such as the National Science Foundation and the National Institutes

of Health. Governments recognize that research universities can be a significant source of economic growth for certain regions. For example, Boston has greatly benefited from having top research universities in its area, such as Harvard University, MIT, Tufts, Boston University, and Brandeis. Similarly, Silicon Valley has developed around Stanford University. And the high-tech center of India, Bangalore, has thrived around the prestigious Indian Institute of Science. State and local governments, as well as the U.S. federal government, provide direct grants to research universities. In recent years, Europeans have increased their support for research universities, recognizing the benefits accrued in the United States.

- **Tax incentives for R&D:**

Since private companies are likely to be more efficient than the government in producing practical R&D that can be immediately used in the development of new products and technologies, governments also encourage R&D by granting tax breaks to private companies for research.

- **Patents:**

Governments grant intellectual property rights to inventors through patents, giving them exclusive rights to use, manufacture, or sell their invention for a specified period. This encourages companies to invest in R&D by allowing them to earn higher profits and recoup their investments.

Table 1: The role of different types of government policies that stimulate productivity

Type of capital	Origin of accumulation	Effects on economic growth.
PHYSICAL and TECHNOLOGICAL (production goods and knowledge of production techniques)	(Romer, 1990) **:** Investment + Research and development expenditures	☐ Improvement in the quality of production goods (increase in production volume or decrease in costs) ☐ Learning effect on workers ☐ Improvement in the production process ☐ Development of new products ☐ Diffusion of innovation
HUMAN (educational level, experience, health)	(Lucas, 1988) **:** Public and private expenditures on education, health, and social protection	☐ Increase in worker productivity ☐ Greater ability to innovate ☐ Diffusion of knowledge
PUBLIC (infrastructures, recherche publique, …)	(Barro, 1990) **:** Public expenditures	☐ Improvement in the productivity of physical capital or workers ☐ Spillover effect on the accumulation of other capital

Source: Authors

Fig. 6: Institution and GDP per capita 2021.
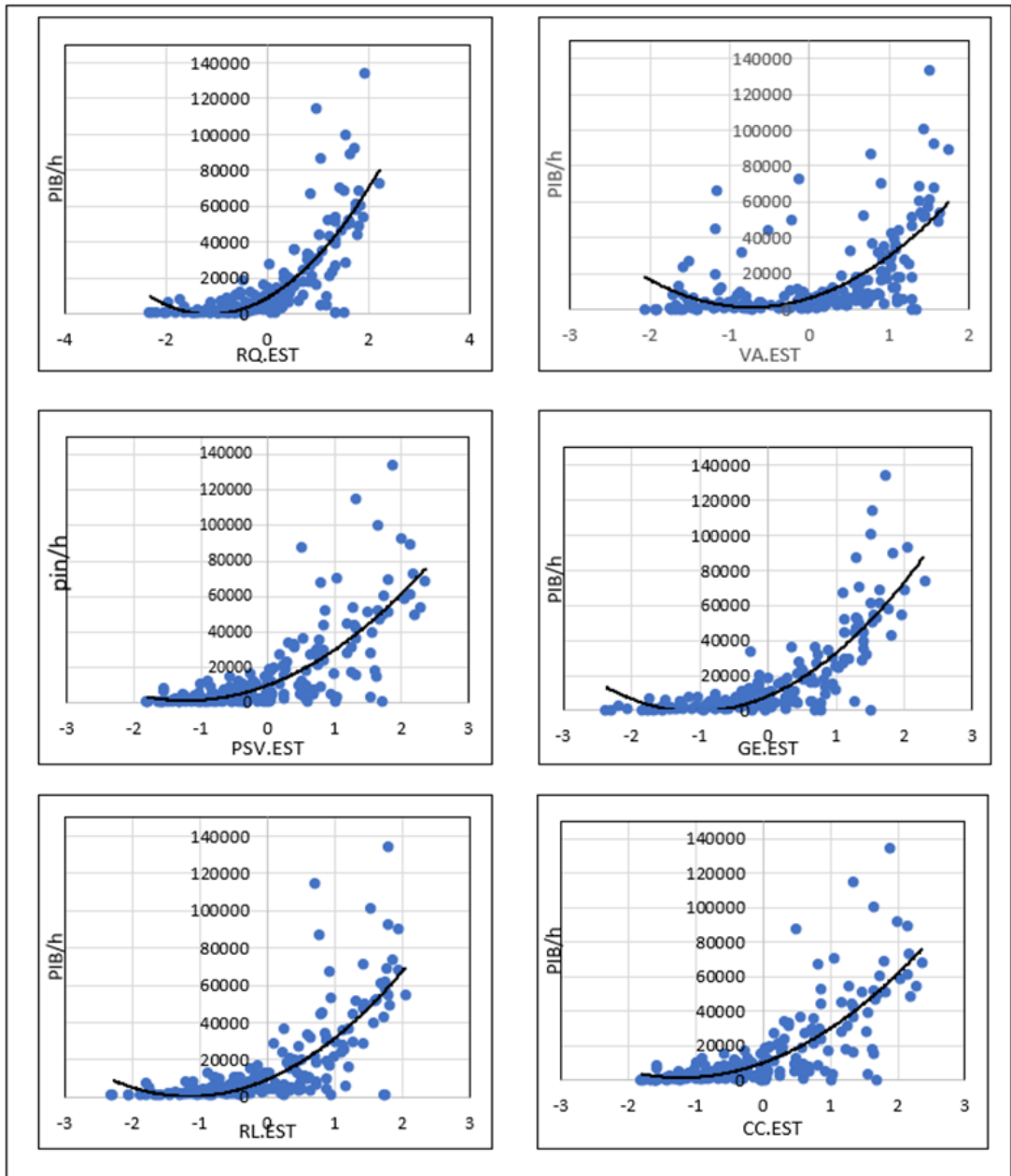
Source: According to the data from the World Development Indicators (WDI) of the World Bank
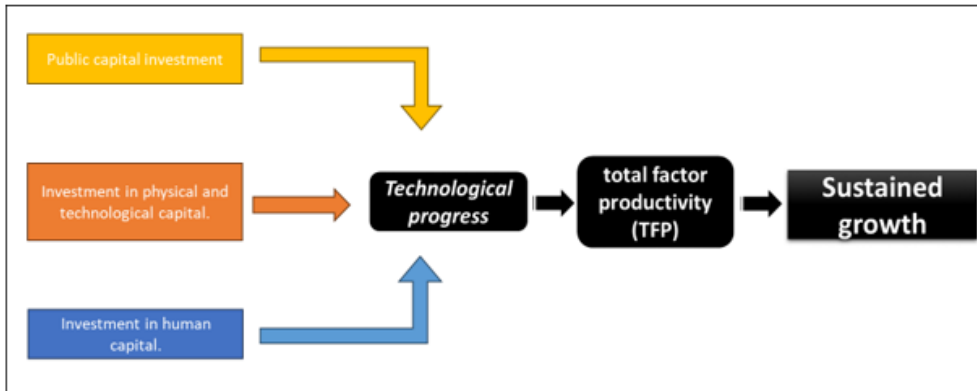
In summary, recent studies on economic growth, such as those by (Romer, 1990), (Lucas, 1988), and (Barro, 1990), confirm that public intervention, particularly through investment in physical, human, and public capital, plays an essential role in achieving sustained economic growth.

Fig. 7: Policies as drivers of economic growth

Source: Authors

In conclusion of this third part, it is clear that policies aimed at promoting productivity growth through innovation incentives, such as the construction of physical infrastructure (roads and ports), increasing the knowledge and skills of workers, and providing incentives to stimulate research and development, are crucial for improving the standard of living (economic growth). Similarly, the existence of a good set of basic institutions is essential for achieving strong growth in capital and productivity, thus reinforcing economic growth.

Since the foundations of these theories were laid, they have attracted the interest of many economists: (Aghion, Blundell, Griffith, Howitt, & Prantl, 2009), (Nelson & Phelps, 1966), (Barro R. J., 2001), (Sianesi & Reenen, 2002), (Acemoglu, Johnson, Robinson, & Yared, 2010), (Aghion & Howitt, 2005), and several others. The following section aims to cite the results of a sample of these works with an increased focus on those specific to the MENA region in order to construct a general overview.

3.   Review of empirical literature

Numerous empirical studies have been conducted in this context to evaluate the significance of the impact of these factors on technical progress:

The (Asian Development Bank, 2019), used a fixed effects panel model and regression models on a sample covering all Southeast Asian countries. This study showed that improving the quality of institutions significantly boosted innovation and sustainable economic growth in the region. Similarly, the (World Bank, 2018), using dynamic panel models applied to a study covering all Sub-Saharan African countries, found that investments in education, appropriate industrial policies, and modern infrastructure are crucial for promoting innovation and stimulating economic growth. Furthermore, the (European Commission, 2017), using a fixed effects

panel model, demonstrated that public and private investments in R&D can improve economic competitiveness and innovation, thereby driving long-term growth. Additionally, a study conducted in Asia by the (Asian Development Bank , 2017), based on a panel covering emerging economies in Asia, revealed that targeted policies promoting R&D and investments in infrastructure are key factors for boosting competitiveness and innovation in the region. Similarly, the (International Monetary Fund , 2016), on a sample including Latin American and Caribbean countries, demonstrated with a fixed and dynamic panel model that financial reforms and macroeconomic stability are crucial for attracting foreign direct investment (FDI) and stimulating innovation and economic growth. Using the same model, the (Organization for Economic Co-operation and Development, 2021), on a sample comprising OECD member countries, found that structural reforms, particularly those focused on the labor market and education, are essential for fostering innovation and supporting long-term economic growth. More recently, the (African Development Bank, 2021), on a sample encompassing North African countries and with a fixed effects panel model, found that investments in information and communication technologies (ICT) and regional integration policies are essential for accelerating innovation and economic growth in this region.

Studies on the MENA region are still very scarce. Research such as that by (Acemoglu, Johnson, Robinson, & Yared, 2010) has examined the institutional determinants of technological progress in developing countries, including the MENA region, highlighting the importance of political and economic institutions in promoting innovation and productivity. Similarly, the work of (Aghion & Howitt, 2005) has emphasized the crucial role of competition and industrial policies in accelerating technological progress and thus in the process of endogenous growth, offering valuable insights for development policies in the MENA region. Additionally, (Hall & Jones, 1999), using regression models, have examined how the protection of intellectual property rights can encourage innovation and technological progress.

However, despite these advances, the literature on technological progress and endogenous growth in the MENA region remains relatively limited. Empirical studies specific to this region are rare, and there is an urgent need for in-depth research to better understand the determinants of technological progress and its impact on economic growth in the region.

From this perspective, the following section aims to fill this gap by providing a comprehensive econometric analysis to assess the significance of the impact of the aforementioned factors on technological progress in the MENA region. Thus, it offers valuable insights to policymakers and researchers interested in the region's economic development.

4.   Methods and Data
4.1.   Methodology

Our objective is to test the significance of the impact of the cocktail of recommendations announced in the previous chapter on technological progress in the Middle East and North African (MENA) region. Therefore, it is necessary to choose an adequate and appropriate model to achieve this objective.

To begin, we start with the key equation in the Romer model[1], which measures the pace of technological progress.

$$\frac{\Delta A_{i,t}}{A_{i,t}} = (\chi_{i,t} * \alpha_{i,t} * N_{i,t}) \tag{1}$$

With:

- $\frac{\Delta A_{i,t}}{A_{i,t}}$: the growth rate of technology (= pace of technological progress).
- $\chi_{i,t}$: the productivity of research and development.
- $\alpha_{i,t}$: the fraction of the population devoted to research and development.
- $N_{i,t}$: the total population of the economy.

To econometrically study this model, we add a few essential elements:

$$g_{A_{i,t}} = \left(\chi_{i,t}^{\beta_1} * \alpha_{i,t}^{\beta_2} * N_{i,t}^{\beta_3} \right)$$

With:

- β_1 : The elasticity of g_A with respect to research and development productivity χ,
- β_2 : The elasticity of g_A with respect to the fraction of the population engaged in research and development, α.
- β_3 : The elasticity of g_A with respect to the total population in the economy, N.

Furthermore, it is necessary to introduce a constant in the econometric model to avoid the risk of biasing the estimator of the coefficient β and that of the variance of the residuals. Moreover, the variance decomposition and the interpretation of the determination coefficient (R) only make sense in the presence of a constant term in the econometric model. Therefore, we pose the following multiple linear model to estimate the equilibrium relationship of g_A :

$$g_{A_{i,t}} = \beta_0 \left(\chi_{i,t}^{\beta_1} * \alpha_{i,t}^{\beta_2} * N_{i,t}^{\beta_3} \right)$$

$$ln \, ln \left(g_{A_{i,t}} \right) = ln \, ln \, (\beta_0) + \beta_1 \, ln \, ln \left(\chi_{i,t} \right) + \beta_2 \, ln \, ln \left(\alpha_{i,t} \right) + \beta_3 ln \, (N_{i,t})$$

---

[1] This relationship is extensively explained in the book (Mishkin, 2010), page 189-191.

The quality of institutions is considered one of the key elements that accelerates the pace of technological progress (g_A). We focus on four indicators of institutions that have been highlighted in the literature:
- FF : **Ease of Doing Business**, which is an average ranking of countries based on the ease of conducting the following ten actions : starting a business, dealing with permits, hiring workers, transferring property, accessing credit, protecting investors, paying taxes, trading across borders, enforcing contracts, and closing a business (BanqueMondiale, 2008).
- QE : **Quality of Higher Education**, which is a composite measure of the extent to which tertiary institutions have : freedom to manage resources, including student selection, autonomy to decide on funding sources and structure, and personnel policies, freedom to set objectives, including setting course content and leaders, including various types of assessment (Oliveira, Borini, Struss, Maisonneuve, & Saadi, 2009).
- DP : **Intellectual Property Rights**, which are measured by a patent protection index (Park & Lippoldt, 2005);
- PSJ : **The origin of legal systems in French**, German, Scandinavian, or English law (Porta, Silanes, Lopez, Shleifer, & Vishny, 1999; Porta, Lopez-De-Silanes, & Shleifer, 2008).

So the model is presented as follows :

$$ln\,ln\left(g_{A_{i,t}}\right) = ln\,ln\left(\beta_0\right) + \beta_1\,ln\,ln\left(\chi_{i,t}\right) + \beta_2\,ln\,ln\left(\alpha_{i,t}\right) + \beta_3\,ln\,ln\left(N_{i,t}\right) + \beta_4 FF_{i,t} + \beta_5 QE_{i,t} + \beta_6 DP_{i,t} + \beta_7 PSJ_{i,t}$$

Finally, as is customary in all econometric models, we add the term $\varepsilon_{i,t}$ which encompasses all other variables that may influence g_A:

$$ln\,ln\left(g_{A_{i,t}}\right) = ln\,ln\left(\beta_0\right) + \beta_1\,ln\,ln\left(\chi_{i,t}\right) + \beta_2\,ln\,ln\left(\alpha_{i,t}\right) + \beta_3\,ln\,ln\left(N_{i,t}\right) + \beta_4 FF_{i,t} + \beta_5 QE_{i,t} + \beta_6 DP_{i,t} + \beta_7 PSJ_{i,t} + \varepsilon_{i,t} \tag{2}$$

4.2. Presentation of the variables and their sources

The variables to be presented are collected over the period 2000–2021. The variables included in our study are total factor productivity (TFP), the fraction of the population engaged in R&D (α), the total population in the economy (N), and R&D productivity, χ.

- **The dependent variable**

TFP is measured using the growth accounting method in which TFP is synonymous with technological progress. In other words, TFP is the portion of growth not explained by the physical quantities of the two traditional factors

(capital and labor). For each country in the sample, TFP is calculated from a Cobb-Douglas production function with constant returns to scale as follows:

$$PGF_t = \frac{Y_t}{K_t^{\beta} * L_t^{(1-\beta)}}$$

With Y_t K_t and L_t representing respectively the real gross domestic product, the stock of physical capital, and the active labor force at time t. Since the contribution of TFP depends on the production elasticity with respect to physical capital, we calculated TFP assuming a value of 0.4 for β, which is often used in empirical studies (Mankiw, Romer, & Weil, 1992; Coe, Helpmae, & Hoffmaister, 1997; Senhadji, 2000)[2].

Thus, the stock of physical capital is calculated using the perpetual inventory method:

$$K_t = Inv_t + (1 - \delta)K_{t-1}$$

Where Inv_t is the gross fixed capital formation (GFCF)[3], and δ is the depreciation rate of physical capital ($\delta = 6\%$). $A_{t=0}$ the initial stock of physical capital is:

$$K_0 = \frac{Inv_0}{g + \delta}$$

Where Inv_0 is the initial investment, and g is the annual growth rate of investment.

Furthermore, for the calculation of TFP, we used real GDP, GFCF, and the employed labor force. The data for these variables, for the 17 countries in our representative sample, are extracted from the World Bank's World Development Indicators CD-ROM, version 2021.

- **Independent Variables**
- ✓ For the fraction of the population engaged in R&D (α), based on the work of (Mankiw, Romer, & Weil, 1992), we use the Researcher-to-Labor Force Ratio (as a percentage of the employed labor force) as a proxy for this variable[4]:

$$\alpha_t = \frac{Chercheurs\ en\ R\&D\ (par\ million\ d'habitants) * million\ d'habitants}{population\ active\ occupée}$$

---

[2] In studying the sources of growth during the period 1960-1994, (Senhadji, 2000) considers a share of capital equal to 0.4 for different regions of the world. (Mankiw, Romer, & Weil, 1992) assume that the share of physical capital in income is equal to 1/3. For (Coe, Helpmae, & Hoffmaister, 1997), this elasticity is also assumed to be equal to 0.4.

[3] The data on Gross Fixed Capital Formation (GFCF) are extracted from the World Bank indicators (2009).

[4] Although the use of this indicator is contested in the literature, it nevertheless provides a measure of the effort made by a country to improve its stock of human capital.

The data are extracted from the World Bank Indicators (2021) and the UNESCO Institute of Statistics (2021).

- ✔ For the productivity in terms of scientific research (χ), we use the number of scientific articles published per million inhabitants as representative variables. The data are extracted from the UNESCO databas.
- ✔ For the total population in the economy (N), we replace it with the total employed labor force. The data are extracted from the World Bank Indicators (2021).
- ✔ Governance is defined as "the traditions and institutions by which authority is exercised in a country for the common good. This includes the process by which governments are chosen, monitored, and replaced, the capacity of the government to develop and implement sound policies, and the respect of citizens and the state for the institutions that govern their economic and social interactions" (Kaufmann, D, Kraay, A, & Zoido-Lobaton, 1999). This definition covers several aspects of governance: the democratic nature of political institutions, political instability and violence, the effectiveness of public authorities, the weight of regulations, the rule of law, and finally, the fight against corruption.

We preferred this definition over the one provided by the World Bank because it takes into account the nature of political regimes. In our study, based on this definition, we consider three indicators of governance:

- **"Quality of Regulation" (QR)** is focused on policies in the strict sense. This criterion includes measures of anti-liberal policies such as price controls or inadequate banking supervision, as well as the burden imposed by excessive regulation in areas such as foreign trade and business development.
- **"Rule of Law" (ED)** determines the success of a state in establishing an environment in which fair and equitable rules form the basis of economic and social relations.
- **"Government Effectiveness" (EG)** is focused on the inputs required for the government to be able to produce and implement good policies and ensure good public service. The data for these variables, for the 17 countries in our representative sample, are extracted from the World Bank's CD-ROM, Worldwide Governance Indicators (WGI), in its 2021 version.

The model is as follows:

$$
\ln\ln\left(g_{A_{i,t}}\right) = \ln\ln(\beta_0) + \beta_1 \ln\ln\left(\chi_{i,t}\right) + \beta_2 \ln\ln\left(\alpha_{i,t}\right) + \beta_3 \ln\ln\left(L_{i,t}\right) \\
+ \beta_4 QR_{i,t} + \beta_5 ED_{i,t} + \beta_6 EG_{i,t} + \varepsilon_{i,t} \tag{3}
$$

5.   Results
5.1.   Estimation Methods

Before proceeding with the estimation, it is necessary to determine the appropriate estimation method for each model. To find the most suitable estimation method for each model, follow the steps outlined in the diagram in Appendix 2.

We apply the Honda test on the model datasets and obtain the results described in the following table :

Table 2: Test of Honda for the existence of individual specific effects.

	LM-statistic	Critical value	p-value	Decision
$Modele\_ln\,(g_A)$	$LM = 7{,}207$	$\chi^2_6 = 12{,}592$	2.85×10^{-13}	$H_0 Rejet$

Source: Authors, RSudio (appendix 3 Fig. 13)

According to Table 2's results, H0 is rejected since the LM-statistic (7.207) is strictly less than the theoretical chi-square value ($\chi^2_6 =$12.592), **confirming the existence of individual-specific effects.**

Similarly, we apply the Hausman test to the model data and obtain the results described in the following table:

Table 3: Results of the Hausman specification test

The $ln(g_A)$ model					
Fixed	**Randam**	**H-statistic**	**Critical value**	**p-value**	**Decision**
$\beta_{1;Within} = 0{,}208$	$\beta_{1\,MCG} = -0{,}071$				
$\beta_{2;Within} = -0{,}372$	$\beta_{2\,MCG} = -0{,}383$				
$\beta_{3;Within} = -0{,}938$	$\beta_{3\,MCG} = 0{,}299$	$H = 12{,}64 \gg$	$\chi^2_6 = 12{,}59$	0.0490	$H_0 Reffuse$
$\beta_{4;Within} = 0{,}119$	$\beta_{4\,MCG} = -0{,}015$				
$\beta_{5;Within} = 0{,}018$	$\beta_{5\,MCG} = -0{,}204$				
$\beta_{6;Within} = 0{,}124$	$\beta_{6\,MCG} = 0{,}087$				

Source: Authors, RSudio (appendix 3 Fig. 14)

With these elements, we obtain the calculated statistic value H, which is 12.64, exceeding the theoretical Chi-Square value at 6 degrees of freedom with a 5% significance level, which is 12.59. Thus, we reject the null hypothesis of no correlation between the random individual specific effects and the explanatory variables of the model. The estimator of the GLS with composite errors model is biased and non-convergent. However, the within estimator is unbiased and convergent. This estimator is none other than that of the **model with individual fixed effects**.

For the tests on the residuals of the fixed effects model, the Jarque Bera test yielded the following result:

Table 4: Results of the Jarque-Bera normality test

	JB-statistic	**Critical value**	**p-value**	**Decision**
$Modele\_ln\,(g_A)$	$JB = 189,25 \gg$	$\chi_2^2 = 5,99$	0.00000	$H_0\,Rejet$

Source: Authors, RSudio (appendix 3 Fig. 15)

According to the result described above, it is observed that the residuals of both models do not follow a normal distribution (see Table 4 and Fig. 8) :

Fig. 8: Distribution of residuals
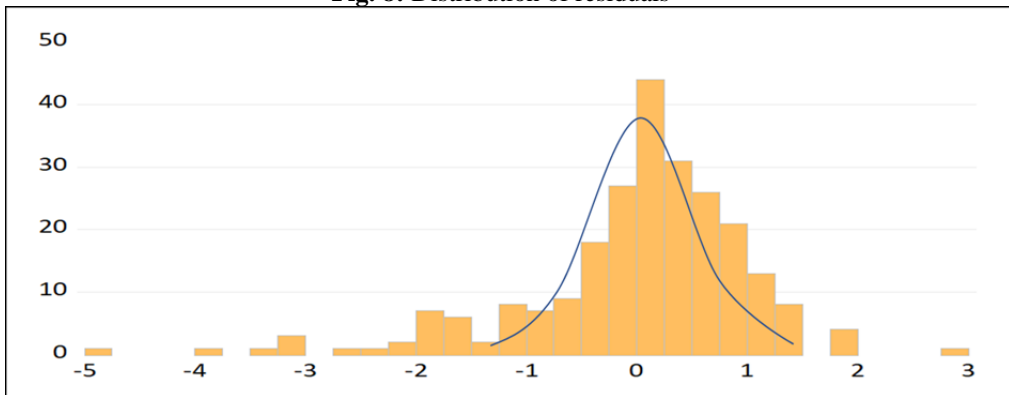
Source: Authors, RSudio (appendix 3 Fig. 15)

Similarly, the Breusch-Pagan test for heteroskedasticity yields the following result :

Table 5: The results of the homoscedasticity test

	BP-statistic	**Critical value**	**p-value**	**Decision**
$Modele\_ln\,(g_A)$	$BP = 9,46 \gg$	$F(6; 1047) = 3,67$	0.1491	$H_0\,Rejet$

Source: Authors, RSudio (appendix 3 Fig. 16)

According to the results in Table 5, we can reject H0 since the BP statistic (9.46) is strictly greater than the theoretical Fisher F (6; 1047) = 3.67, indicating the presence of heteroskedasticity in the model.

Table 6: The results of the autocorrelation test (intra-individual correlation)

	BG-statistic	**Critical value**	**p-value**	**Decision**
$modéle\_ln\,(g_A)$	$BG = 0,0046 \ll$	$F(6; 1047) = 3,67$	0.9455	$H_0\,Rejet$

Source: Authors, RSudio (appendix 3 Fig. 17)

There are no autocorrelated errors in the model since the BG statistic (0.0046) is strictly lower than the theoretical Fisher F (6; 1047) = 3.67 (Table 6). We apply the Pesaran test (CD) on the model dataset and obtain the results described in the following table :

Table 7: The results of the autocorrelation test (intra-individual correlation)

	CD-statistic	**Critical value**	**p-value**	**Decision**
$modéle\_ln\,(g_A)$	$CD = 3{,}69 \gg$	$t_{c(5\%)} = 1{,}96$	0.0002162	$H_0\,Rejet$

Source: Authors, RSudio (appendix 3 Fig. 18)

According to Table 7, we reject the null hypothesis (H0) as CD-statistic = 3.69 exceeds the critical t-value tc(5%) = 1.96, indicating individual error dependence in the model.

Finally, we observe that all assumptions are violated (except for within-individual correlation). To address the issues of heteroscedasticity and inter-individual and within-individual correlation, we resort to estimating the fixed-effects model using the Generalized Least Squares (GLS) method. The abnormality of errors is automatically corrected during the correction of other assumptions by GLS.

5.2. Results and Interpretation

The results of the estimated model are presented in Table 8. Key insights reveal that GLS estimation aligns closely with existing literature (Acemoglu, Johnson, Robinson, & Yared, 2010; Aghion & Howitt, 2005). Indeed, the fraction of the population engaged in R&D (α) positively and significantly impacts the total factor productivity. The estimated coefficient of (α) is substantially greater than 1/2. The associated elasticity is $\beta_2 = expo\,(-0.321)\ = 0.72$. This indicates that a one percentage point increase in the proportion of researchers in R&D in the active population increases g_A in the medium term by approximately 0.72 percentage points. These coefficients are close to those estimated by (Aghion & Howitt, 2005). This strong significant relationship is explained by the efforts made by most Arab countries in the field of R&D; over the past two decades, public spending on R&D in Arab states has seen a considerable increase, averaging $5 billion in 2000 to $15 billion in 2017 (see Fig. 9).

Table 8: Result of model estimation by GLS

	$ln(\chi_{t,i})$	$ln(\alpha_{i,t})$	$ln(L_{i,t})$	$EG_{i,t}$	$QR_{i,t}$	$ED_{i,t}$	$cost$
Coefficients	0,505	-0,321	-0,332	0,096	0,33	0,035	0,34
(t statistic)	(0,73)	(-2,05)*	(-1,44)	(0,36)	(1,21)	(0,10)	(0,222)

Source: Authors, RSudio (appendix 3 Fig. 19)

It is widely accepted today that productivity in terms of scientific research, measured by the number of scientific articles, is closely linked to notable growth in Total Factor Productivity (TFP). According to UNESCO data (Fig. 10), Arab countries have experienced significant growth in the publication of scientific articles over the past decade, particularly Saudi Arabia, Egypt, Tunisia, and Qatar, which positively reflects on scientific productivity in the Arab world. However, these encouraging figures

unfortunately mask a less favorable reality, contrary to the UNESCO report on science in these countries. The distribution of these figures at the sectoral level shows that the sectors considered most important in studies have very few scientific outputs. Even if some of them have fortunately been successful, they owe their success to clear external cooperation, which explains the insignificance of the coefficient relative to scientific productivity at traditional confidence levels (the statistic $t = -0.61 < tc(1\%) = 2.58$; $tc(5\%) = 1.96$; $tc(10\%) = 1.64$). This result confirms the necessity for certain Arab countries to find the right balance aiming for a qualitative and quantitative increase in article publications to improve their impact on g_A.

The general underinvestment in research, the lack of correlation between DIRD and R&D (GDP %), the significant weakness in private funding, the shortage of researchers in host institutions, and the high emigration of graduates all work against this governance and clearly demonstrate its weakness in terms of efficiency and organization. The institutional coefficients are non-significant at traditional confidence levels (the statistic $t = -0.61 < tc(1\%) = 2.58$; $tc(5\%) = 1.96$; $tc(10\%) = 1.64$).

Fig. 9: Total spending on R&D in the Arab world between 2000 and 2017
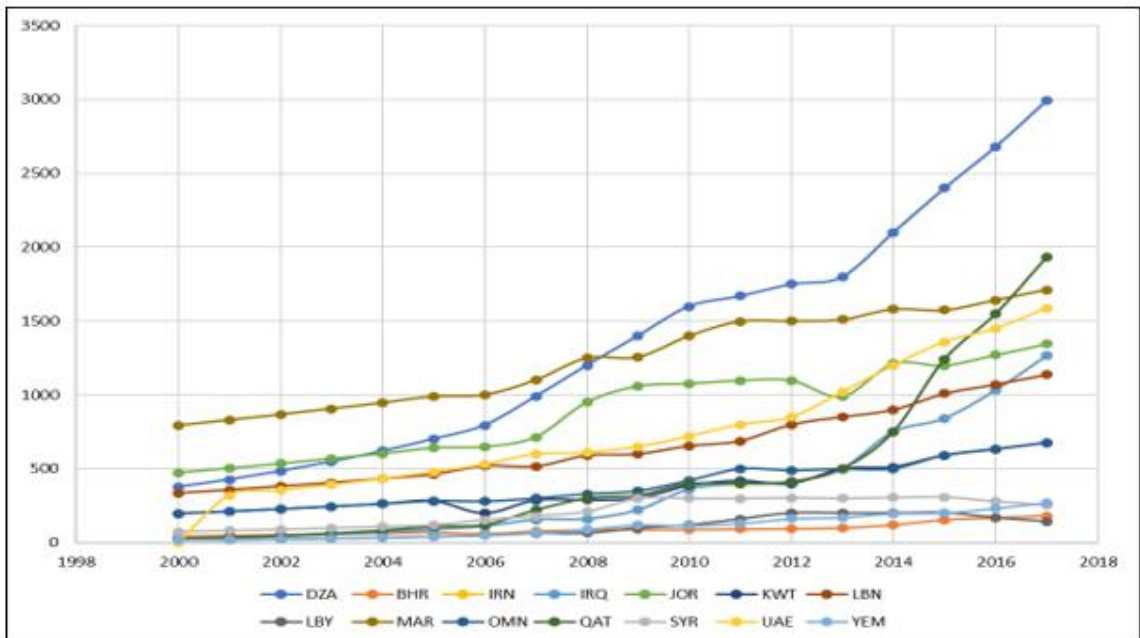
Source: World Bank World Development Indicators

Fig. 10 : Trends in scientific publications in Arab States, 2000-2017
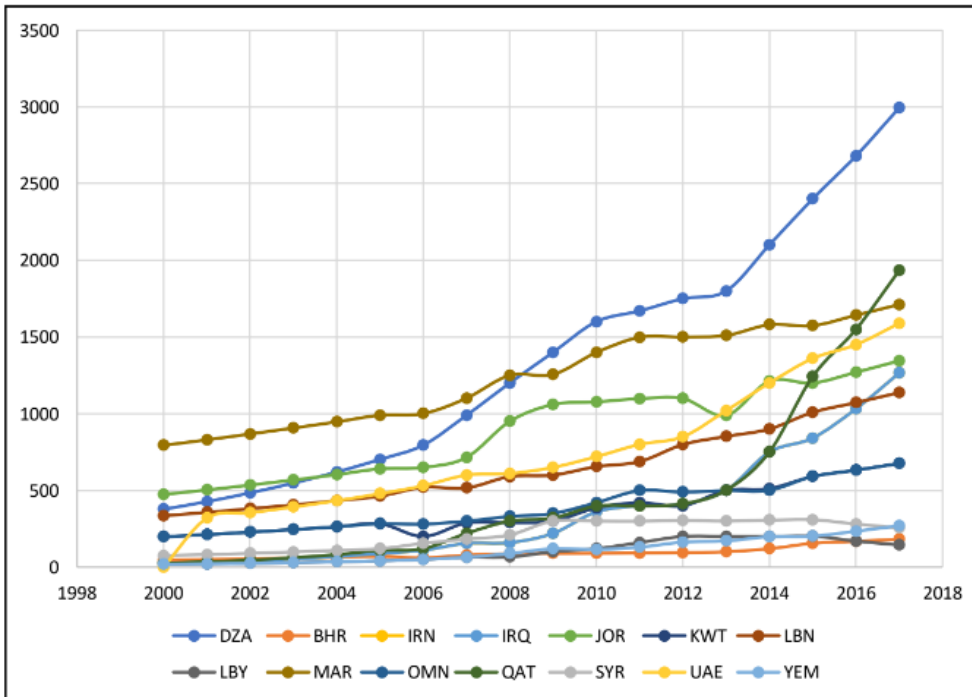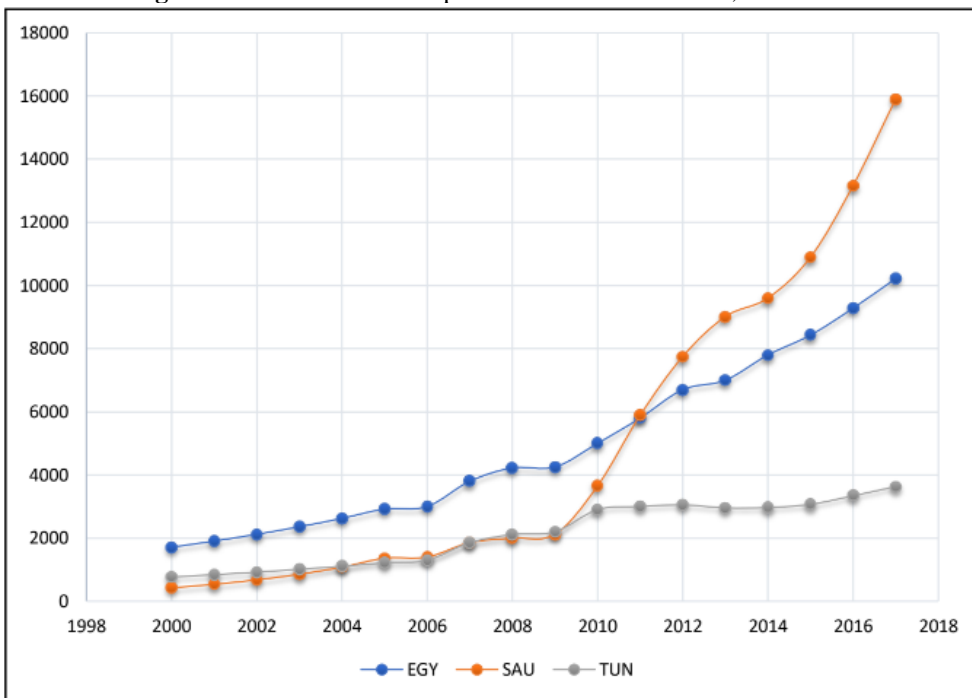
Source: UNESCO Institute for Statistics

Conclusion

From the dawn of the Christian era until the Industrial Revolution, the standard of living saw no significant change and remained almost stable during this period. This stagnation was characterized by low economic growth and a lack of remarkable technological progress. However, starting from the Industrial Revolution, living standards underwent a radical transformation and sustained growth that continues to this day.

The Solow model attributes this continuous growth to technical progress, a crucial factor that has been promoted and stimulated by various economic and social dynamics. This technical progress is further favored and stimulated by research and development (Romer, 1990), the improvement of human capital (Lucas, 1988), the enhancement and strengthening of construction infrastructure (Barro, 1990), as well as the existence of a good set of basic institutions.

In the MENA region, these factors are unfortunately very fragile. For example, the share of public spending on research and development does not exceed 1% of GDP, which is insufficient to generate significant advancements. Additionally, there is a lack of correlation between foreign direct investment (FDI) and R&D, which limits the potential for innovation. Education spending, which could make workers in the R&D sector more productive and thus increase productivity (χ), is almost negligible. Moreover, the legal system in many countries in the region is often perceived as dependent and corrupt, failing to ensure the security of contracts. This situation is exacerbated by widespread corruption, the complexity of administrative procedures, a lack of transparency in economic information, and an unstable economic environment.

This fragility of factors explains the precarious situation of technical progress in the MENA region, as clearly confirmed by econometric model results. Therefore, much remains to be done in this region to initiate a genuine effort to follow the example of developed nations like the United States, Sweeden, Switzerland, Japan, Germany, France. It is necessary to build a research and innovation system based on the needs of economic and social development. This includes significantly increasing the budget allocated to research, massive investment from the private sector in universities, as well as strengthening and creating robust and effective institutions.

Although the results of this study are consistent with and supported by several other works, such as those of Acemoglu et al. (2010) and Howitt (2009), a more detailed analysis and the use of more precise models, such as the computable general equilibrium (CGE) model, are necessary to obtain a comprehensive view of the economy and growth dynamics in the MENA region.

Publication Ethics Statement:

We, the authors of this article, commit to uphold the highest ethical standards throughout the publication process. We declare the following:

- *Integrity and honesty:* We affirm that all the work presented in this article is original and that we have not plagiarized or falsified any data. All sources used have been properly cited and referenced.
- *Respect for copyright*: We guarantee that this article is the result of our own work, and we have respected the copyrights of other authors by citing their works when appropriate.
- *conflicts of interest/competing interest:* The authors declare that they have no financial or personal conflicts of interest that could influence the results or interpretations presented in this article. No external funding sources were received for the conduct of this research.
- *Data transparency*: We commit to providing full access to the underlying data and sharing all methodological details necessary to enable the replication of our results by other researchers : https://docs.google.com/spreadsheets/d/1FOuti_tXtOsCoefGIZTawzf i9EIpRoD8/edit?usp=drive_link
- *Author Contributors*: All authors contributed to the design and conception of the study. Adil Ez-Zetouni prepared the materials and collected the data. El hajoui Yassine wrote the majority of the article (introduction, review, and estimation) and edited the article. El Baoucheri Nabil revised, corrected, and modified everything necessary to ensure a good state of submission.

References:

1. Acemoglu, Johnson, Robinson, & Yared. (2010). Income and Democracy. *American Economic Review, 98(3)*, 808-842.
2. African Development Bank. (2021). Information and Communication Technology Investments and Regional Integration Policies for Innovation and Economic Growth in North Africa. *AfDB Policy Research Paper.*
3. Aghion, & Howitt. (2005). *Handbook of economic growth*, 67-110.
4. Aghion, Blundell, Griffith, Howitt, & Prantl, S. (2009). The effects of entry on incumbent innovation and productivity. *The review of economics and statistics,91(1)*, 20-32.
5. Agnès Bénassy-Quéré, B. C.-F. (2017). *Politique économique,4 edition.* DE BOECK SUPERIEUR.
6. Asian Development Bank . (2017). Infrastructure Investments and Trade Liberalization as Key Drivers of Competitiveness and Innovation in Emerging Asian Economies. *ADB Economic Research Series.*

7. Asian Development Bank. (2019). Improving Institutional Quality and Industrial Policies for Sustainable Economic Growth in Southeast Asia: A Panel Data Analysis. *ADB Economic Working Paper Series.*

8. BanqueMondiale. (2008). *Pratique des affaires dans le monde 2008.* http://francais.doingbusiness.org/documents/fullreport/2008/DB_08_ Full_Report_French.pdf.

9. Barro. (1990). Les dépenses publiques dans un modèle simple de croissance endogène. *Journal of political economy, 98(5, Part 2),*, S103-S125.

10. Barro, R. J. (2001). Human capital and growth. *American economic review, 91(2)*, 12-17.

11. Blanchard, O., & Cohen, D. (2020). *Macroéconomie, 8e édition.* Paris: Pearson.

12. Coe, Helpmae, & Hoffmaister. (1997). North-South R&D Spillovers. *TheEconomic Journal,107 (440)*, 134-149.

13. European Commission. (2017). *Science, Research and Innovation Performance of the EU 2017.* European Union Publications.

14. Hall, & Jones. (1999). Why Do Some Countries Produce So Much More Output per Worker than Others? *The Quarterly Journal of Economics, 114(1)*, 83-116.

15. Inter-American Development Bank (BID). (Various Years). *Institutions, Policies, and Economic Performance in Latin America.* BID Research Publications.

16. International Monetary Fund . (2016). Financial Reforms, Macroeconomic Stability, and Foreign Direct Investment: Evidence from Latin America and the Caribbean. *IMF Working Paper.*

17. Kaufmann, D, KRAAY, A, & ZOIDO-LOBATON. (1999). Governance matters, Policy Research. *The World Bank, Working Paper Series 2196*.

18. Korea Institute for Industrial Economics and Trade (KIET). (Various Years). *Industrial Policies and Economic Growth in East Asia.* KIET Research Papers.

19. Lucas, R. (1988). On the Mechanisms of Economics Development. *Journal of Monetary Economics,22, 3, July*, p. 3-42.

20. Mankiw, Romer, & Weil. (1992). A Contribution to the Empirics of Economic Growth,. *Quarterly Journal of Economics, 107 (2)*, 407-437.

21. Mishkin, F. S. (2010). *Macroeconomics Policy and Practice.* Boston: PEARSON.

22. Montenegro, & Patrinos. (2014). Comparable estimates of returns to schooling around the world. *Policy Research Working Paper No. 7020, The World Bank.*

23. Nelson, R., & Phelps, E. S. (1966). Investment in Humans, Technological Diffusion and Economic Growth. *American Economic Review 56, 2 (May),*, 69-75.

24. Oliveira, Borini, Struss, Maisonneuve, & Saadi. (2009). The Policy Determinants of Investment in Tertiary Education. *OECD Journal: Economic Studies, 1,*, 111-148.

25. Organization for Economic Co-operation and Development. (2021). Structural Reforms for Long-Term Growth: Dynamic Panel Data Analysis. *OECD Economic Studies.*

26. Park, & Lippoldt. (2005). International licensing and the strengthening of intellectual property rights in developing countries during the 1990s. *OECD Economic Studies,n°40*, 7-48.

27. Patrinos, & Psacharopoulos. (2018). Returns to investment in education: A decennial review of the global literature. *Education Economics, 26(5)*, 445-458.

28. Porta, L., Silanes, Lopez, Shleifer, & Vishny. (1999). The quality of government. *Journal of Law, Economics and Organization*, 222-279.

29. Porta, Lopez-De-Silanes, & Shleifer. (2008). The Economic Consequences of Legal Origins. *Journal of Economic Literature, 46 (2)*, 285–332.

30. Rivera-Batiz, & RomerI. (1991). Economic Integration and Endogenous Growth. *The Quarterly Journal of Economics, 106 (2)*, 531-555.

31. RODRIK, D. R. (2005). *Economics of Transition, The European Bank for Reconstruction and Development, 13 (3)*, 533-564.

32. Romer, P. M. (1990). Endogenous Technological Change. *Journal of Political Economy*, pp. S71-S102 (32 pages).

33. Senhadji. (2000). Sources of Economic Growth: An Extensive Growth Accounting Exercise. *International Monetary Fund Staff Papers, 47 (1)*, 129-157.

34. Senhadji. (2000). Sources of Economic Growth: An Extensive Growth Accounting Exercise, . *International Monetary Fund Staff Papers, 47 (1),*, 129-157.

35. Sianesi, & Reenen, V. (2002). The returns to education: a review of the empirical macro-economic literature.

36. SOLOW. (1957). Technical Change and the Aggregate Production Function. *Review of Economics and Statistics, 39 (3)*, 312-320.

37. Solow, R. (1957). Technical Change and the Aggregate Production Function. *The Review of Economics and Statistics*.

38. Subramanian, & Rodrik. (2003, 2003). La primauté des institutions (ce que cela veut dire et ce que cela ne veut pas dire). *Finances & Développement*, 31-34.

39. Word Bank. (s.d.). *Worldwide Governance Indicators*. Récupéré sur The World Bank: https://www.worldbank.org/en/publication/worldwide-governance-indicators

40. World Bank. (2018). *Accelerating Poverty Reduction in Africa: In Five Charts.* World Bank Group Publications.

41. Young. (1991). Learning by doing and the dynamics effects of International trade,. *Quarterly Journal of Economics, 106 (2),*, 369-405.

Appendix
Appendix 1: The evolution of GDP per capita from the dawn of the Christian era to the present
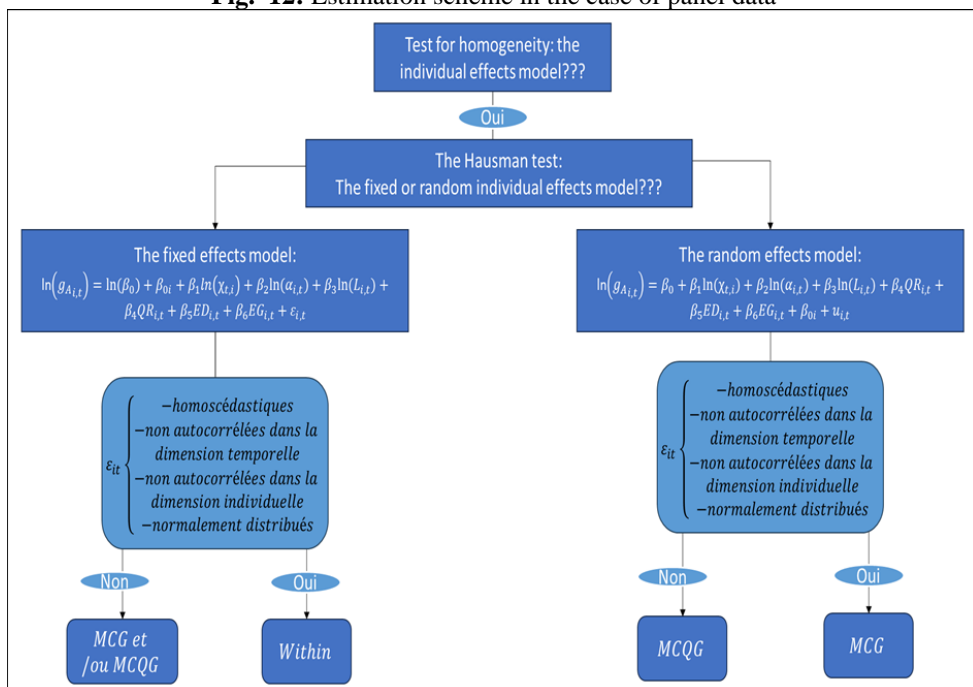
Fig. 11: World GDP per capita in $ and innovation
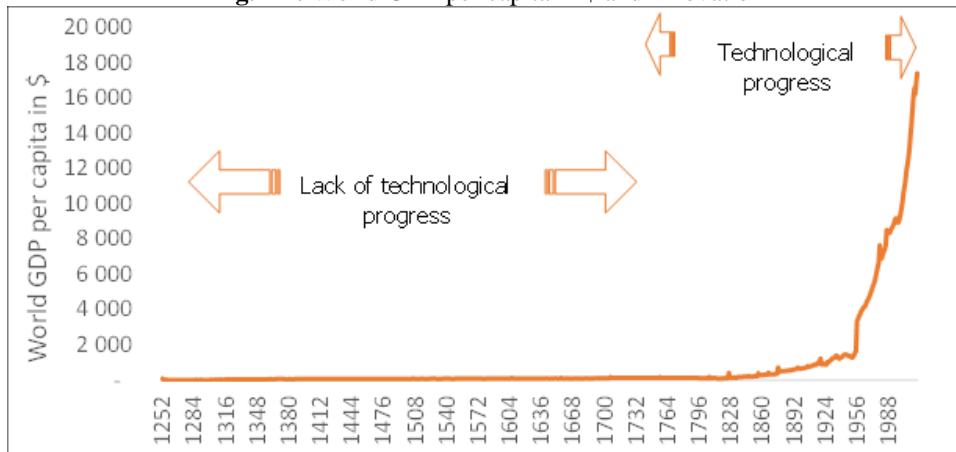
Source: *Maddison, Angus. Historical statistics, population and per capita GDP levels, 1−2006. www .ggdc.net/maddison/*

Appendix 2: The process used in panel econometrics to determine the estimation method

Fig. 12: Estimation scheme in the case of panel data

Appendix 3 : software output

Fig. 13: The results of Honda's specification tests

```
> library("zoo")
> library("lmtest")
> library("collapse")
> library("plm")
> library("readxl")
> library(readxl)
> modéle_finale <- read_excel("D:/livre Macro/excelle/modéle finale.xlsx",
+     sheet = "Feuil2")
New names:
• `` -> `...11`
> view(modéle_finale)
> pdata=pdata.frame(modéle_finale,index=c("i","t"))
> RF=plm(ln_ga~ln_alpha+ln_pro+ln_L+EG_+QR_+ED_,data=pdata,model1="within")
> plmtest(RF,effect="individual",type="honda")

        Lagrange Multiplier Test - (Honda)

data:  ln_ga ~ ln_alpha + ln_pro + ln_L + EG_ + QR_ + ED_
normal = 7.2074, p-value = 2.851e-13
alternative hypothesis: significant effects
```

Fig. 14: Jarque Bera test on Eviews

Series: Standardized Residuals	
Sample 2000 2021	
Observations 242	
Mean	-3.49e-17
Median	0.150302
Maximum	2.991679
Minimum	-4.959216
Std. Dev.	1.037448
Skewness	-1.334134
Kurtosis	6.413139
Jarque-Bera	189.2559
Probability	0.000000
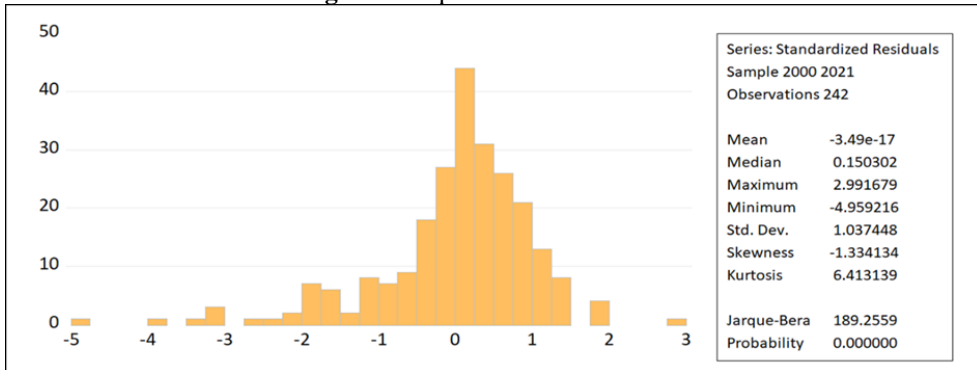
Fig. 15: Specification test by Hausman

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	12.646153	6	0.0490

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
LN_L_	-0.938135	0.299597	0.178389	0.0034
LN_PRO_	0.208033	-0.071049	0.007923	0.0017
LN_ALPHA_	-0.372695	-0.383380	0.017422	0.9355
EG_	0.124408	0.087871	0.028102	0.8275
ED_	0.018903	-0.204761	0.042739	0.2793
QR_	0.199233	-0.015496	0.054016	0.3555

Fig. 16 : Inter-individual correlation test

```
> pdata=pdata.frame(modéle_finale,index=c("i","t"))
> RF=plm(ln_ga~ln_alpha+ln_pro+ln_L+EG_+QR_+ED_,data=pdata,model1="within")
> pcdtest(RF,test="cd")


        Pesaran CD test for cross-sectional dependence in panels


data:  ln_ga ~ ln_alpha + ln_pro + ln_L + EG_ + QR_ + ED_
z = 3.6992, p-value = 0.0002162
alternative hypothesis: cross-sectional dependence
```

Fig. 17: Autocorrelation test (intra-individual correlation)

```
> library("dplyr")
> pdata=pdata.frame(modéle_finale,index=c("i","t"))
> RF=plm(ln_ga~ln_alpha+ln_pro+ln_L+EG_+QR_+ED_,data=pdata,model1="within")
> pbgtest(RF,order=1)

        Breusch-Godfrey/Wooldridge test for serial correlation in panel models


data:  ln_ga ~ ln_alpha + ln_pro + ln_L + EG_ + QR_ + ED_
chisq = 0.0046757, df = 1, p-value = 0.9455
alternative hypothesis: serial correlation in idiosyncratic errors
```

Fig. 18: Breusch-Pagan homoscedasticity test

```
> library("zoo")
> library("lmtest")
> library("collapse")
> library("plm")
> library("readxl")
> library(readxl)
> modéle_finale <- read_excel("D:/livre Macro/excelle/modéle finale.xlsx",
+     sheet = "Feuil2")
New names:
• `` -> `...11`
> View(modéle_finale)
> pdata=pdata.frame(modéle_finale,index=c("i","t"))
> bptest(ln_ga~ln_alpha+ln_pro+ln_L+EG_+QR_+ED_,data=pdata,studentize = F)

        Breusch-Pagan test

data:  ln_ga ~ ln_alpha + ln_pro + ln_L + EG_ + QR_ + ED_
BP = 9.4643, df = 6, p-value = 0.1491
```

Fig. 19: Regression model estimation results by OLS

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LN_L_	-0.332191	0.229391	-1.448145	0.1490
LN_PRO_	0.055460	0.075144	0.738055	0.4613
LN_ALPHA_	-0.321730	0.156381	-2.057356	0.0408
EG_	0.096021	0.265680	0.361416	0.7181
ED_	0.035058	0.331508	0.105752	0.9159
QR_	0.334367	0.276159	1.210775	0.2273
C	0.349481	1.571394	0.222402	0.8242

Effects Specification

Cross-section fixed (dummy variables)

Weighted Statistics			
R-squared	0.798213	Mean dependent var	-5.101206
Adjusted R-squared	0.777942	S.D. dependent var	7.400509
S.E. of regression	1.042749	Sum squared resid	238.1241
F-statistic	39.37740	Durbin-Watson stat	1.638546
Prob(F-statistic)	0.000000		

Unweighted Statistics			
R-squared	0.373727	Mean dependent var	-2.881509
Sum squared resid	262.2560	Durbin-Watson stat	1.529618

Evaluating Industrial Dispute Resolution Methods: A Case Study of Bangladesh

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Abstract

Currently, parties involved in the process of industrial dispute resolution prefer alternative dispute resolution (ADR) to the adversarial process which requires an evaluation of ADR to infer how effective it is. Theoretically, the concept of ADR has been originated from the theory of conflict resolution management. Even though ADR has been implemented largely by apparel firms, studies to assess the effectiveness of ADR are scant. To assess the effectiveness of ADR as an industrial dispute resolution method (DRM), the study evaluated seven hypotheses using the Chi-square test and Cramer's V. Data were gathered from both employers and employees of apparel factories in Bangladesh using two different sets of survey questionnaires. The results showed that employees are more familiar with ADR processes if the companies are run for a long time. It has also been found that the presence of a labor union has been determined to be crucial in the selection of DRMs and workers advocate more for ADR than formal adjudication machinery. The findings of the research are expected to contribute to the dispute resolution process since this study attempted to explore the perceptions of both employees and employers which is instrumental to the amicable settlement of disputes by applying ADR.

Keywords: Industrial dispute, Dispute resolution method, Alternative dispute resolution (ADR)

1.   Introduction

Disputes in industrial settings are found inevitable. Disputes may manifest if there are conflicts of interest among individuals and there is a disparity between parties concerning discrepancies of opinions. Everybody possesses a right to get access to the formal court for dispute resolution. However, many people cannot access the formal system because of geographical distance, high cost, lack of information, etc. In this context, the ADR has an instrumental role to play for those who are deprived of the spirit of justice for everyone. ADR has been very popular because it consumes less time, requires less cost, and is mutually beneficial. Now, the effectiveness of ADR needs to be evaluated based on empirical evidence. Against this backdrop, the study attempts to understand the status of ADR in terms of effectiveness compared to formal adjudication machinery. Many disputes arise between individuals and organizations that can be resolved without a formal judicial system. These disputes are resolved outside the court involving ADR.

Professor J.G. Merrills explained that disputes are specific differences concerning a fact, law, or legal measures where there is claim of a party is negated and counterclaimed by the other party (Merrills and De Brabandere, 2022). In a disputant situation, a party with a higher power source may abruptly try to influence the other parties by exerting societal pressure which may be unethical and unlawful to resolve concerned disputes (Tyagi, 2021). Sometimes, any third party may have a stake in a particular dispute but not in the dispute itself. Therefore, the interfering third party might be biased. In such a situation it is not unusual that the resolved dispute would arise again later (Menkel-Meadow, Porter-Love, Kupfer-Schneider, and Moffitt, 2018). Moreover, in resolving disputes, parties involved are not expected to persuade others to select ADR or legal adjudication machinery (Kohlhoffer-Mizse, 2020). According to studies on dispute resolution, the employee-management relationship has an impact on Western nations' choice of dispute settlement procedures (Chong and Zin, 2012). The influence of the industrial relations climate on the preferred procedural framework for resolving labor disputes may vary among nations due to institutional and cultural differences. The theoretical basis for ADR has been ingrained in the conflict resolution arrangement (Colvin and Avgar, 2018; Wilkinson, Donaghey, Dundon, and Freeman, 2020; Kolb, 1985). The ADR has been found to prioritize the determination of solutions within the borders of the firms or lessening the transfer of conflicts to any outside bodies e.g. civil courts. If utilized properly and under the right circumstances, alternative dispute resolution (ADR) can be an effective and efficient technique for settling disagreements (Jones, 2006). ADR may take a variety of approaches, such as negotiation, conciliation, mediation, and various forms of arbitration. All ADR techniques

share the traits of being faster, less formal, more affordable, and frequently less confrontational than a court trial (Sarker, Abedin, Osmani, and Nayan, 2022).

Bangladesh's textile and garment sector is a key contributor to the country's economy, and it is a vital player in the worldwide apparel and textile market. According to the Bangladesh Garments Manufacturers and Exporters Association (BGMEA), Bangladesh is the second-largest apparel exporter in the world in the fiscal year 2022-2023, exporting clothing worth US more than $42.613 billion (BGMEA, 2023). In more than 4,600 operational garment manufacturers, the apparel industry directly employs around 4.4 million people (BGMEA, 2022). The number of disputes is higher in the garment industry than in any other sector in Bangladesh (Uddin, Moniruzzaman, and Alam, 2022; Ansary and Barua, 2015). The RMG industry remains concerned about the lack of an effective system to guarantee the enforceability of the applicable regulations for upholding worker rights and ensuring workplace safety, which is supposed to lead to additional disputes between workers and employers (De Jong, Wiezer, De Weerd, 2016). Hence, the status of industrial relations and procedural preferences for labor dispute resolution would therefore be further investigated (Xie and Zhou, 2020).

While ADR has been very popular in the apparel sector of Bangladesh, empirical studies to assess its effectiveness in this sector are scant. It is expected that by filling this research gap ADR might be used as an effective tool of dispute resolution for the benefit of the workers. This study examines the reasons behind selecting ADR or legal procedure; incentives to follow ADR; the extent to which disputant parties can exercise liberty; and impairments of ADR procedures while resolving conflicts. The salient objectives of the study are: (a) to assess the present standing of the ADR procedures and how effectively it is functioning; (b) to understand the perceptions of employees and employers about ADR procedure; d) to identify the impairments of settling conflicts using ADR.

Section 2 of the paper presents the literature review depicting existing literature in the field of ADR development of research hypotheses. Section 3 is about study settings and methodology. Analysis and findings are illustrated in section 4. Discussion on the findings is described in section 5 while concluding remarks are made in section 6.

2.   Literature Review

ADR is being used more and more because of the inherent weaknesses of formal court procedures (Ibrahim, Abubakari, Akanbang, and Kepe, 2022). It has also been found in the last decades that as an instrument of resolving conflicts, formal lawsuits are not working satisfactorily (Golub, 2007). The glitches in the existing rule of law are multi-faceted (Zhijie, 2020). The party

with less power to influence generally faces substantial hindrances that deter them from entering into the formal system (Hasle, 2003). In several instances, it has been found that the outcome of the formal system is not effectively operative and objectionable to the deprived workers. Based on the top-down method, the formal method involves legislative organizations aiming for legal improvements, engaging adjudicators, attorneys, etc. In this connection, the supply side is more or less organized but the demand side is not adequately organized. It is evident that reaching out to justice would lie behind if dispute resolution is just dependent on formal litigation management without resorting to ADR methods e.g., conciliation, counseling, and other non-formal representation (Artho Rin Adalat Ain, 2003). Studies showed that the formal adjudication system and informal system are supposed to be operative side by side (Ahmad, and Von Wangenheim, 2021).

The study conducted by Asadullah, Kashyap, Tiwari, and Sakafi (2021) revealed that individuals who have been deprived of justice tend to be engaged in informal dispute-resolving methods as the formal legal systems are unusually cumbersome to enter into. Other studies also revealed that most individuals from rural areas like to enter into the conflict resolution system using informal methods (Al Faruque, 2021). In this connection, the ADR methods are expected to be more conclusive, less expensive, and quick. India introduced 'Lok Adalat' in the 1980s to facilitate ADR with well-trained arbitrators for settling industrial disputes. In the USA, ADR methods have been found existent since the 1970s (Sternlight, 2005).

ADR methods are available with different attributes. Mediations tend to be more participative but offer non-binding solutions, while arbitration delivers binding decisions. The time and cost required for ADR methods differ based on the ADR methods engaged and the procedure involved. Furthermore, ADR methods are substantially influenced by the parties involved. Therefore, the choice of an ADR method is critical and deserves careful attention (Siddiqui, 2000). ADR takes a complementary form to courtroom dispute resolution and varies from country to country (Illankoon, Tam, and Ranadewa, 2022). Each of the ADR techniques has unique benefits and drawbacks that apply in particular situations. According to an empirical study by Cheung, Suen, and Lam (2002), disputants are primarily concerned with benefits such as a quick conclusion, low cost, and preservation of relationships when choosing a good dispute resolution process. The rapid growth of alternative dispute resolution (ADR) processes, such as conciliation, mediation, adjudication, and other hybrid processes, has been prompted by the perceived shortcomings of formal litigation and the corresponding rise in costs and delays (Illankoon, et al., 2019, Cheung et al., 2002).

The history of the practice of ADR is not free of criticism for its informal nature of dispute resolution. Critics identified that resolving disputes

outside the courts is much more challenging and sometimes questionable because the explanation of laws obtained is considered essential for defending and establishing the rights of individuals (Giabardo, 2020). Accountability to the public may not be acclaimed if dispute resolution is considered an individual issue instead of a community matter (Menkel-Meadow, 2018). Different critics suggested reforms by initiating a joint program of ADR and formal administration to minimize any misuse of ADR (Albert, Olarinde, and Albert, 2019). Krishna (2014) argued that many studies revealed that ADR may not serve the expected purpose for which it is proposed.

In reality, the courts are overburdened with cases relating to industrial disputes. Moreover, the shortage of adjudicators has made the situation even more intricate. It has been revealed from several studies that the failure of formal adjudication machinery and the disparity between aggrieved parties' perception of and justice deduced by the official rule of law might lead to the use of ADR. However, the challenges of using ADR concerning the nature of workers, the culture of the organization, the education level of workers, and satisfaction ratings among employees/employers have not been properly addressed by previous studies (Kalabamu, Faustin, 2021). Thus, the current study endeavors to examine the discrepancies amongst the perceptions from the point of view of the poor and rich namely employees and employers.

The nature of workers (employee/employer) and DRM type

While understanding the applicability of ADR, the employment status of the parties involved was not taken into consideration properly. Baranik et al., (2019) and Szulc and Smith (2021) depicted in their study that the employee-employer relationship has a substantial impact on the settlement of disputes using. The study by CRR Global (2019) revealed that the employer-employee relationship plays a substantial role in increasing the efficiency of the DRM types, especially ADR. It has also been found that the settlement of disputes is significantly expedited by the employee-employer relationship leading to a higher level of organizational productivity (Pollyn, 2022). In this connection the following hypothesis has been proposed:

The tenure of operation of the organization and DRM-type

Conflict management strategy in relation to DRM is to a great extent dependent on the tenure of operation of the organization. The study conducted by Martins, Taiwo, Francis, and Kelvin (2023) illustrated that the collaborative attitude of the management increases as the organization goes through the continuous learning process. The study also claimed that the accommodating approach of both employees and employers is substantially influenced if the organization is in operation for a longer period. A quick

solution to the industrial dispute might the possible if the culture of applying ADR in the workplace is in place (Ojo, 2023).

Education level of workers and types of DRMs

Ranasinghe (2012) studied the applicability and efficiency of ADR and they found that there is a positive correlation between education level and outcomes through ADRs. Effective utilization of ADR is also found to be influenced by the education level of workers and the type of disputes (Hapuarachchi and Udayangani, 2022). Workers with higher levels of education are involved in minor disputes and prefer ADR whereas illiterate workers with lower education levels cause a large number of disputes at greater complexities that call for a formal adjudication system (Illankoon, et al., 2022).

The category of jobs (Government/private) and type of DRM

The choice of the DRM is found to be dependent upon the nature of the organization (Dukes and Streeck, 2020). Workers of public organizations are more involved in unions and many cases, unions provide legal aid to the members of the unions. Therefore, they are inclined to go to court (Sigafoos and Organ, 2021). In contrast, ADR is promoted largely by the management of the private organizations and unions are not encouraged in the private organizations. Workers in private organizations show a higher level of tendency to resolve disputes using ADRs (Araujo, Safradin, and Brito, 2020).

Satisfaction regarding ADR and Courts

In the context of access to justice, workers are more satisfied with ADR than the formal justice system. However, it has been explored that not in all situations, ADR is applicable. Both parties are to be careful about selecting the mode of dispute resolution methods. Satisfaction regarding ADR and Courts largely depends on whether the objectives of justice have been addressed or not (Noone and Ojelabi, 2020). The satisfaction of the parties is affected by the control over the access and procedures related to the mode of DRM (Ojelabi, 2019).

3.   Methodology

For developing questionnaires, the recommendation provided by Churchill (1979) was followed and two sets of questionnaires and scales have been established. At first, open-ended questionnaires were devised to acquire insights regarding dispute resolution methods concerning ADR. The devised questionnaires were then scrutinized by reputed academicians and professionals of the legislative bodies. After incorporating the comments of the experts, the final questionnaires were found to embrace with five-point

Likert scale. A pilot survey has been carried out to evaluate the lucidity, reliability, and validity of the items of the questionnaires. The appropriate changes were also made after getting responses from the pilot survey.

Sampling frame and sampling technique

The target population of the survey was comprised of senior executives and union leaders of the organizations who are engaged in dealing with industrial relations between employees and management. The sample units are firms that are full members of the Bangladesh Garments Manufacturers and Exporters Association (BGMEA). To examine the perception of the respondents, the study sample was selected from the BGMEA member firms in June 2021. Thirty (30) firms were selected out of 453 member firms randomly. The researchers conducted face-to-face interviews to collect data from the respondents. Two separate sets of survey questionnaires have been used to collect data from employees and employers respectively in the readymade garments (RMG) factories. Since a large number of RMG factories of different categories are situated in the areas of Dhaka, Gazipur, Savar, and Chattogram in Bangladesh, the study considered these areas as the sample frame. Target respondents were identified from the RMG sector because industrial disputes are very common to find in the RMG sector. It was revealed from the investigation that both employees and employers are aware of the existence of labor unions in the industry. From the fieldwork, it was unveiled that most of the employers are aware of the Labor Union in their respective companies. To understand the nature of the data descriptive statistics has been determined.

Using the crosstabulation, Chi-square test, and Cramer's V, the study examined seven hypotheses to understand the efficacy of ADR as an industrial dispute resolution mechanism (DRM). The hypotheses are as follows:

H_1: *There is a significant association between the nature of workers (employee/employer) and DRM type.*
H_{2a}: *There is a significant association between the tenure of operation of the organization and DRM-type*
H_{2b}: *At least one of the means is different from other means of the satisfaction ratings regarding the tenure of operation of the organization and DRMs.*
H_{3a}: *Education level and types of DRMs are related*
H_{3b}: *At least one of the means is different from other means of the satisfaction ratings regarding education level and DRMs.*
H_4: *The category of jobs (Government/private) and type of DRM are related*
H_5: *There is a significant difference between the satisfaction ratings between ADR and Courts*

4.   Analysis and findings

Upon questionnaire survey, respondents were requested to identify factors that affect their choices against particular types of dispute resolution methods (DRMs). The most influential factors are presented in Table 1 along with corresponding frequencies. It has been found that the existence of labor unions plays a key role in the case of the choice of any DRMs with 21.57% among respondents. Respondents identified the duration of the operation as the second factor with 16.24% frequency. The findings revealed the fact that if the firms are being operated for a long period, workers become more acquainted with DRMs.

Table 1: Factors Influencing the DRMs

Reasons for choice	Frequency	Percentage
Existence of labor union	162	21.57
Duration of the existing company	122	16.24
Flexibility	117	15.58
Acceptability	96	12.78
Concept about ADR	91	12.11
Transparency	87	11.58
Concept of Labor Court	34	4.53
Cost	22	2.93
Influence of the labor union	14	1.86
Influence of the management	6	0.80

On the basis of the effects of the labor union, cost, and influence of firm administration 10.12% opined in favor of choosing DRMs. According to data analysis, about 12.11% responded in favor of the awareness regarding ADR in selecting DRMs against formal adjudication machinery. It is perceived that the flexibility of ADR was influenced largely while selecting DRMs with 15.58% responses since ADR is expected to provide substantial flexibility over formal litigation in terms of time and money. It is quite astonishing that only 3% of responses have been recorded in terms of charges for dispute resolution. The reason behind this low response may be low awareness about the cost of the ADRs and whether settling disputes outside the courts is less costly or not. A large number (103) has been recorded to be nonresponse while comparing ADR and courts. Further investigation revealed that many of the workers do not have ideas about the distinct advantages of ADR.

Table 2: Association between the type of parties (employee/employer) and DRM type

	Client type		
DRM type	Employee	Employer	Total
ADR	84	23	107
Courts	31	17	48
Non-response	60	43	103
Total	175	83	258

Note: Non-response means either they did not go for ADR or they did not respond regarding their choice of ADR and Courts even though they have gone for ADR.

The findings suggested that employees are more eager to engage in ADR than employers (84 out of 107) while employers are found to be unwilling to be engaged in ADR (17 out of 83). Data analysis reveals that worker type and selection of DRM type have a significant relationship (χ^2 =10.149, p=0.006 < .05, Cramer's V=0.20). Thus, the data analysis supports H_1.

It is shown in Table 3 that about 257 out of 174 of the respondents are from corporate houses with more than five years of operation whereas 83 of them are from firms with less than five years of operation. Further investigation also revealed the fact that workers from metropolitan are more engaged in ADR than those from rural areas. The relationship between the tenure of operation of firms and the DRM type selected has been substantiated by data analysis (χ^2=9.690 with df=2, p=0.008<0.05) supporting H_{2a}.

Table 3: Association between tenure of the operation of firms and DRM type

	Gender		
DRM type	≥5 years	<5 years	Total
Court	54	42	96
ADR	120	41	161
Total	174	83	257

Note: 1 employee out of 258 was found a non-respondent regarding the type of DRM.

Hypothesis H_{3a} (Table-4) has been evaluated and found to be not significant and indicating no significant association between education level and types of DRMs (χ^2=10.48, p=0.23>0.05; Cramer's V=0.14).

These results (Table 4) reveal that the education levels of the respondents have no effect in selecting between ADR and courts for dispute settlement purposes. For example, it can be understood from the table that workers having higher education prefer ADR but side by side workers with lower education levels like SSC or below (107 respondents) also prefer ADR. Since educated workers are likely to be more well-informed about the ADR method, their inclination to choose ADR over courts is higher. This advocates the supposition that the ease and flexibility of the courts' services must be assured. Moreover, well-educated workers are also expected to claim better

services. Less educated workers are taking services from courts due to tradition, less use of technology, and more dependability.

Table 4: Association between education and DRM type

DRM	Education level					Total
	Primary or less	HSC or SSC	Graduate & postgraduate	Others	Non-response	
Court	3	50	41	0	2	96
ADR	2	107	47	4	1	161
Total	5	158	88	4	3	258

Data analysis revealed a significant association between the category of jobs and type of DRM (H_4) having $\chi^2=69.29, p=0.00 <0.05$, and Cramer's $V=0.36$. Thus, it can be interpreted that workers in the government sector and workers in the private sector workers are interested in courts and ADR respectively. The evidence is depicted in Table 5 where 96 respondents are found to be in support of courts, and among them, 48 are from the government sector.

Table 5: Association between job category and DRM type

DRMs	Job category					Total
	Non-response	Government	Private (not companies)	Business	Others	
Courts	3	48	10	12	23	96
ADR	2	14	68	35	42	161
Non-response	0	1	0	0	0	0
Total	5	63	78	47	65	258

Business workers are likely to select ADR (35 out of 47) as they require quick services that are better provided by the ADR than the adversarial one. Based on data analysis, it is revealed that there is a statistically significant difference between ADR and courts in terms of overall satisfaction ($\chi^2=40.01, p=0.005 < .05$, Cramer's $V=0.20$) supporting H_5. The cross-tabulation for overall satisfaction scores has been depicted in Table 6.

Table 6: Overall satisfaction regarding formal litigation and ADR

	Overall satisfaction from ADR (frequency)						Total
	Scale	0	1	2	3	4	5	
Overall satisfaction from courts	1		3		4	25	23	55
	2				6	33	16	55
	3	9		1	12	52	26	100
	4	2		1	10	13	13	39
	5				3	3	3	9
		11	3	2	35	126	80	258

One-way ANOVA (analysis of variance) was performed to test for differences among the satisfaction scores for courts concerning different educational categories (H_{2b} and H_{3b}). From the data analysis, the considerable

variance was predictable while selecting a formal litigation system amongst various educational groups ($F=3.179$, *p-value=0.014<0.05*). The result signifies that at least one group mean was significantly unlike. The ANOVA test performed for ADR reveals that there is no significant difference in this regard (*F = 0.048, p-value=0.999>0.05*). Another ANOVA test was performed to assess the variances in the satisfaction scores against courts and ADR concerning the tenure of operation of firms. The data analysis revealed that there are no significant differences (for courts *F= 0,493, p-value =0.483>.05* and for ADR, *F=0.167, p-value =0.683 > .05*) amongst the means for the length of operation of the concerned firms. Thus, it can be concluded that differences in the length of operation of the concerned firms do not affect satisfaction with a specific DRM (ADR or Court). It has been identified that underprivileged workers may not be interested in formal litigation procedures when they might have the opportunity to resolve disputes outside the courts (Patoari et al., 2020).

5. Discussion

It has been found that both individuals and organizations are in favor of informal conflict resolution because it allows them to avoid expenses, delays, and potential harm to their reputation (Xie and Zhou, 2020). The study found that depending on the type of work settings (Government/private), the selection of DRM is significantly influenced by the labor unions. The study conducted by Illankoon, et.al. (2022) found a similar result in Srilanka that Government workers are more prone to move to ADR influenced by labor unions. Negotiations between the parties would be supported by a transparent and accountable trade union with proper participation from both the employees and employers. To protect workers' rights, it is crucial to offer these facilities (Sarker, et al. 2022).

The results of this study are in line with the study of Kisi, Lee, Kayastha, and Kovel (2020) revealing that in those firms operating for a longer period, workers become more acquainted with the concepts of ADR and consequently go for different forms of ADR. It has also been found from the investigation that workers like ADR due to the shorter time required for settling industrial disputes (De Ville, 2006). Lee, Yiu, and Cheung (2016) confirmed that one of the primary variables directly influencing the choice of the ADR technique is the settlement time. The Asian region has the longest average dispute resolution time, at roughly 19.5 months, significantly longer than the global average of 15.5 months.

It has been found that workers' institutional education level does not significantly affect the selection of DRMs. While lack of experience, understanding, and professional attitude toward conflict management can help select the appropriate method of DRM. Hence, researchers emphasize that

educating and training workers by specialist corporate bodies might encourage workers to gain the benefits of ADR (Ezulike and Hoare, 1998). Studies have found that there is substantial evidence of positive and immediate impacts on the workers who were involved in the ADR procedure compared to those who have gone to court without being involved in ADR. ADR is expected to improve positive perception among the parties involved along with an enhanced sense of empowerment and satisfaction regarding the settlement of disputes. Moreover, disputes settled with the help of ADR are found less prone to return to formal adjudication systems (Pereira and Correia, 2020). ADR has been found more accepted by respondents due to its long history and widespread use in the field (Chong and Zin, 2012). In most cases, workers do not like the formal litigation process since it is more bureaucratic and clumsier to deal with. Similar findings have also been found in the research conducted by Price (2018). It is becoming crucial to be there for a productive communication channel to resolve disputes. Between workers and managers, participative management is necessary. Studies also argue that to avoid labor crises, organizations should establish long-term employment benefits packages and human resource planning (Hossain, Sarkar, and Afrosze, 2012).

Implication of the study

This study is significant in several ways. First, managers in all business organizations will benefit because conflict is now a common and frequent aspect of business organizations. Managers will be able to determine how disputes will be mitigated since they cannot be avoided by looking into the causes of organizational conflicts. Additionally, by looking into the origins of disputes, the study will be able to establish why they keep happening. The study will also be able to determine the tactics' limitations by looking at how disagreements are handled. All of these will serve as the foundation for recommendations to be made in favor of management. Secondly, this study will be useful to employees in both commercial and public sector enterprises. This is because it will demonstrate how their interpersonal ties produce conflict and how they may resolve those relationships or what strategies to take to prevent disputes. Thirdly, the study will also be useful to union leaders. This is because the research will demonstrate how they may utilize their positions to promote long-term peace inside business groups. Finally, this study would be of great importance to students and all those in the academic sector who wish to carry out further academic research topics related to this field of study, as it will serve as a reference point.

Conclusion

The dispute would be settled as early in the dispute resolution process as is practical. Hypothesis testing of the study revealed that employees in

comparison with employers are found more in favor of ADR. Workers employed in organizations with longer years of operation have a culture of being involved in unions and prefer ADR for dispute settlements. The study found that there is no association between the level of education and the rate of involvement in ADR. In terms of satisfaction rating, respondents rated higher for ADR than formal litigation process. From the data analysis, it is also found that in comparison with the adversarial process, workers mostly are in favor of ADR due to less service cost less time, and less clumsy. To implement ADR techniques more effectively, monitoring by an external body is to be employed to ensure adherence to the practice of law and impartial assessment. Moreover, parties involved in the process of ADR are to be selected more carefully following specific guidelines for ensuring quality judgment. Policymakers may consider the experiences of different countries and incorporate them in the process of settling disputes in relation to ADR. Thus, considering the popularity of ADR over the adversarial process, ADR demands substantial attention for effective and efficient operation in the industrial and commercial sectors of Bangladesh. To investigate the reasons and solutions for worker disputes in the RMG sector of Bangladesh, additional research is required that might consider more garment factories. The findings of this research may also be cross-validated using alternative research methodologies.

References:
1. Ahmad, J., & Von Wangenheim, G. (2021). Access to justice: An evaluation of the informal justice systems. *Liberal Arts and Social Sciences International Journal (LASSIJ)*, 5(1), 228-244.
2. Albert, I. O., Olarinde, Y. T., & Albert, O. (2019). Order outside the law? rethinking amnesty as an ADR mechanism in Nigeria. *Beijing L. Rev.*, *10*, 913.
3. Al Faruque, A. (2021). An Empirical Study on Unethical Legal Practices in Bangladesh and Suggested Remedial Measures. *Dhaka University Law Journal*, 87-102.

4. Ansary, M. A., & Barua, U. (2015). Workplace safety compliance of RMG industry in Bangladesh: Structural assessment of RMG factory buildings. *International Journal of Disaster Risk Reduction*, *14*, 424-437.

5. Araujo, S., Safradin, B., & Brito, L. (2019). Comparative Report on Labour conflicts and access to justice: the impact of alternative dispute resolution. *ETHOS consortium*.Artho Rin Ain, Act No. Voll of 2003

6. Asadullah, M., Kashyap, R., Tiwari, R., & Sakafi, N. (2021). Community and Restorative Justice Practices in India, Nepal, and Bangladesh: A Comparative Overview. *Comparative Restorative Justice*, 223-244.

7. Baranik, L. E., Cheung, J. H., Sinclair, R. R., & Lance, C. E. (2019). What happens when employees are furloughed? A resource loss perspective. *Journal of Career Development*, *46*(4), 381-394.

8. BGMEA sustainability Report (2022). *Bangladesh Garments Manufacturers and Exporters Association.*

9. Cheung, S.O., Suen, H.H.C. and Lam, T. (2002). Fundamentals of alternative dispute resolution processes in construction", *Journal of Construction Engineering and Management*, *128(5)*, 409-17.

10. Chong, H. and Zin, R. M. (2012). Selection of dispute resolution methods: factor analysis approach. Engineering, *Construction and Architectural Management*,19(4), 428-443.

11. Churchill Jr, G. A. (1979). A paradigm for developing better measures of marketing constructs. *Journal of marketing research*, 64-73.

12. Colvin, A. J., & Avgar, A. C. (2018). Knowns and unknowns in the study of workplace dispute resolution: Towards an expanded research agenda. *The Routledge Companion to Employment Relations*, 266-284.

13. De Jong T, Wiezer N, De Weerd M, et al. (2016). The impact of restructuring on employee wellbeing: A systematic review of longitudinal studies. *Work and Stress* 30(1), 91–114.

14. De Ville, J. (2006). The rule of law and judicial review: re-reading Dicey: the constitutional context. *Acta Juridica, 2006(1)*, 62-91.

15. Dukes R and Streeck W (2020) Labor constitutions and occupational communities: social norms and legal norms at work. Journal of Law and Society 47(4), 612–638. doi: 10.1111/jols.12254.

16. Ezulike, E. I., & Hoare, D. J. (1998). The need for education in alternative dispute resolution (ADR) in the construction industry. *Engineering Construction and Architectural Management, 5(2)*, 144-149.

17. Giabardo, C. V. (2020). Private Justice: The Privatisation of Dispute Resolution and the Crisis of Law. *Wolverhampton Law Journal*, 4.

18. Global, C. R. R. (2019). Organization & Relationship Systems at Work (ORS@ Work): An Introduction to Relationship Systems Coaching. Course. ICF (International Coach Federation).

19. Golub, S. (2007). The Rule of Law and the UN Peacebuilding Commission: a social development approach. *Cambridge review of international affairs*, 20(1), 47-67.

20. Hapuarachchi, H. N. M., & Udayangani, K. (2022). Suitability of alternative dispute resolution methods based on risk factors to the Sri Lankan construction industry.

21. Hasle, L. (2003). Too poor for rights? Access to justice for poor women in Bangladesh. *The Bangladesh Development Studies*, 29(3/4), 99-136.

22. Hossain, C. G., Sarkar, M.A. R., and Afrosze, R. (2012). Recent Unrest in the RMG Sector of Bangladesh: Is This an Outcome of Poor Labour Practices? *International Journal of Business and Management*. 7(3). 206-218.

23. Ibrahim, A. S., Abubakari, M., Akanbang, B. A., & Kepe, T. (2022). Resolving land conflicts through Alternative Dispute Resolution: Exploring the motivations and challenges in Ghana. *Land Use Policy*, *120*, 106272.

24. Illankoon, I. M. C. S., Tam, V. W., Le, K. N., & Ranadewa, K. A. T. O. (2022). Causes of disputes, factors affecting dispute resolution, and effective alternative dispute resolution for the Sri Lankan construction industry. *International Journal of Construction Management, 22(2)*, 218-228.

25. Jones, D. (2006). Construction project dispute resolution: Options for effective dispute avoidance and management. *Journal of Professional Issues in Engineering Education and Practice, 132(3)*, 225-235.

26. Kalabamu, F. T. (2021). Land conflicts and alternative dispute resolution in Sub-Saharan Africa: The Case of Botswana. *Land Issues for Urban Governance in Sub-Saharan Africa*, 171-187.

27. Kisi, K. P., Lee, N., Kayastha, R., & Kovel, J. (2020). Alternative dispute resolution practices in international road construction contracts. *Journal of Legal Affairs and Dispute Resolution in Engineering and Construction*, *12*(2), 04520001.

28. Kohlhoffer-Mizser, C. (2020). A leader is a person who deals with conflict. Global answers in conflict management. In *SHS Web of Conferences* (Vol. 74, p. 06011). EDP Sciences.

29. Kolb, D. M. (1985). To be a mediator: Expressive tactics in mediation. *Journal of Social Issues*, *41*(2), 11-26.

30. Krishna, K. L. (2014). Industrial development and policies since independence: growth without employment. 2014). *Indian Economy*

Since Independence: A Comprehensive and Critical Analysis of India's Economy, 2014, 2014-15.

31. Lee, C. K., Yiu, T. W., & Cheung, S. O. (2016). Selection and use of alternative dispute resolution (ADR) in construction projects—Past and future research. *International Journal of Project Management*, *34*(3), 494-507.

32. Martins, I. Y. A. M. A. B. H. O. R., Taiwo, O. J., Francis, N. E., & Kelvin, O. (2023). Perspective in Workplace Conflict Management Strategies and Organizational Performance: A Review of the Extant Literature.

33. Menkel-Meadow, C. J., Porter-Love, L., Kupfer-Schneider, A., & Moffitt, M. (2018). Dispute resolution: Beyond the adversarial model. *Aspen Publishers*.

34. Menkel-Meadow, C. (2018). Whose dispute is it anyway?: a philosophical and democratic defense of settlement (in some cases). In Mediation (pp. 39-72). *Routledge*.

35. Merrills, J., & De Brabandere, E. (2022). Merrills' International Dispute Settlement. *Cambridge University Press*.

36. Noone, M. A., & Ojelabi, L. A. (2020). Alternative dispute resolution and access to justice in Australia. *International Journal of Law in Context*, *16*(2), 108-127.

37. Ojelabi, O. A. (2019). Ethical issues in court-connected mediation. *Civil Justice Quarterly*, *38*(1), 61-77.

38. Ojo, S. O. (2023). Alternative Dispute Resolution (ADR): A Suitable Broad Based Dispute Resolution Model in Nigeria; Challenges and Prospects. *International Journal of Conflict Management*, *4*(1), 50-62.

39. Patoari, M., Hossain, M., Nor, A. H. M., Awang, M. N. B., Chowdhury, A. H., & Talukder, J. (2020). Legal and Administrative Challenges of Alternative Dispute Resolution (ADR) as a Peaceful Means of Resolving the Land Dispute in the Rural Areas of Bangladesh. *Beijing L. Rev.,* 11, 415.

40. Pereira, S. P. M., & Correia, P. M. A. R. (2020). Sustainability of Portuguese courts: Citizen satisfaction and loyalty as key factors. *Sustainability, 12(23)*, 10163.

41. Pollyn, I. F. (2022). Resolving employee-employer conflicts in the private sector: the challenges, strategies, and prospects. A study of First Bank plc.

42. Price, C. (2018). Alternative dispute resolution in Africa: is ADR the bridge between traditional and modern dispute resolution. Pepp. *Disp. Resol. LJ*, 18, 393.

43. Ranasinghe, A. (2012). Construction arbitration in Sri Lanka. *Proceedings of the Institution of Civil Engineers-Management, Procurement, and Law*, *165*(2), 91-94.

44. Sarker, A. R., Abedin, F., Osmani, N., and Nayan, F. S. (2022), "Status of Basic Labor Rights in Leather Goods and Footwear Manufacturing (LGFM) Sector in Bangladesh", *Kardan Journal of Economics and Management Sciences* 5 (1) 106 –115.

45. Siddiqui, K. (2000). Local Governance in Bangladesh: leading issues and major challenges. *University Press*.

46. Sigafoos J and Organ J (2021). What about the poor people's rights?' The dismantling of social citizenship through access to justice and welfare reform policy. Journal of Law and Society 48. doi: 10.1111/jols.12312.

47. Sternlight, J. R. (2004). Creeping mandatory arbitration: Is it just. *Stan. L. Rev.*, 57, 1631.

48. Szulc, J. M., & Smith, R. (2021). Abilities, motivations, and opportunities of furloughed employees in the context of Covid-19: preliminary evidence from the UK. *Frontiers in Psychology*, *12*, 635144

49. Tyagi, N. (2021). Understanding Attitude and Asymmetries, Final or Fair Settlements and Quest for Gender Justice Through ADR: Some Dilemmas. In Women, Matrimonial Litigation and Alternative Dispute Resolution (ADR) (217-257). *Springer, Singapore*.

50. Uddin, M.S., Moniruzzaman, A.K.M., and Alam, M.M. (2022). Actors Active in Maintaining Industrial Relations in Ready-Made Garment Industry in Bangladesh *Jagannath University Journal of Business Studies*, Vol. 9, No. 1 & 2, 139-155.

51. Wilkinson, A., Donaghey, J., Dundon, T., & Freeman, R. B. (Eds.). (2020). *Handbook of research on employee voice*. Edward Elgar Publishing.

52. Xie, P., & Zhou, L. (2022). Keeping dispute resolution internal: Exploring the role of the industrial relations climate, organizational embeddedness and organizational turbulence. *Economic and Industrial Democracy*, *43*(2), 898-917.

53. Zhijie, Y. (2020, July). The Achievements, Problems, and Improvements in the Development of the Rule of Law for Rural Environmental Protection. In IOP Conference Series: Earth and Environmental Science 545(1), *IOP Publishing*.

The Alignment of Accounting Curriculum with Market Requirements: The Iraqi Case

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Abstract
        This research investigates the alignment between Iraqi university accounting courses and industry demands to enhance the standard and relevance of accounting education. The primary research method was a questionnaire, aiming to understand how well accounting courses at Iraqi institutions meet market requirements. The study's methodology comprised two parts: examining the current accounting curriculum and conducting a follow-up survey using diverse sources and analytical techniques. A total of 350 surveys were distributed to academics and employers, yielding 87 responses from academic staff and 102 valid responses from employers. The study analyzed the latest accounting curriculum, demographic data, relevance ratings for courses, and assessments of essential work skills using SPSS software. Results revealed diverse demographics, with significant responses from academics (58%) and employers (51%). Findings indicate both convergence and divergence in the perceived importance of specific accounting courses, suggesting gaps between theoretical concepts and practical applications. The report underscores the need to align Iraq's

accounting curriculum with business needs. Recommendations include systematic curriculum assessments, increased industry-academia collaboration, continual professional development for educators, and a broader focus on skills. This study provides evidence-based suggestions for improving accounting education in Iraq to meet evolving market demands.

Keywords: Accounting Education, Accounting Courses, Curriculum Alignment, Market Requirements, Skills Gap, Iraq

Introduction

Education is generally recognized as a catalyst for economic growth, and development as worker skills, and competencies directly affect an economy's productivity, and competitiveness (Ozturk, 2001; Sahlberg, 2006). Giving students the knowledge, and abilities they need to thrive in the accounting sector is the particular aim of accounting education (Kassim, 2014). To do this, universities, and colleges need to design curricula that satisfy the expectations, and demands of the job market (Anastasiu, et al., 2017).

The curriculum serves as a guide, for providing educational programs, and outlines the format, and content of the courses. However, there is an ongoing debate among many stakeholders over the extent to which accounting graduates should possess a broader variety of skills beyond technical accounting knowledge (Kavanagh & Drennan, 2008). (Venter, 2001) asserts that, in addition to providing students with a solid theoretical foundation in company management, accounting curricula should provide them with the abilities, and knowledge necessary to manage small businesses.

In today's dynamic business world, characterized by globalization, and advancements in digital technology, the role of accountants has become increasingly complex (Aldredge, Rogers, & Smith, 2020). Accountants are expected to possess a wide range of skills these days, including adaptability to technology, problem-solving, communication, and analytical thinking (Howcroft, 2017). Accounting education must evolve, and provide curricula that enable graduates to successfully adapt to the altering needs of the market in order to ensure that graduates are sufficiently prepared to satisfy these dynamic expectations (Mandilas, Kourtidis, & Petasakis, 2014).

Accounting curricula must be in step with market demands in order to generate graduates who can meet employer's expectations and are prepared for the workforce. Inadequate alignment can lead to issues with workforce development, and employability by creating a significant skills gap between what employers require, and what graduates can offer (Webb & Chaffer, 2016; Jackling & Lange, 2009). Employers bear the blame for this discrepancy, as

graduates might have to invest more time, and resources in training, and development in order to meet the demands of the desired positions.

Moreover, the advent of technological advancements such as Industry 4.0 and big data has underscored the need for accountants to acquire additional skills. As conventional accounting tasks become automated, accountants must focus on increasingly complicated analytical and interpretative work (Zhang, Abigail, Dai, Vasarhelyi, & Miklos A, 2018). If these technological advancements and the skill sets that accompany them are not incorporated into accounting curricula, the graduate's ability to contribute to the workforce in an effective manner may be compromised, thereby increasing the distance between accounting education, and practice (Cheng, 2019; Liang & Zhao, 2022).

The needs of the labor market must be reflected in accounting curricula for Iraq's economy to grow. Iraq needs accountants with the skills, and experience necessary to oversee complex financial systems, uphold regulatory compliance, and foster sustained economic development. The business climate in Iraq is dynamic and ever-changing. Nonetheless, it is critical to assess how well Iraqi university's current accounting curricula meet industrial needs.

The aim of this study is to examine how closely accounting courses at Iraqi colleges align with market demands. The study specifically looks for disparities or inconsistencies between the skills. and competencies that are taught in the curriculum, and the qualities that employers value. The researchers distributed survey questions to several groups. Accounting educators, accounting graduates, professionals with accounting degrees from Iraqi Association for Certified Public Accountants (IACPA) institutes, and employers who hire accounting graduates from Iraqi universities are among those who teach accounting in Iraqi universities. The research obtained valuable insights into the perspectives, and anticipations of key stakeholders in the accounting school ecosystem by distributing questionnaires to employers, graduates, and instructors.

The study's conclusions will contribute to raising the standard and relevance of accounting education in Iraq by offering evidence-based recommendations for curricular improvement. By aligning the accounting curriculum with industry expectations, universities can better equip graduates with the knowledge, and abilities they need to increase their employability and contribute significantly to the economy.

Accounting Education in Iraq

Undergraduate accounting degree programs are offered by more than 60 public, and private colleges, including those in the Kurdistan area. Prospective students can also pursue higher accounting studies through master's, and doctorate degree programs at a considerable number of these universities.

Thus, accounting education may be found all around Iraq. The formal application procedure, which is based on the student's cumulative average high school achievements, is centrally coordinated, and overseen by the Central Admission Office of the Iraqi Ministry of Higher Education and Scientific Research.

The country's modern higher education system began roughly a century ago with the founding of the Baghdad College of Law in 1908. Following this accomplishment, several other universities, and institutes were founded in the 1920s and 1950s. In 1958, an attempt was made to organize the university system by gathering all of these institutions under one roof in Baghdad, naming it Baghdad University, and drafting a charter for it. As a result, the largest university in the nation was established. Following the founding of the University of Baghdad, the field of higher education flourished throughout the 1960s and the early 1970s. Several universities were officially established as modern institutions of higher learning, including Al-Mustafaniriya University in 1963, Basra University in 1964, and Mosul University in 1967. All of these institutions were placed under the Ministry of Higher Education and Scientific Research in an effort to organize and oversee the field of higher education. (Bedan, 2022). The first accounting department in Iraq opened its doors in 1985 at Basra University, and the University of Baghdad followed suit in 1986. Today, there are over 60 public and private universities in the country that offer accounting degrees. The University of Baghdad introduced accounting education to universities in 1974 and offered degrees in business administration with an emphasis on accounting (Jabbar & Shnawa, 2021).

Literature Review

For accounting education to be successful, and relevant, curriculum alignment with market demands is essential. It is essential that accounting education stay up with these advancements as the field of accounting continues to change, and adapt to shifting corporate, and economic environments (Carvalho & Almeida, 2022; Cunha, Martins, Carvalho, & Carmo, 2022; Stanciu, Pugna, & Gheorghe, 2020). According to (Mohamed & Lashine, 2003; Jackling & Lange, 2009; Howieson, 2003). Accounting education can better prepare students for the demands of the labor market, and enable them to make valuable contributions to the accounting profession by ensuring that the curriculum and market requirements are in line.

Several research works have revealed a discrepancy between the competencies offered by accounting programs, and the demands of businesses. This underscores the need to match educational programs with market demands. According to (Gray & Collison, 2002), in order for accounting to remain a recognized profession, satisfy public interest requirements, and tackle sustainability issues, there has to be a clearer link between education,

and training. To successfully close this gap, the authors suggested a significant overhaul of accounting degrees as well as the creation of a specialized graduate profession. (Pan & Perera, 2012) examined the relevance of university accounting programs to the business sector. Their goal was to ascertain if recent accounting graduates had the abilities, and knowledge demanded by employers. Potential disparities in curriculum structure and emphasis were identified by the study, pointing to a disconnect between accounting education, and industry standards. Additionally, the authors (Carr, Chua, & Perera, 2006) discuss how accounting education is not keeping up with the demands of the industry. According to the report, significant stakeholders may not have had their expectations fully met by the way accounting programs are designed. The curricula focus on specific topics, like auditing, is disproportionate to the weight assigned to other topics, such as professionalism, a global view, and social, and environmental concerns.

In the fast-paced world of global business, accounting education faces issues notwithstanding the disconnect between market need, and curriculum. The discrepancy between market demands, and accounting education was studied by (Mohamed & Lashine, 2003), especially in light of the changing international corporate environment. The study found that accounting education has difficulties in providing students with information. and abilities that employers are looking for. It highlights the necessity of raising accountant's proficiency levels in order to meet the evolving needs of the global business community. In a similar vein, (Douglas & Gammie, 2019) discuss the disparity between accounting education and the skills required by the ever-changing corporate world. The report highlights how accounting degree programs fall short of developing non-technical abilities. Because they believe that graduates from non-accounting disciplines have more developed non-technical abilities, businesses actively seek out graduates from these fields. The results show that accounting degree providers favor some non-technical abilities above others due to accreditation criteria that demand high amounts of technical material. The research promotes a balanced emphasis on both technical and non-technical abilities, highlighting the significance of matching accounting education with industry demands.

Accounting graduates who receive their education through traditional techniques that primarily rely on lecture-based instruction sometimes lack critical job skills. The discrepancy between accounting education, and industry expectations is brought to light by (Lightweis, 2014). Due to traditional training techniques that emphasize lecture-based learning, accounting graduates frequently lack the skills essential for their employment. According to the findings, including simulations in the curriculum encourages students to succeed in their careers by helping them make the connection between their theoretical knowledge and actual accounting scenarios. In the

same way, (Rajeevan, 2020). Emphasized the significance of introducing accounting students to industry-specific training, and experience learning from an early age in order to mirror modern accounting processes. Working together, academic institutions and professional associations may create a curriculum that turns forth highly qualified accounting professionals. Additionally, it was shown that accounting instructors and final-year accounting students had some degree of agreement about the necessity of vocational skills beyond technical, and cognitive talents, (Alshbili & Elamer, 2020).

The market requires a wide range of skills and competencies, many of which are underemphasized in university accounting curricula, according to existing literature.

For accountants to be effective, they must possess technical skills such as knowledge of technical accounting, problem-solving abilities, critical thinking, data analytics, and information technology skills (Hussein, 2017; Andiola, Masters, & Norman, 2020; Dzuranin, Jones, & Olvera, 2018; Ballou, Heitger, & Stoel, 2018; Hussin, et al., 2023). According to (Tan & Laswad, 2018; Barisic, Novak, & Sever Malis, 2021; Ghani & Suryani, 2020) employers place a high value on interpersonal, and personal skills like collaboration, communication, teamwork, and a positive attitude. These authors attribute this to the fact that employers highlight the importance of these skills as they contribute to the overall effectiveness and adaptability of accountants in the workplace.

Professionals in accounting need to possess analytical, and critical thinking abilities (Awayiga, Onumah, & Tsamenyi, 2010; Kavanagh & Drennan, 2008; Sin, Jones, & Wang, 2015). Additionally, to negotiate a complicated global corporate world, business graduates including accountants need soft relationship skills in addition to technical talents (Villiers, 2010; Asonito & Hassall, 2019; Dolce, Emanuel, Cisi, & Ghislieri, 2020). An undergraduate accounting degree is essential for developing transferable and management abilities (Gammie, Gammie, & Cargill, 2002). Communication Skills. It is critical for accountants to possess strong communication skills since good communication is essential for delivering financial facts and insights to a variety of audiences (Webb & Chaffer, 2016; Gray & Murray, 2011).

A small number of pertinent studies have been conducted in Iraq, but they have not focused enough on matching the country's accounting curriculum with industry needs. Nonetheless, by evaluating Iraq's adherence to International Accounting Standards (IES2), (Al-anbagi1, Al-azzawi, & Al-obaidi, 2018) explore the alignment. As Iraq advances toward switching to IFRS and IPSASs, the research attempts to ascertain how closely the nation adheres to these international standards. They compared accounting programs

in Iraqi universities with others throughout the world using an archival research approach, and a questionnaire, paying special attention to IES. Although there are notable disparities in values, ethics, and understanding of the workplace, corporate governance, financial markets, organizational behavior, and information technology, the results show that 55% of respondents comply with IES2. The research highlights the need for harmonizing accounting programs to prepare aspiring accountants for global norms and satisfy corporate requirements. (Salih & Ahmed, 2018) highlights how crucial it is to match accounting education to the needs of the job economy, and the accounting profession. It uses both a quantitative descriptive technique, and an analytical theoretical approach to evaluate accounting education, and the labor market in the Duhok Governorate. The research highlights the need for skilled accountants, and services that satisfy market expectations by exposing gaps between accounting education, and industry requirements. The study's drawback, though, is that it only surveyed professional, and academic accountants, ignoring the opinions of employers, and recent accounting grads. Employer's and graduate's viewpoints would be added to the study's results, and practical consequences, giving rise to a more thorough grasp of market demands.

This study distinguishes itself from other studies by using a multimodal method to look at the demands of the market. It explores the viewpoints of employers, professional accountants, recent graduates, and academic personnel. Through a comparison of perspectives from academic staff members, and practitioners, the study evaluates the importance of different courses in the accounting curriculum provided by universities in Iraq. Additionally, it looks at the perceived significance of particular competencies, and abilities that Iraqi accounting graduates are expected to possess and assesses whether the current curriculum effectively equips students with these crucial qualities.

Research Methodology

The major research technique utilized by the authors was a questionnaire, with the aim of achieving a more nuanced understanding of the alignment between accounting courses at Iraqi institutions, and the capabilities required by the market. The study's methodology had two main parts: an examination of Iraqi institution's current accounting curriculum, and a follow-up questionnaire survey that made use of a wide range of sources, and analytical techniques.

Deeper insights into the study subject were to be gained, and important components to include in the questionnaire survey were to be identified with the first research instrument. The Ministry of Higher Education in Iraq is the main authority on the organization of accounting curricula in Iraqi institutions.

It establishes minimum credit hours and defines knowledge domains. At this stage, a thorough examination of the Ministry's criteria was conducted, delving into accounting curricula to identify courses that should be included in the questionnaire survey.

Of the sixty public, and private colleges in Iraq, the authors concentrated on those that were fully accredited, and offered an accounting bachelor's degree, even though accounting diploma programs were available. A thorough analysis of the study plans for the 2023–2024 school year revealed courses that are important from the perspectives of employers, and accounting teachers.

The carefully designed questionnaire used for the survey was divided into three sections: the first collected respondent's demographic information, the second rated the relevance of accounting courses and topics, and the third evaluated the relevance of 29 key competencies and skills in the workplace. The responses were scored using a Likert-style scale ranging from 1 to 5.

A total of 350 surveys were distributed, targeting both academics and employers. Out of 150 distributed surveys to academic staff members in accounting departments, specifically lecturers and professors, 87 were returned, and used in the study. Employers were given 200 questionnaires at random to complete, and 102 valid responses from both foreign and domestic businesses operating in Iraq were analyzed.

The statistical analysis of the data obtained from the questionnaires was conducted using SPSS software. The validity of the questionnaire was confirmed by a reliability study. Each skill's ranking average was determined, revealing respondent's opinions on the significance of these abilities.

Findings

This study provides insightful information by conducting a thorough investigation of how accounting programs at Iraqi institutions correspond with the changing needs of the industry. The research draws on perspectives from both the academic, and professional communities.

Table 1. Total Institutions Contacted and Corresponding Responses

Profession	No. Contacted	No. Responds	% of Responds
Academics	150	87	58%
Employers	200	102	51%

As can be seen in Table 1. above, the authors engaged 150 Academics, and 200 Employers throughout the first part of our inquiry, which produced a notable response rate. With 87 responses, academics demonstrated a strong level of participation, yielding a 58% response rate. Employers also actively engaged, accounting for 102 out of 200 organizations and 51% of responses.

Table 2. Academics and Professional Profile

Profile	N	%
Gender		
Male	59	67.8 %
Female	28	32.2 %
Age		
18-25 Years	9	10.3 %
26-35 Years	43	49.4 %
36-45 Years	28	32.3 %
46-55 Years	5	5.7 %
55 and above	2	2.3 %
Academic Title		
Professor	4	4.6 %
Assistance Professor	4	4.6 %
Senior Lecturer	5	5.7 %
Lecturer	12	13.8 %
Assistance Lecturer	9	10.4 %
Profession		
Iraqi Certified Public Accountant	53	60.9 %
Education		
Ph. D	7	8.0 %
Master Degree	26	30.0 %
Bachelor	47	54.0 %
ICPA	7	8.0 %
Years of Experience		
Less than 1 Year	6	6.9 %
1-5 Years	23	26.4 %
6-10 Years	25	28.7 %
11-15 Years	17	19.5 %
More than 15 Years	16	18.5 %

Examining the profession, and demographic landscape Table 2: Gender Dynamics showed that men made up 67.8% of the representation, while women made up 32.2%. The dataset was enhanced by the age distribution, which demonstrated variety. Academic titles also varied, with Lecturers leading the way at 32.2%, and Assistance Professors following closely at 29%.

Iraqi Certified Public Accountants were added to the professional spectrum, with Lecturers making up the majority of this category at 13.8%. A wide range of educational backgrounds was represented among the respondents: 54% had a bachelor's degree, 29% had a master's degree, and 8% had a doctorate. The distribution of experience levels was balanced, with a sizable fraction claiming professional experience spanning 6–10 years (28.7%) and 11–15 years (19.5%).

Table 3. Employer's Profile

Profile	N	%
Industry Sector:		
Manufacturing	20	19.6 %
Financial Services.	38	37.2 %
Retail	16	15.7 %
Healthcare	11	10.8 %
Information Technology	10	9.8 %
Others	7	6.9 %
Company Size:		
Small (1-50 employees)	29	28.4%
Medium (51-250 employees)	46	45.1 %
Large (251+ employees)	27	26.5 %
Years of Operation:		
Less than 5 years	25	24.5 %
5-10 years	29	28.5 %
11-20 years	34	33.3 %
More than 20 years	14	13.7 %

Turning attention to the employer's perspective Table 3 illustrates the varied environment that developed across industrial sectors, business sizes, and years of operation. Financial Services was the most prevalent industry, accounting for 37.2% of the total. The percentage of small, medium, and large businesses was found to vary: 28.4%, 45.1%, and 26.5%, respectively. Operational lifetime differed across the firms; 33.3 % claimed to have been in operation for 11–20 years, while 13.7% had been in operation for more than 20 years.

These study results highlight the active participation of academics, especially lecturers, and assistant professors, in the complex web that constitutes the accounting field at Iraqi institutions. Financial services take center stage on the employer side, where businesses of all sizes actively participate. The variety of respondent's experience levels and educational backgrounds adds to the depth of viewpoints captured in these survey results.

Table 4. Assessing the Significance of Accounting Courses

Accounting Course	Academics		Employer	
	Mean	Rank	Mean	Rank
Principles of Accounting	4.0	1	3.8	7
Intermediate Accounting	3.8	2	3.7	9
Governmental Accounting	3.7	8	3.5	15
Accounting Software	3.6	12	3.8	6
Accounting for Non-Profit Organization	3.5	19	2.5	23
Cost Accounting	3.8	3	3.5	16
Advanced Financial Accounting	3.7	6	3.7	8
Unified Accounting System	3.6	15	3.6	11
Unified Accounting System for Banking and Insurance Industry	3.5	18	3.6	10

Taxation Accounting	3.7	5	3.6	14
Ethic in Accounting Profession	3.7	7	3.6	13
Agriculture Accounting	3.2	24	2.5	24
Accounting for Oil and Gas	3.5	20	2.9	22
Financial Statement Analysis	3.6	10	3.8	5
Accounting Information System	3.4	22	3.8	4
Advanced Cost Accounting	3.6	11	3.2	20
Managerial Accounting	3.6	14	3.9	3
Accounting Theory	3.5	20	3.3	18
Auditing	3.6	9	4.0	1
International Accounting	3.4	23	3.1	21
International Accounting Standard	3.5	17	3.4	17
Accounting for Hotel and Hospital	3.6	16	3.3	18
Accounting Application in Excel	3.7	4	4.0	2
Accounting for Companies (Partnership + Corporation)	3.6	13	3.6	12

A variety of viewpoints became apparent when we found the wider range of accounting courses, demonstrating the similarities, and differences between employers, and academics. Table 4. Presents a multidimensional environment that shapes the conversation about the alignment of accounting curriculum with market requirements in the Iraqi context. It highlights areas of agreement as well as those that require further development. Employers rate cost accounting 16th (mean 3.5), but academics rank it third (mean 3.8). Cost accounting has a crucial place. This disparity indicates that academic programs in cost accounting may need to be adjusted to better correlate theoretical ideas with real-world applications.

Although both groups favor advanced financial accounting, there are subtle differences. Employers rate it 8th (mean 3.7), while academics rank it 6th (mean 3.7), indicating a slight difference in emphasis, however a common understanding of its significance.

Employers (ranking 11th and 10th, mean 3.6), and academics (15th and 18th, mean 3.6) place different emphases on the Unified Accounting System, and the Unified Accounting System for Banking and Insurance Industry. This implies that there may be a need to harmonize viewpoints about the particular uses of Unified Accounting Systems in the workplace, and in academia.

Both parties find significance in taxation accounting, but slightly differently. Employers rate it 14th (mean 3.6), whereas academics rank it 5th (mean 3.7). This suggests that subtle improvements are needed to better match academic courses in taxation accounting with industry expectations.

Employers and academics alike put ethics in the top ten areas, demonstrating the clear convergence on the significance of ethics in the accounting profession.

Accounting for Oil and Gas and Agriculture appear to be two areas where academic emphasis may need to be adjusted further to align with

industrial standards. The difference in placement between companies (24th and 22nd), and academics (24th and 20th) suggests that there may be a need to improve the alignment of these courses with industry requirements.

Even though Financial Statement Analysis ranks in the top ten for employers (5th, mean 3.8), and academics (10th, mean 3.6), it has a subtle concentration. This implies a common understanding of its significance but with minor differences in the degree of emphasis.

Accounting Information System is ranked highly by employers, and academics (22nd and 4th, respectively), although the disparity in focus points to certain areas where academic instruction should be improved to better align with business standards.

Employers rate Advanced Cost Accounting 20th (mean 3.2), while academics rank it 11th (mean 3.6). This suggests that greater cooperation may be required to match theoretical ideas with real-world applications.

Even while both groups prioritize Managerial Accounting, there are subtle differences. While employers place it third (mean 3.9), academics put it fourteenth (mean 3.6), suggesting that there is a slight difference in the focus despite a common understanding of its significance.

Employers and academics both put auditing among the top ten disciplines, demonstrating clear congruence in their understanding of the field's significance.

Despite its importance, International Accounting and International Accounting Standard show little differences in focus between employers (ranked 21st and 17th), and academics (ranked 23rd and 20th). This raises the possibility of improving academic material to better align with industrial norms and worldwide accounting standards.

For both groups, accounting for Hotels and Hospitals is ranked in the middle, indicating a mutual understanding of its significance without clear differences in priority.

One area where businesses and academics agree is on the importance of accounting applications in Excel, which is highlighted in the top rankings.

Lastly, Accounting for Companies (Partnership + Corporation) illustrates a subtle distinction, although being important for employers, and scholars alike. Employers place it 12th (mean 3.6), while academics put it 13th (mean 3.6), indicating that there is a slight difference in emphasis, but a common understanding of its significance.

To sum up, the thorough examination of these accounting courses offers a nuanced picture of the subtle distinctions and shared interests between companies, and academics. These observations provide insightful advice on how to improve academic programs so that they are in harmony with the ever-changing demands of the accounting industry in Iraq.

Table 5. Assessing the Significance of Non-Accounting Courses

Non-Accounting Course	Academics		Employer	
	Mean	Rank	Mean	Rank
Principles of Management	3.0	9	3.6	5
General English Language	3.4	2	3.9	3
English for Accounting	3.8	1	3.6	6
Principles of Economics	2.9	11	3.3	10
Kurdology+ Human Right	2.4	16	2.5	16
Financial Mathematics	2.9	12	2.9	12
Computer Skills	3.2	6	4.0	1
Principles of Statistics	2.8	15	2.8	15
Academic Debate	2.9	13	2.9	14
Commercial Law	3.1	7	3.4	8
Operation Research	3.0	10	2.9	13
Research Methods	3.0	8	3.1	11
Production and Operation Management	2.9	14	3.3	9
Marketing	3.2	4	3.8	4
Financial Management	3.2	4	3.9	2
E-Commerce	3.0	3	3.5	7

Table 5. Presents a range of viewpoints from employers, and academics, highlighting common interests, and subtle distinctions. The answers go beyond the specifics of accounting classes and offer insightful information on how wider academic programs might be tailored to meet market demands in the Iraqi setting. One area of agreement is shown in the top ten rankings, where employers and academics alike acknowledge the importance of Principles of Management.

While both groups rank highly in the general English Language, there are subtle differences. Employers place it third (mean 3.9), while academics put it second (mean 3.4), suggesting that both groups recognize its significance, but with slightly different weights.

Academics and companies alike emphasize the importance of English for Accounting, making it stand out as a shared priority among the top ranks.

Principles of Economics exhibits a minor discrepancy in focus despite being valued by employers, and academics alike. Employers rate it 10th (mean 3.3), while academics rank it 11th (mean 2.9), indicating a shared understanding with a little focus difference.

Financial Mathematics, Kurdology, and Human Rights stand out as subjects where further adjustment of the academic focus may be necessary to align with industrial standards. The differences in placement between companies (16th and 12th) and academics (16th and 16th) suggest that there may be a need to improve the alignment of these courses with industry requirements.

There is general agreement that Computer Skills are highly valued by employers, and academics, indicating their central place in the professional environment.

Principles of Statistics is important to both groups, indicating that there are no clear differences in how important they think it is.

Employers and academics alike value Academic Debate and Commercial Law, which is shown in their joint positions among the top ten.

While it is important for both groups, Operation Research reveals a subtle distinction. It is ranked 13th (mean 2.9) by employers, and 10th (mean 3.0) by academics, indicating areas where academic courses should be improved to better align with industry standards.

Despite being regarded by both groups, Research Methodology reveals a subtle distinction. Employers place it 11th (mean 3.1), whereas academics put it eighth (mean 3.0), suggesting that while employers and academics agree on its significance, their emphasis is slightly different.

Employers and academics alike enthusiastically endorse Production and Operation Management, Marketing, and Financial Management, demonstrating their shared understanding of the course's importance among the best.

Academics and employers alike emphasize the importance of E-commerce, making it stand out as a common priority in the top ranks.

All things considered, non-accounting courses offer a comprehensive awareness of common goals, and minute distinctions in focus between companies, and academics. Beyond the confines of accounting-specific education, these findings provide invaluable direction for improving academic curriculum to achieve a harmonic alignment with the evolving needs of the Iraqi professional world.

Table 6. Proficiency and Ranking of Skills

Skills	Academics		Employer	
	Mean	Rank	Mean	Rank
Computer Proficiency	3.1	5	4.0	2
Language competency	3.1	12	3.1	24
Critical Thinking	3.0	22	2.9	29
Problem-Solving skills	3.2	3	3.8	6
Flexibility and Adaptability	3.1	8	3.8	8
Creativity and Innovation	2.9	27	3.6	11
Time Management	3.1	8	4.1	1
Public Speaking	3.0	24	3.1	23
Written Communication	2.9	28	3.4	17
Verbal Communication	2.9	29	2.9	28
Documentation skills	3.0	20	3.4	14
Information Analysis	3.0	20	3.3	21
Information Gathering	3.1	12	3.2	22

Regulatory Compliance	3.0	26	3.4	15
Concentration and Focus	3.2	2	3.3	19
Capability to work Independently	3.1	11	3.3	20
Cultural Assimilation	3.2	1	3.1	26
Alignment with Values	3.0	25	3.4	17
Applied Knowledge	3.1	12	3.1	25
Organizational Understanding	3.1	12	3.1	27
Teamwork	3.1	5	3.8	4
Leadership	3.1	18	3.8	5
Negotiation Skills	3.1	12	3.4	15
Motivational Abilities	3.1	12	3.9	3
Dedication to Job	3.1	8	3.6	12
Continuous Learning	3.2	4	3.8	6
Knowledge Sharing	3.0	23	3.6	13
Strategic Planning	3.0	19	3.7	9
Performing under Pressure	3.1	7	3.7	10

Employer's and academic's perceptions of the complex tapestry of abilities show subtle differences as well as harmonic intersections. When looking for a common ground, Computer Proficiency comes up as a crucial agreement point. Employers, with a mean of 4.0, and a rating of 2, emphasize its critical relevance, in line with academics, who have a mean of 3.1, and a rank of 5.

However, there is a subtle difference when it comes to Language Competency. Employers rank it at 24th (mean 3.1), while academics rank it at 12th (mean 3.1). This suggests that academic focus may be improved to better align with industrial standards.

A little distinction becomes apparent when the focus turns to Critical Thinking. Employers rate it 29th (mean 2.9) while academics rank it 22nd (mean 3.0), indicating a chance for academic courses to go further into developing this critical ability.

The Problem-Solving skills landscape shows that employers (mean 3.8, rank 6), and academics (mean 3.2, rank 3) all regard Problem-Solving skills as highly important, indicating a consensus on their critical importance.

Employers rank creativity, and innovation at 11th (mean 3.6), whereas academics rank it at 27th (mean 2.9). This indicates that there is a need for academic improvement in order to keep up with industrial standards.

The ability that demands a careful balance between academic attention, and practice is Public Speaking. Employers rate it 23rd (mean 3.1), but academics rank it 24th (mean 3.0), suggesting room for improvement in academic instruction.

There are similarities between Written and Verbal Communication, however, there are also little differences. Employers rank these abilities 17th

and 28th, respectively, but academics rank them 28th and 29th, indicating possible areas for academic improvement.

A subtle distinction is revealed by regulatory compliance. It is ranked 26th (mean 3.0) by academics, and 15th (mean 3.4) by employers, indicating that there is a need, for academic improvement to match industrial standards.

Applied Knowledge, Organizational Understanding, Teamwork, Leadership, Negotiation Skills, Motivational Abilities, Dedication to the work, Continuous Learning, Knowledge Sharing, Strategic Planning, and Performing under Pressure are all echoed by unified priorities that include Concentration and Focus, Ability to Work Independently, Cultural Assimilation, Alignment with Values, and Teamwork.

In summary, this examination of talents demonstrates the diversity, and unity of viewpoints held by businesses, and academics. These observations offer a compass for academic programs to more accurately match the complex requirements of Iraq's professional environment, producing graduates with a well-rounded skill set that melds smoothly with industry standards.

Conclusion

In summary, this study highlights how crucial it is to match accounting curricula to the changing demands of the industry, especially in the context of Iraq. The results emphasize how important it is to have an accounting curriculum that is well-structured and meets the many needs of the working world. A wide range of stakeholders, including academics, employers, and professionals, were included in the research in order to thoroughly evaluate the degree to which academic offers and industry expectations correspond.

The examination of accounting curricula identified both places where employer expectations and academic viewpoints diverged, and overlapped. Important classes like Advanced Financial Accounting and Cost Accounting brought to light any theoretical, and practical shortcomings, indicating that the curriculum at academic institutions needs to be improved. The survey also noted the value of particular courses, such as Managerial Accounting and Auditing, which were underlined by employers and academics alike.

The study included non-accounting courses in addition to accounting courses, offering a more comprehensive view of how academic curricula correspond. Courses like Principles of Economics and Financial Mathematics showed subtle differences in focus, whereas Principles of Management and General English Language emerged as common priorities.

In addition, the examination of critical abilities exposed a complex web of common interests and minute distinctions. Employers and academics agreed that Problem-Solving and Computer Proficiency were essential abilities. Variations were seen, meanwhile, in areas like language competency

and creativity and innovation, indicating areas where academics may improve to better match industrial standards.

The study's conclusions offer insightful recommendations for raising the caliber and applicability of accounting education in Iraq. It is suggested that particular course alignments be improved, that a more thorough comprehension of fundamental abilities be fostered, and that curricula be regularly modified to meet the changing demands of the workforce. Universities in Iraq can better prepare graduates, increasing their employability and enabling them to make significant contributions to the economy, by bridging the gap between academics, and industry. The organized approach of the study and the involvement of many stakeholders resulted in evidence-based suggestions for curriculum enhancement, providing the groundwork for an increasingly adaptable, and successful accounting education system in Iraq.

Recommendations

Many suggestions are made for a thorough improvement of the system in light of the results showing the discrepancies between accounting education in Iraqi institutions, and the demands of businesses.

First and foremost, there is a pressing need for an organized, and regular evaluation of the accounting curriculum, one that involves working with employers, alumni, and industry experts. The curriculum will stay dynamic and in line with the changing needs of the labor market thanks to this iterative approach. Furthermore, it is essential to incorporate real-world case studies, and practical applications into accounting courses in order to close the knowledge gap between theory and practice.

Another important suggestion is to strengthen the connections between academics, and business through guest lectures, seminars, and internships. Students will be exposed to real-world situations through this cooperative project, which will deepen their comprehension of industry dynamics, and provide networking chances with possible employers.

Furthermore, chances for ongoing professional development are crucial for accounting instructors to stay current with technology innovations, market trends, and regulatory changes. This will improve their ability to provide pupils with current and pertinent material.

A wider range of abilities, such as critical thinking, communication, creativity, and flexibility, should be prioritized in the curriculum to match the changing nature of the accounting industry. This will improve the graduate's general employability, and readiness to face a variety of issues in the workplace.

Given the worldwide character of corporate processes, special emphasis should be paid to implementing a particular focus on international accounting

standards. This integration can be facilitated by cooperation with international accounting organizations, and entities.

It is also essential to modify the curriculum to incorporate new technologies like big data analytics and Industry 4.0 tools. Graduates will have the abilities required for the increasingly technologically-driven corporate world thanks to this.

The relevance of the curriculum can be increased by providing industry-driven optional courses that are developed after frequent talks with experts, and employers. It is essential to maintain ongoing stakeholder involvement through surveys and focus groups in order to get insights into the evolving demands of the business and make appropriate curriculum revisions.

Developing soft skills through workshops, seminars, and extracurricular activities should be prioritized. These abilities include teamwork, leadership, and effective communication. With this all-encompassing approach, graduates will not only be highly skilled technically but also in interpersonal and leadership domains.

Graduates will be prepared for worldwide employment prospects by incorporating a global perspective into the curriculum through exposure to varied accounting methods, and foreign case studies.

Last but not least, putting in place a methodical procedure for tracking accounting graduate's professional results, including performance indicators, and employer input, would offer insightful information about how well the curriculum is working.

Iraqi colleges may improve the caliber, and applicability of their accounting programs by putting these suggestions into practice, turning out graduates who are prepared to take on the ever-changing needs of the workforce.

References:

1. Aldredge, M., Rogers, C., & Smith, J. (2020). The strategic transformation of accounting into a learned profession. *Industry and Higher Education, 35*(2), 83-88.
2. Cunha, T., Martins, H., Carvalho, A., & Carmo, C. (2022). Not Practicing What You Preach: How Is Accounting Higher Education Preparing the Future of Accounting. *Education Sciences, 12*(7), 432.
3. Dolce, V., Emanuel, F., Cisi, M., & Ghislieri, C. (2020). The soft skills of accounting graduates: perceptions versus expectations. *Accounting Education, 29*(1), 57-76.
4. Gray, F., & Murray, N. (2011). 'A distinguishing factor': Oral Communication Skills in New Accountancy Graduates. *Accounting Education, 20*(3), 275-294.
5. Mandilas, A., Kourtidis, D., & Petasakis, Y. (2014). Accounting curriculum and market needs. *Education+ Training, 56*(8-9), 776-794.
6. Al-anbagi1, A. T., Al-azzawi, N. S., & Al-obaidi, H. H. (2018). Compliance with International Education Standards (IES 2) in Iraq towards the Adoption of International Accounting Standards. *Opcion, 34*(86), 2456-2469.
7. Alshbili, I., & Elamer, A. (2020). The vocational skills gap in accounting education curricula: empirical evidence from the UK. *International Journal of Management in Education, 14*(3), 271-292.
8. Anastasiu, L., Anastasiu, A., Dumitran, M., Crizbo, C., Holmaghi, A., & Roman, M. (2017). How to Align the University Curricula with the Market Demands by Developing Employability Skills in the Civil Engineering Sector. *Education Sciences, 7*(3), 74.
9. Andiola, L., Masters, E., & Norman, C. (2020). Integrating technology and data analytic skills into the accounting curriculum: Accounting department leaders' experiences and insights. *Journal of Accounting Education, 50*(100655).
10. Asonito, S., & Hassall, T. (2019). Which skills and competences to develop in accountants in a country in crisis? *The International Journal of Management Education, 17*(3), 100308.
11. Awayiga, J., Onumah, J., & Tsamenyi, M. (2010). Knowledge and Skills Development of Accounting Graduates: The Perceptions of Graduates and Employers in Ghana. *Accounting Education, 19*(1-2), 139-158.
12. Ballou, B., Heitger, D., & Stoel, D. (2018). Data-driven decision-making and its impact on accounting undergraduate curriculum. *Journal of Accounting Education, 44*, 14-24.
13. Barisic, I., Novak, A., & Sever Malis, S. (2021). Professional Accountants Skills Expected from Accounting Employers – Evidence

from Recent Research. *Proceedings of FEB Zagreb 12th International Odyssey Conference on Economics and Business. 3*, pp. 14-27. University of Zagreb, Faculty of Economics and Business.

14. Bedan, S. (2022). Higher Education in Iraq between the Past and the Present. *Journal of Positive School Psychology, 6*(4), 4718-4731.

15. Carr, S., Chua, F., & Perera, H. (2006). University Accounting Curricula: The Perceptions of an Alumni Group. *Accounting Education, 15*(4), 359-376.

16. Carvalho, C., & Almeida, A. (2022). The Adequacy of Accounting Education in the Development of Transversal Skills Needed to Meet Market Demands. *Sustainability, 14*(10), 5755.

17. Cheng, Y. (2019). Research on the Reform of Accounting Course System Guided by Accounting Education Objectives. *In 1st International Symposium on Education, Culture and Social Sciences (ECSS 2019)*, 468-472.

18. Douglas, S., & Gammie, E. (2019). An investigation into the development of non-technical skills by undergraduate accounting programmes. *Accounting Education, 28*(3), 304-332.

19. Dzuranin, A., Jones, J., & Olvera, R. (2018). Infusing data analytics into the accounting curriculum: A framework and insights from faculty. *Journal of Accounting Education, 43*, 24-39.

20. Gammie, B., Gammie, E., & Cargill, E. (2002). Personal skills development in the accounting curriculum. *Accounting Education, 11*(1), 63-78.

21. Ghani, M. A., & Suryani, A. W. (2020). Professional Skills Requirements for Accountants: Analysis of Accounting Job Advertisements. *Jurnal ASET (Akuntansi Riset), 12*(2), 212-226.

22. Gray, R., & Collison, D. (2002). Can't see the wood for the trees, can't see the trees for the numbers? Accounting education, sustainability and the Public Interest. *Critical Perspectives on Accounting, 13*(5-6), 797-836.

23. Howcroft, D. (2017). Graduates' vocational skills for the management accountancy profession: exploring the accounting education expectation-performance gap. *Accounting Education, 26*(5-6), 459-481.

24. Howieson, B. (2003). Accounting practice in the new millennium: is accounting education ready to meet the challenge? *The British Accounting Review, 35*(2), 69-103.

25. Hussein, A. (2017). Importance of Generic Skills in Accounting Education: Evidence from Egypt. *International Journal of Accounting and Financial Reporting, 7*(2), 16-35.

26. Hussin, S., Wan, N., Abdullah, A., Aziz, A., Razak, S., San, S., Tumiran, S. (2023). Accounting Students' Knowledge and Skills: Expectations of Employers. International Journal of Modern Education *(IJMOE), 5*(17), 210-219.

27. Jabbar, N. S., & Shnawa, N. S. (2021). The role of international accounting education standards in developing accounting education programs in Iraq (An analytical study). *Al-Qadisiyah Journal for Administrative and Economic Sciences, 23*(2), 93-105.

28. Jackling, B., & Lange, P. (2009). Do Accounting Graduates' Skills Meet the Expectations of Employers? A Matter of Convergence or Divergence. *Accounting Education, 18*(4-5), 369-385.

29. Kassim, C. K. (2014). Accounting Education Change: Improving the Quality of Accounting Graduates. *Journal of Applied Environmental and Biological Sciences, 4*(6S), 1-7.

30. Kavanagh, M., & Drennan, L. (2008). What skills and attributes does an accounting graduate need? Evidence from student perceptions and employer expectations. *Accounting & Finance, 48*(2).

31. Liang, Q., & Zhao, H. (2022). Research on Teaching Reform of Finance and Accounting Major in Applied University under the Background of New Business: Take LNSF College for Example. *Curriculum and Teaching Methodology, 5*(7), 57-64.

32. Lightweis, S. (2014). Bridging the Gap between Accounting Students and the Profession: A Case Study. *Higher Education Studies, 4*(5), 18-27.

33. Mohamed, E., & Lashine, S. (2003). Accounting knowledge and skills and the challenges of a global business environment. *Managerial Finance, 29*(7), 3-16.

34. Ozturk, I. (2001). The role of education in economic development: a theoretical perspective. *Journal of Rural Development and Administration, XXXIII* (1), 39-47.

35. Pan, P., & Perera, H. (2012). Market relevance of university accounting programs: Evidence from Australia. *Accounting Forum, 36*(2), 91-108.

36. Rajeevan, S. (2020). Accounting: the teaching, the practice and what is missing. *Vilakshan-XIMB Journal of Management, 17*(1/2), 15-37.

37. Sahlberg, P. (2006). Education reform for raising economic competitiveness. *Journal of Educational change, 7*, 259-287.

38. Salih, A. I., & Ahmed, A. Y. (2018). The Role of The Labor Market in Improving the Quality of Accounting Education an Exploratory Research the Opinions of a Sample of Professionals and Academics in The Field of Accounting in The Province of Duhok. *Academic Journal of Nawroz University, 7*(2), 10-30.

39. Sin, S., Jones, A., & Wang, Z. (2015). Critical Thinking in Professional Accounting Practice: Conceptions of Employers and Practitioners. *The Palgrave handbook of critical thinking in higher education*, 431-456.

40. Stanciu, V., Pugna, I., & Gheorghe, M. (2020). New coordinates of accounting academic education. A Romanian insight. *Accounting and Management Information Systems, 19*(1), 158-178.

41. Tan, L., & Laswad, F. (2018). Professional skills required of accountants: what do job advertisements tell us? *Accounting Education, 27*(4), 403-432.

42. Towers-Clark, J. (2015). Undergraduate accounting students: prepared for the workplace? *Journal of International Education in Business, 8*(1), 37-48.

43. Venter, E. (2001). A constructivist approach to learning and teaching. *South African Journal of Higher Education, 15*(2), 86-92.

44. Villiers, R. d. (2010). The incorporation of soft skills into accounting curricula: preparing accounting graduates for their unpredictable futures. *Meditari Accountancy Research, 18*(2), 1-22.

45. Webb, J., & Chaffer, C. (2016). The expectation performance gap in accounting education: a review of generic skills development in UK accounting degrees. *Accounting Education, 25*(4), 349-367.

46. Zhang, Abigail, C., Dai, J., Vasarhelyi, & Miklos A. (2018). The Impact of DisruptiveTechnologies on Accounting and Auditing Education: How Should the Profession Adapt? *The CPA Journal, 88*(9), 20-26.

Appendix

Please provide ratings for the following courses based on their level of importance, using a scale from 1 (Not Important) 2 (Somewhat Important), 3 (Moderately Important), 4 (Important), 5 (Very Important).

Accounting Courses	1	2	3	4	5
Principles of Accounting					
Intermediate Accounting					
Governmental Accounting					
Accounting Software					
Accounting for Non-Profit Organization.					
Cost Accounting					
Advanced Financial Accounting					
Unified Accounting System					
Unified Accounting System for Banking and Insurance Industry					
Taxation Accounting					
Ethic in Accounting Profession					
Agriculture Accounting					
Accounting for Oil and Gas					
Financial Statement Analysis					
Accounting Information System					
Advanced Cost Accounting					
Managerial Accounting					
Accounting Theory					
Auditing					
Internatinal Accounting					
International Accounting Standard					
Accounting for Hotel and Hospital					
Accounting Application in Excel					
Accounting for Companies (Partnership + Corporation)					
Nonaccounting Courses	1	2	3	4	5
Principles of Management					
General English Language					
English for Accounting					
Principles of Economic					
Kurdology + Human Rights					
Financial Mathematic					
Computer Skills					
Principles of Statistics					
Academic Debate					
Commercial Law					
Operation Research					
Research Method					
Production and Operation Management					
Marketing					
Financial Management					
E-Commerce					

Do you believe that the education and training of employees should include these skills, as indicated on a rating scale? 1 (Not Important) 2 (Somewhat Important), 3 (Moderately Important), 4 (Important), 5 (Very Important).

Skills	1	2	3	4	5
Proficiency in fundamental computer tools such as internet browsing and office software.					
Language competency					
Critical thinking proficiencies					
Problem-solving skills					
Flexibility and adaptability to navigate new circumstances					
Demonstrating creativity and innovative thinking					
Efficient time management skills					
Proficiency in public speaking					
Strong written communication skills					
Effective verbal communication aptitude					
Documentation skills for capturing ideas and making decisions					
Proficiency in analyzing and interpreting information					
Competence in gathering and organizing information					
Compliance with rules and regulations					
Ability to concentrate and focus effectively					
Capability to work independently					
Ability to assimilate and integrate into a company's culture					
Alignment with the company's image and values					
Ability to apply theoretical knowledge in practical contexts					
Understanding of organizational frameworks and structures					
Effective teamwork and collaboration skills					
Leadership capabilities and qualities					
Proficiency in negotiation and conflict resolution					
Motivational abilities to inspire and encourage others					
Demonstrating personal dedication and commitment to the job					
Dedication to continuous learning and growth					
Willingness to share knowledge and resources with others					
Strategic planning, coordination, and organizational skills					
Performing effectively under pressure					