From Infrastructure to Growth: Evaluating PPP Investments in Morocco

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Abstract

This study investigates the impact of public–private partnerships (PPPs) on Morocco's economic growth over the period 1993–2023. GDP growth is employed as the dependent variable, with the number of PPP projects, PPP investment, gross fixed capital formation, unemployment, and inflation as explanatory variables. Using the Autoregressive Distributed Lag (ARDL) technique, the analysis captures both short-run and long-run dynamics. Results indicate that in the long run, PPP investment exerts a positive and significant effect on GDP growth, whereas the number of PPP projects has a negative impact, suggesting that project proliferation without efficiency may hinder performance. Gross fixed capital formation positively and significantly contributes to growth, while inflation exerts a negative and significant influence. Unemployment, although negative, is statistically insignificant in the long run. In the short run, PPP projects contribute positively, while unemployment consistently reduces growth. Gross fixed capital formation positively and significantly contributes to growth, while inflation exerts a negative and significant influence. Unemployment, although negative, is statistically insignificant in the long run. Robustness tests confirm the absence of serial correlation, heteroskedasticity, and non-normality, while

CUSUM and CUSUMQ verify model stability. These findings highlight that investment quality, rather than project frequency, is the key driver of Morocco's long-run growth, underscoring the need for governance and efficiency-centered PPP strategies.

Keywords: Public–Private Partnerships, GDP growth, ARDL, Morocco, Investment

Introduction

In recent years, governments in both developed and developing countries have faced growing challenges to finance infrastructure and development projects. The persistence of budget deficits, the risen public debt levels and the necessity to allocate essential resources for urgent social sectors such as health, education and social protection, have reduced their ability to maintain long-term investment in infrastructure. These fiscal pressures have been aggravated by the enduring impacts of the 2008 global financial crisis, the Eurozone debt crisis and more recent global shocks as the COVID19 pandemic and geopolitical uncertainty. In this context, governments are facing growing pressure to identify innovative financing tools that have the capacity to overcome infrastructure needs while preserving fiscal discipline.

In response to these challenges, Public–Private Partnerships (PPPs) have emerged as one of the most chosen tools used to mobilize the participation of the private sector in infrastructure and public service delivery. The combination of public oversight with private capital, expertise and risk-sharing arrangements, PPPs are expected to improve the quality and efficiency of infrastructure

PPPs are expected to improve the quality and efficiency of infrastructure while also contributing to economic growth. First developed in Anglo-Saxon countries (Chen & Man, 2020), the PPP model expanded in a significant way during the late 20th and early 21st centuries, that way becoming an important and even key policy instrument across Europe, Asia, Africa and beyond (Uddin & Aktir, 2021)."

International organizations have also contributed in the subject by playing a great role in clarifying and standardizing the concept. The World Bank Institute (2012) defines a PPP as "a long-term contract between a private party and a government agency for providing a public asset or service, in which the private party bears significant risk and management responsibility." Similarly, the OECD (2025) presents PPPs as a "long-term agreement between government and private partners whereby the private partner delivers and funds public services using a capital asset, sharing the associated risks."

From this perspective, PPPs are more and more recognized as effective growth tools; in this sense, the World Bank (2016) stated that well-structured

PPPs can play a decisive role in helping to overcome infrastructure constraints that hinder growth, particularly in developing economies. Likewise, the Asian Development Bank (Dordevic & Rakic, 2021) highlights the great benefits of PPPs, going from increased access to infrastructure and strengthening institutional and technical capacities, to improved transparency, management practices, better source allocation of public funds and the attraction of private capital into long-run investment projects.

Despite the expected benefits, the literature shows that the outcomes of PPPs on economic growth are far from being universal, which makes this a complex and debated issue. While various studies confirm their potential to support economic growth, others point to weak or even negative effects. For instance, Amedanou and Yawovi (2023) show that PPPs in Sub-Saharan Africa surpass traditional public investments by improving the quality and efficiency, that way they exerting a stronger positive influence on growth. Meanwhile, Yurdakul & al. (2020) identify only a weak link between PPP activity and GDP. Furthermore, Pimentel & al. (2016) stipulate that in Portugal, PPP investments led to crowding-out effects on both public and private investment, which produced a negative impact on GDP. These divergent and various results highlight the fact that the effectiveness of PPPs depends on sectoral allocation, the institutional and governance framework, and the global macroeconomic context in which these projects are integrated.

While the literature offers valuable insights into the potential of PPPs as tools for growth, important gaps remain. First, to the best of our knowledge, many of the existing studies are focusing on regions such as Asia, Sub-Saharan Africa, or the Eurozone, often with varying findings depending mainly on sectoral focus, methodological approaches, or institutional contexts. Evidence for North African economies, and Morocco in particular, is still limited despite the country's growing dependence on PPPs to finance strategic infrastructure projects. Second, this study examines both long-run equilibrium relationships and short-run dynamics by mobilizing the Autoregressive Distributed Lag (ARDL) approach. The ARDL is a robust econometric approach, and is suitable for small samples and mixed order integration of variables. Third, this study not only provides new evidence on the role of PPPs in the economic growth of Morocco, but also offers valuable insights for other emerging economies that are confronting similar fiscal and infrastructure challenges.

The structure of this study is organized as follows. The next section presents the case of PPPs in Morocco, followed by a comprehensive overview of the relevant literature. Then, the specification of the model equations and data employed. The empirical findings and insights are described. Finally, the study presents a concise summary of the key findings and suggestions for policy implications, and the next section discusses the empirical results and their implications.
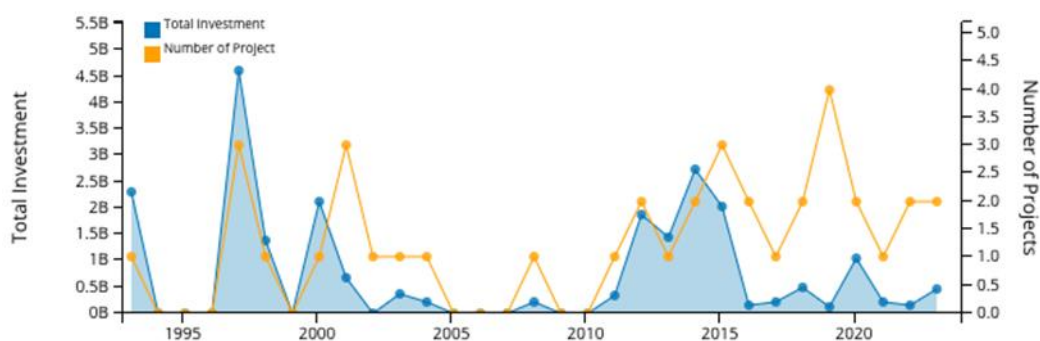
PPPs in Morocco

Public–Private Partnerships in Morocco have their roots in the early 20th century. According to the Economic, Social and Environmental Council (CESE) in its report on Law 86-12, in 1914 Morocco introduced concession contracts in strategic and vital sectors such as drinking water supplies, railways and port infrastructure. In 1956, after independence, these concessions were progressively transferred to state-owned enterprises, in the process of nationalization.

A new emergence of PPPs occurred during the 1990s, when private operators were reintroduced in the management of public services. It is particularly over the last two decades that PPPs won more national visibility, especially with major projects such as the Tangier Med port, the Noor Ouarzazate solar power plant and other major transport infrastructure. This improvement was shaped by many major factors, such as the fragility of public finances, which limited Morocco's ability to finance infrastructure by mobilizing traditional budgetary resources, the erosion of confidence in the state-led technocratic model and the continuously growing public demand for a higher and better quality of services.

According to the United Nations Conference on Trade and Development (UNCTAD, 2016), Morocco occupies the second position in Africa, recording cumulative investments of USD 27.5 billion, after Nigeria (USD 37.9 billion) and ahead of South Africa (USD 25.6 billion). This reflects Morocco's strategic approach to mobilize private investment to complement public financing to develop infrastructure.

Fig. 1. PPP investment and project trends in Morocco

Source: PPI Visualization Dashboard - The World Bank & PPIAF

Figure 1 presents the evolution of PPP development in Morocco from 1993 to 2023, revealing notable fluctuations in both the number of projects and the volume of investment. The data show variability throughout the period, with clear peaks and downturns. Investment activity experienced a major surge between 2012 and 2015, with annual commitments surpassing

USD 2 billion, largely driven by the launch of capital-intensive infrastructure projects. This phase was followed by a slowdown in 2016–2017. PPP activity then showed a modest recovery between 2019 and 2021, before registering another decline in recent years, which reflects broader economic constraints and changes in national investment priorities.

Literature review

Public–private partnerships (PPPs) are widely regarded as long-term contractual arrangements in which a government delegates the provision of a public good or service to a private operator involving a significant transfer of risk and managerial responsibilities (World Bank Institute, 2012). To understand how PPPs function and perform, the literature draws on three key theoretical frameworks: transaction cost theory, incomplete contract theory, and agency theory. Together, these approaches explain the contractual complexity, incentive structures, and governance challenges that shape PPP outcomes.

Transaction cost theory (Coase, 1937; Williamson, 1973, 1985) argues that economic transactions generate costs linked to negotiating, supervising, and adapting contracts. In PPP arrangements, these costs tend to be elevated because they rely on long-term and complex contracts that span the entire infrastructure life cycle. The inherent complexity of PPPs, combined with uncertainty and information asymmetry, reinforces the need for monitoring and repeated renegotiation. Williamson highlights three main determinants of transaction costs: Asset specificity – PPP investments are highly specialized and cannot be redeployed elsewhere, increasing dependence and risks of opportunism. Uncertainty – economic, technological, and institutional volatility makes contracts inherently incomplete and more susceptible tp renegotiation, and finally, Transaction frequency – PPP projects are infrequent and infrequent, requiring strong governance systems. Overall, PPPs require robust institutional and contractual arrangements to effectively manage and limit transaction costs.

The incomplete contract theory holds that PPP contracts cannot account for every future contingency because of limited information and rationality (Hart & Moore, 1990). As a result, residual control rights—the ability to decide in unexpected situations—become crucial for determining project performance. Within PPPs, the private partner faces a choice between productive investments, which reduce costs while maintaining service quality, and non-productive investments, which cut costs but lower quality (Hart, 1997). Since contracts cannot fully rule out such behavior, the way rights and responsibilities are distributed is essential for aligning private incentives with public goals. This perspective helps explain why PPP outcomes vary

depending on contract design and the ability of public authorities to regulate and limit opportunistic behavior.

Agency theory (Jensen & Meckling, 1976) examines PPPs through the problem of information asymmetry between the public authority and the private operator. It underscores two major risks: Adverse selection, which arises before contracting, when the public sector must choose a partner without full knowledge of their actual capabilities. Moral hazard after the contract, when the private operator may reduce effort, overlook maintenance, or under-invest in quality due to limited monitoring (Laffont & Tirole, 1993). To limit these risks, PPPs incorporate performance-based clauses, payment systems tied to quality outcomes, and regular audits. Empirical evidence shows that these mechanisms—when supported by strong institutional oversight—ensure transparency, efficiency, and long-term project sustainability. Agency theory, therefore, highlights the need for well-designed incentives and monitoring frameworks to align private actions with public objectives.

These theories are reflected in a growing number of empirical studies. The relationship between Public–Private Partnerships (PPPs) and economic growth has attracted significant academic attention, yet the evidence remains divergent and far from being conclusive. While many studies highlight the developmental benefits of PPPs, others question their effectiveness, mentioning the methodological limitations, contextual differences and different institutional environments. Consequently, the literature offers no unified position regarding whether PPPs enhance economic growth, making further country-specific analysis necessary and timely.

A first group of studies advocates the perspective that PPPs contribute positively to growth, particularly through improvements in infrastructure provision and efficiency gains. In Asia, Lee & al. (2018) show that higher PPP-to-GDP ratios promote infrastructure accessibility and quality. Their study also reveals indirect macroeconomic benefits, indicating that when PPPs meet their objectives, governments can reallocate scarce fiscal resources to social sectors while mobilizing long-term private savings through pension and insurance funds. However, their analysis focuses mainly on aggregate indicators and does not totally address causality, raising the possibility that stronger economies attract more PPP projects. Similarly, Atapattu (2019) highlights that PPPs support growth in a significant way in nine Asian countries between 1990 and 2015, yet the study treats Asian countries as a homogeneous block despite various and wide institutional disparities that can influence PPP results.

In Africa, Amedanou and Yawovi (2023) report that PPPs outperform traditional public investment by improving the quality of service and expanding financing sources across a panel of 14 Sub-Saharan African economies. While their findings are promising, they depend on cross-country

regressions that can possibly suffer from endogeneity and measurement inconsistencies in PPP data. Within the same perspective, Mofokeng & al. (2023) find strong multiplier effects of PPP investments in the energy sector in 35 developing economies from 1997 to 2018. However, their sector-specific focus restricts the generalization of findings, the energy PPPs tend to be large, financially structured projects and do not reflect the performance of PPPs in social infrastructure or urban services. In the case of Morocco, Loukili & al. (2025) find a long-term positive and significant effect of PPP investment on Morocco's economic growth, offering important country-level evidence on the developmental role of PPPs. Their analysis, done at a macroeconomic level, provides an overview of the aggregate link between PPPs and GDP.

A growing body of recent empirical contributions attempted to uncover causal links between PPPs and growth employing more advanced econometric methods. Liu & al. (2024) used a difference-in-differences approach in Chinese cities and find that PPP adoption increases real GDP per capita by 2.9%, driven by increased investment, employment and human capital accumulation. Although the causal design significantly improves identification, the study is geographically specific and influenced by China's administrative structure and strong central coordination, which represent conditions not necessarily applicable in other developing countries. Yeboah (2024) argues that PPPs in sustainable building projects promote growth through technology transfer, financial mobilisation and job creation. Nevertheless, this study is conceptually oriented and does not provide long-term macroeconomic estimates. Gupta and Sharma (2024), focused on cross-country panel of 114 emerging economies, concluding that PPP attractiveness is highly dependent on market size, macroeconomic stability and regulatory quality, suggesting that the positive effects of PPPs are conditional, not automatic. Finally, Baba & al. (2025) provide the finding that PPP-driven energy infrastructure in BRICS economies decreases poverty and unemployment while enhancing long-term growth.

In contrast, a second strand of the literature warns against concluding that PPPs generate positive economic effects. Yurdakul and Kamasa (2020), examining the Moroccan case, find only a weak link between PPPs and growth, suggesting that other macroeconomic variables, such as debt dynamics, governance constraints, or investment efficiency, can dominate the economic performance. Meanwhile, Liu & al. (2022), focused on 52 studies on PPPs in smart cities, caution that in economies facing high or unsustainable debt burdens, PPPs can hinder fiscal vulnerabilities and undermine growth. Their systematic review also highlights a lack of long-term evaluation frameworks, with most studies assessing PPPs during early implementation and not over their full life cycle. Zuo (2024) adds more complexity by showing that PPP adoption in Chinese prefectures can negatively affect economic

performance. This suggests that PPPs may not only fail to deliver expected outcomes but may, in some cases, lead to structural inefficiencies.

Collectively, the literature reveals various elements that help explain why results on the PPP and growth relationship remain mixed. Firstly, many studies use macroeconomic data, which is appropriate for capturing aggregate trends but can make it difficult in some cases to fully address issues such as endogeneity or reverse causality. Secondly, regional and institutional characteristics are not always incorporated into empirical models, even if factors such as regulatory quality, governance arrangements, institutional capacity and fiscal conditions can strongly influence PPP performance. Incorporating these aspects helps clarify why outcomes differ between economies and highlights the importance of context-specific analysis. Lastly, the literature is generally done on Asia and large emerging economies, leaving North Africa, and particularly Morocco, relatively understudied despite the country's growing reliance on PPPs to face infrastructure needs.

Although many contributions advocate the potential of PPPs to promote economic growth through improved infrastructure delivery, efficiency gains and financing diversification, a significant body of research underscores the mixed or adverse effects, especially in settings characterized by weak governance, high debt burdens, or institutional fragility. These divergent findings show evidence that PPPs cannot be considered a universal tool for stimulating growth. Rather, their effectiveness depends on a complex interaction of economic, institutiona,l and project-specific factors. Due to this unresolved debate and the lack of robust empirical evidence for Morocco, a focused examination of the Moroccan case is necessary and justified to understand how PPPs operate and under what conditions they can effectively contribute to sustainable economic growth.

In light of the previous results of the empirical findings, our hypothesis to be tested is:

Hypothesis: Public-private partnership investments are positively related to Morocco's long-run economic growth

Data and methodology
Data and model specification

The study examines the impact of Public-Private Partnerships (PPPs), unemployment, investment, inflation and capital formation on economic growth in Morocco. In line with prior empirical research such as (Lee & al, 2018), (Mapule & al, 2023), (Loukili Z. & El Hamma A., 2025), we use GDP growth (annual %) as the dependent variable. The data is collected annually from the World Development Indicators (WDI, 2025) and the World Bank's Private Participation in Infrastructure (PPI) database, for the period from 1993 to 2023, counting a total of 31 observations. Table 1 provides a detailed

summary of the variables used in the analysis. Fig.2 illustrates the yearly trends of the used variables.

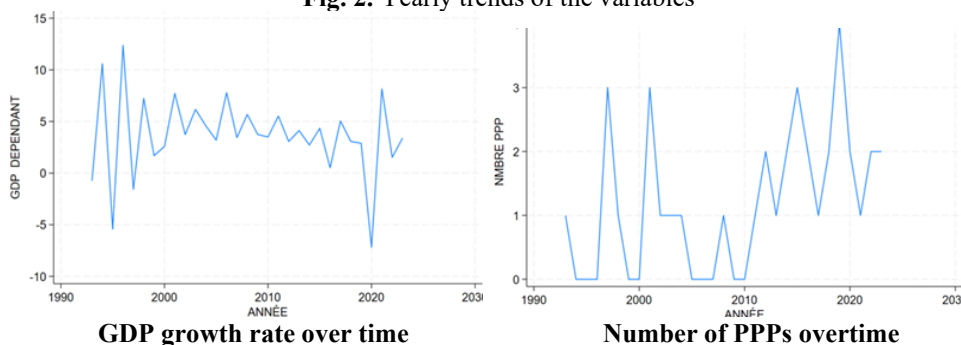The following model presents the empirical framework used in the analysis:

$$\textbf{GDPDEPENDANTt} = \alpha 0 + \alpha 1\ \textbf{NBREPPPt} + \alpha 2\ \textbf{INVPPPt} + \alpha 3\ \textbf{Unempt} + \alpha 4\ \textbf{GFCFt} + \alpha 5\ \textbf{Inft} + \varepsilon t.$$

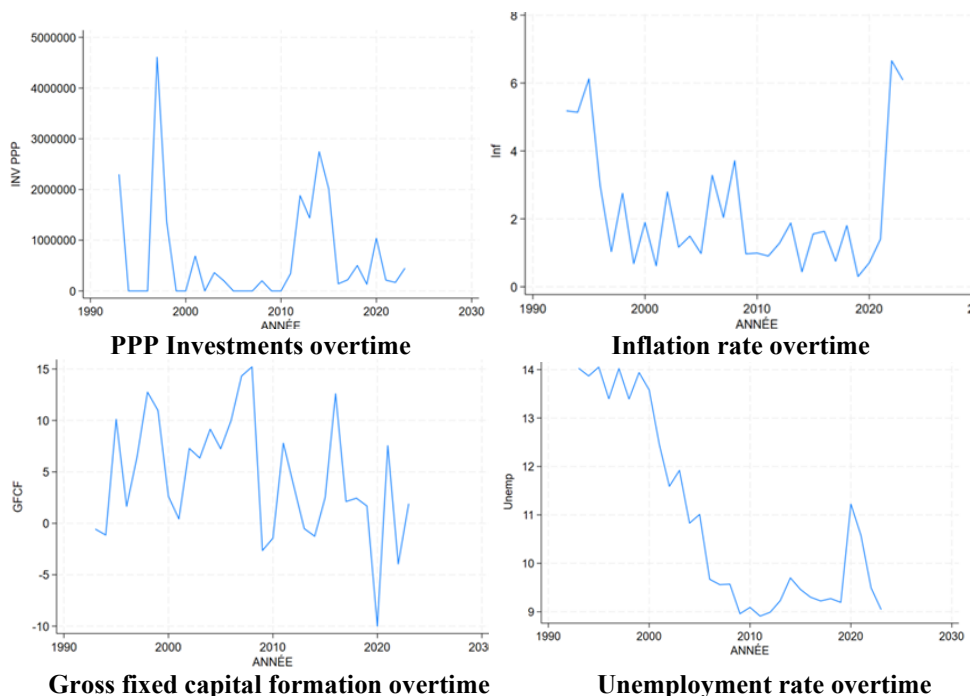Where GDPDEPENDANTt denotes GDP growth (annual %), used as the dependent variable, NBREPPPt represents the number of PPP projects, INVPPPt refers to PPP investment (US $), Unempt stands for unemployment (% of total labor force), GFCFt indicates gross capital formation (% of GDP) and Inft represents inflation, measured by consumer prices (annual %).

Table 1. A summary of the parameters and their sources

Parameter	Description	Source
GDPDEPENDANT	GDP growth (annual %)	World Bank (WDI)
NBREPPP	Number of PPPs (numbers)	World Bank's Private Participation in Infrastructure (PPI)
INVPPP	PPP investment (US $)	World Bank's Private Participation in Infrastructure (PPI)
Unemp	Unemployment, total (% total labor force)	World Bank (WDI)
GFCF	Gross capital formation (% of GDP)	World Bank (WDI)
Inf	Inflation, consumer prices (annual %)	World Bank (WDI)

Fig. 2. Yearly trends of the variables

GDP growth rate over time

Number of PPPs overtime

PPP Investments overtime

Inflation rate overtime

Gross fixed capital formation overtime

Unemployment rate overtime

Methodology

The first step of our analysis is to test the stationarity of the data. Implementing unit root tests is indispensable, as it helps prevent spurious or misleading regression results. Nonetheless, the effectiveness of unit root tests depends on sample size. Hence, the application of multiple tests is recommended to reduce the possibility of misinterpreting the integration characteristics of the time series (BENSOUDA.G & OUKASSI.M 2025). To confirm the integration order of the variables and rule out I(2) processes, we conduct both the Augmented Dickey–Fuller (ADF) test (Dickey & Fuller, 1979) and the Phillips–Perron (PP) test (Phillips & Perron, 1988). Once stationarity has been confirmed, the next stage consists of estimating the ARDL bounds cointegration test introduced by Pesaran & al. (2001). This approach serves to assess the existence of a long-run relationship between the variables and accommodates regressors integrated of different orders, specifically I(0) and I(1). The ARDL model is estimated in Stata via the ardl command, applying the Akaike Information Criterion (AIC) for automatic lag determination a maximum of four lags. The bounds test examines the null hypothesis of no long-run relationship using the F-statistic. If the statistic exceeds the critical bounds, the null is rejected and confirming the existence of cointegration.

Equation 2 illustrates the ARDL bounds test:

$$\Delta GDP_t = \sum_{i=1}^{p} a_i \Delta GDP_{t-i} + \sum_{j=o}^{q_1} \beta_j \Delta NBREPPP_{t-j} +$$
$$\sum_{i=0}^{q_2} \beta_i INVPPP_{t-i} + \sum_{l=o}^{q_3} \beta_l \Delta UNEMP_{t-l} + \sum_{m=0}^{q_4} \beta_m \Delta GFCF_{t-m} +$$
$$\sum_{p=0}^{q_5} \beta_p \Delta INF_{t-p} + a_1 GDP_{t-1} + a_2 NMBREPPP_{t-1} + a_3 INVPPP_{t-1} +$$
$$a_4 UNEMP_{t-1} + a_5 GFCF_{t-1} + a_6 INF_{t-1} + \varepsilon_t$$

Δ denotes the first-difference operator, The coefficients $a_i, \beta_j, \beta_i, \beta_l,$ β_m, β_p refer to the short-run dynamic coefficients, while a_1 to a_6 denote the long-run relationship coefficients, ε_t denotes the error term

After establishing cointegration, the long-run coefficients are obtained from the level terms in the ARDL model while the short-run dynamics from the differenced terms. The Error Correction Term (ECM) reflects and indicates the rate of adjustment toward long-run equilibrium after a disturbance.
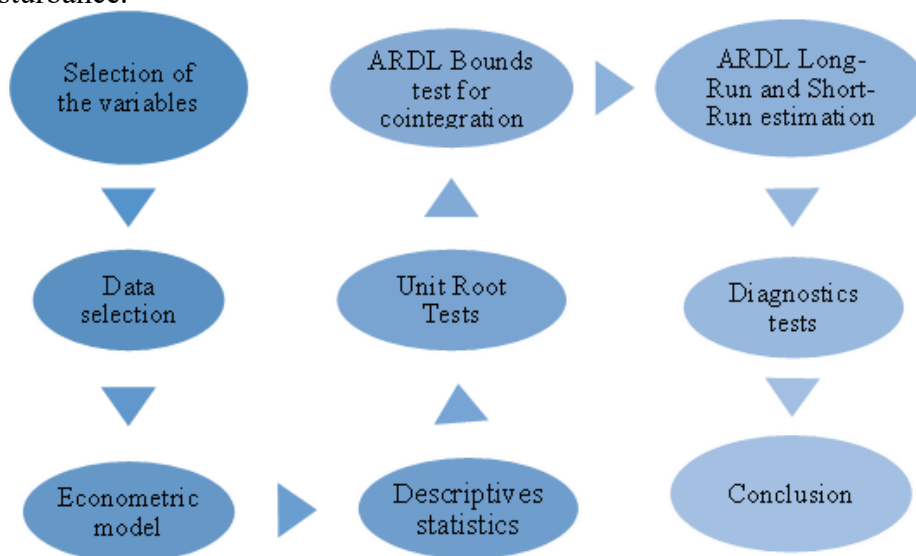

Fig. 3. Research flowchart

Results and discussion

Table 2 presents the descriptive statistics for the variables used in the study. The mean value of GDP growth is 3.66%, with a standard deviation of 3.98%, indicating noticeable fluctuations. Its minimum and maximum values range from -7.18% to 12.37%, indicating periods of both economic contraction and growth in Morocco during the study period. The number of PPPs shows a mean of 1.19 projects, with values ranging from 0 to 4, which reflects relatively low but varying activity in terms of project frequency. PPP

investment averages 677,708 US$, but with a high standard deviation (1,062,259), and values ranging from 0 to 4,608,000 US$, revealing the volatility and uneven scale of PPP financing across years. Regarding macroeconomic indicators, unemployment records an average of 10.92% with limited variation, moving between 8.91% and 14.05%. Gross capital formation shows a mean of 4.36% of GDP but demonstrates significant dispersion, indicating unstable investment dynamics. Lastly, inflation records a mean of 2.23% with moderate variability.

Table 2. Descriptive Statistics

Parameter	Mean	Std. Dev	Min	Max
GDPDEPENDANT	3.662	3.983	-7.178	12.372
NBREPPP	1.193	1.108	0	4
INVPPP	677708.4	1062259	0	4608000
Unemp	10.921	1.946	8.91	14.052
GFCF	4.362	5.925	-9.998	15.209
Inf	2.235	1.826	0.303	6.657

Table 3 contains the results of the unit root tests. The study used the Augmented Dickey–Fuller (ADF) and Phillips–Perron (PP) procedures to evaluate the stationarity of the variables. The results confirm that GDP growth is stationary at level, integrated of order I(0), with significance confirmed by both ADF and PP tests. Similarly, the number of PPPs, PPP investment, and gross capital formation are also stationary at level, showing integration of order I(0). In contrast, unemployment and inflation are non-stationary in levels but become stationary after first differencing, which confirms their integration of order one, I(1).

Overall, the findings suggest a mix of I(0) and I(1) variables, with no variable integrated of order two I(2), making the use of the ARDL approach justified.

Table 3. Unit Root Test Results (ADF and PP)

Parameter	Test type	Level (p-value)	First Difference (p-value)	Order of Integration
GDPDEPENDANT	ADF	0.0027		l(0)
	PP	0.0000		
NBREPPP	ADF	0.004		l(0)
	PP	0.0014		
INVPPP	ADF	0.0341		l(0)
	PP	0.0025		
Unemp	ADF	0.8938	0.026	l(1)
	PP	0.8312	0.0000	
GFCF	ADF	0.0026		l(0)
	PP	0.0003		
Inf	ADF	0.9252	0.0127	l(1)
	PP	0.4617	0.0000	

Bolded p-values denote rejection of the null hypothesis at the 5 % level.

Table 4 presents the outcomes of the ARDL bounds test. The calculated F-statistic value of 19.19 which exceeds the upper critical bound value of 3.79 at the 5% significance level. This finding leads to the rejection of the null hypothesis of no long-run relationship, and confirm the existence of a stable cointegration between GDP growth, and the independent variables. The results therefore validate the presence of a long-run equilibrium association between economic growth and the explanatory variables in the model.

Table 4. Bounds Test for Cointegration.

Test statistic	Value	I(0) Bound	I(1) Bound	Conclusion
F-statistic	19.19	2.62	3.79	Cointegration exists
K = 5				

Table 5 presents the detailed results of the ARDL estimation. For the long-run relationship between economic growth and the explanatory variables, the estimates show that the number of PPPs has a statistically significant and negative effect on GDP growth, with a coefficient of –0.5203 at the 5% significance level. This suggests that in the long run, a 1 unit increase in the number of PPPs is associated with a long-run decline in GDP growth by approximately 0.52 percentage points at a 5% significance level. By contrast, PPP investment exerts a positive and significant effect on growth at the 5% level, indicating that higher levels of PPP financing can contribute to long-run economic performance; in other words, larger investments in PPP projects can mobilize resources, improve infrastructure and stimulate productivity, which may contribute to the support of long-run economic growth. Evidence from studies done on other countries such as the research of Mapule & al. (2023), Lee & al. (2018), and for the case of Morocco Loukili & al. (2025), indicates that PPP investments positively impact growth. This is explained by their role in strengthening public infrastructure while fostering private infrastructure investment, which leads to a national production boost. While the results confirm that PPP investment has a positive and significant effect on long-run GDP growth, the number of PPP projects displays a negative long-run impact; these findings must be interpreted with caution. The variable "number of PPPs" reflects the frequency of project adoption but does not capture project efficiency, performance quality, or implementation outcomes. Consequently, the assumption that a higher number of PPPs may distort incentives, create coordination challenges, or signal the presence of low-performing projects remains plausible but cannot be empirically validated within the current model. Since key dimensions such as efficiency, governance quality, sectoral allocation, cost overruns, and risk-management outcomes are not included in the ARDL specification, the mechanism through which project proliferation

could dampen long-run growth should be regarded as a reasoned interpretation rather than a demonstrated causal pathway.

Regarding unemployment, it affects negatively but statistically insignificantly growth, indicating that variations in unemployment do not exert a strong long-run impact on GDP in this model. This finding may be explained by the structural nature of the labor market, such as informality and underemployment, which weaken the direct relation between unemployment and GDP growth. However gross capital formation, is positive and significant, 0.0951 at the 5% level, supporting the idea that higher investment shares in GDP stimulate long-run economic expansion. Meanwhile, inflation exerts a negative and significant effect, suggesting that the instability of the price represents a major constraint on Morocco's long-run growth outcome.

In the short run, the coefficients show more nuanced dynamics compared to the long-run findings. The results show that the number of PPPs impacts in a positive and statistically significant way GDP growth, with a coefficient of 0.7508 at the 5% significance level. This can indicate that a rise in PPP projects can cause immediate growth benefits, unlike the negative long-run impact found earlier, such as the finidings of Loukili & al. (2025). The non-existence of a short-run impact of PPP investment may reflect the long implementation process of such projects, since their economic benefits appear only once projects become fully operational. This result goes hand in hand with findings by Papadomanolakis (2022), who noted that PPPs in the Eurozone primarily represents a complementary long-term instrument under fiscal constraints, while Mofokeng and al. (2024), emphasized that PPPs contribute positively to growth in the long run, particularly in the energy sector, rather than generating immediate impacts. Overall, these studies indicate that PPP investments are more likely to deliver lasting benefits over time rather than immediate short-run gains. On the other hand, unemployment and its lagged value both show negative, highly significant effects, which suggests that rising unemployment quickly weaken short-run economic performance. Gross capital formation, despite being a stimulation factor of growth theoretically, shows a negative but statistically insignificant coefficient, implying that the fluctuations of investment fail to immediately translate into growth effects in the short-run. The absence of inflation in the short-term estimation is due to the automatic lag selection process under the ARDL model. The model tends to retain only variables that have a significant impact on short-run dynamics, which automatically exclude the variables with weak or statistically insignificant lag structures. In the case of Morocco, this may indicate that short-run dynamics in inflation do not have immediate measurable impact on economic growth but can exert long-term effects.These findings collectively indicate that PPPs have the potential to act as counter-cyclical instruments in the short term.

The ECM is highly significant at the 1% level and carries a negative coefficient of –1.7831, which confirms the presence of a stable long-run relationship between the variables. This coefficient suggests that approximately 178% of any deviation from the long-run equilibrium is corrected within one year, implying a rapid adjusting process back to equilibrium. The model also shows a strong overall explanatory power, with an R^2 of 0.91 and an adjusted R^2 of 0.86, indicating that more than 86% of the fluctuation in GDP growth is explained by the independent variables included in the model.

Table 5. Results of ARDL long- and short-run analysis.

Variables	Coefficient	t-Statistic	p-value
Long-run relationship			
NBREPPP	-0. 5203 **	-2.61	0,018
INVPPP	5.23e-07 **	2.69	0,015
Unemp	-0.1207	-1.36	0,190
GFCF	0.0951 **	2.41	0,027
Inf	-0.2800 **	-2.71	0,014
Short-run dynamics			
NBREPPP (ΔNBREPPPt)	0.7508 **	2.73	0.014
Lagged Unemp (ΔUnempt-1)	-3.3666 ***	-6.64	0.000
Unemp (ΔUnempt)	-1.8984 ***	-3.47	0.003
GFCF (ΔGFCFt)	-0.0695	-1.37	0.189
Constant	8.7376 ***	4.75	0.000
Error Correction Term (ECM)	-1.7831 ***	-18.84	0.000
R-SQUARED	0.9142		
Adjusted R-squared	0,8666		

Note: *p < 0.10, **p < 0.05, ***p < 0.01

Table 6 presents the results of the diagnostic tests conducted to evaluate the statistical reliability of the ARDL estimation. First, the Jarque–Bera test for normality of residuals produced a statistic of 0.27 with a p-value of 0.8738, indicating that the residuals are normally distributed. Second, the Breusch–Godfrey LM test for autocorrelation, applied with two lags, returned a statistic of 4.745 and a p-value of 0.0933. This result fails to reject the null hypothesis of no autocorrelation, suggesting that the residuals are free from serial correlation. Finally, the Breusch–Pagan–Godfrey test reported a statistic of 0.05 with a p-value of 0.8306, confirming the presence of homoscedasticity. Overall, the results of these diagnostic tests provide strong evidence that the ARDL model is well specified and statistically reliable.

Table 6. Diagnostic Tests

Test	Statistic	p-value	Conclusion (5%)
Jarque-Bera test	0.27	0.8738	Residuals normal
Breusch-Godfrey LM test (lag=2)	4.745	0,0933	no autocorrelation
Breusch-Pagan- Godfrey test	0.05	0.8306	homoscedasticity

Figure 4 reports the outcome of the CUSUM and CUSUMQ test used to assess the structural stability of the ARDL model. The results show that the CUSUM and CUSUMQ statistics stays within the 5% significance bounds over the entire sample, indicating no evidence of structural breaks or parameter instability. This implies that the estimated coefficients remain stable over time, enhancing confidence in the robustness of the model's long-run equilibrium and short-run dynamics. In addition, the visual trajectory displays a smooth cumulative variance, with no sudden deviations beyond the confidence limits, thus fulfilling a key assumption for valid inference in time series analysis.
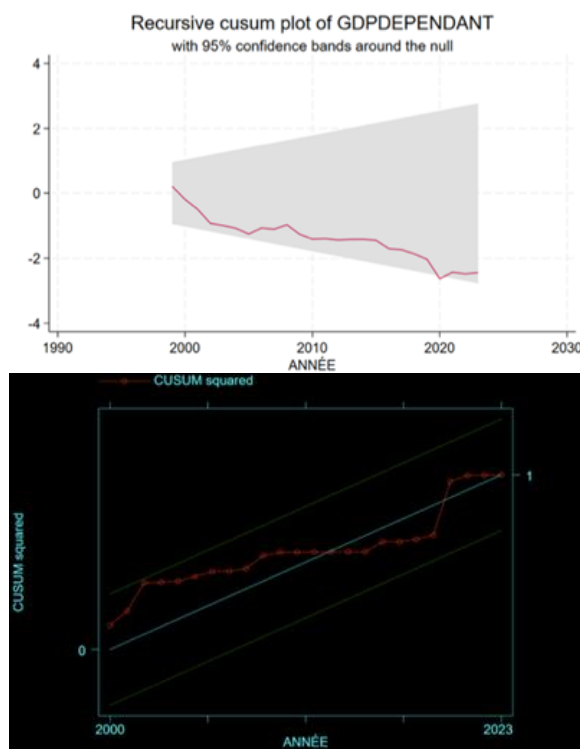

Fig. 4. CUSUM and CUSUM of Squares Tests

Conclusion

Our study examines the relationship between public-private partnerships (PPPs) and economic growth in Morocco over the period 1993–2023. GDP growth is employed as the dependent variable, while the number of PPPs, PPP investment, and control variables such as gross fixed capital formation, unemployment, and inflation are used as explanatory variables. To investigate both the long-run and short-run dynamics, the ARDL approach is applied. As a first step, the ADF and PP unit root tests were conducted, and the results indicated that unemployment and inflation are integrated of order I(1), while GDP growth, the number of PPPs, PPP investment, and gross fixed

capital formation are integrated of order I(0). Secondly, the ARDL bounds test confirmed the existence of a stable long-run relationship among the variables.

The long-run estimates show that the number of PPPs exerts a statistically significant negative effect on GDP growth, suggesting that an increase in the number of projects is associated with weaker economic performance when not accompanied by efficiency and quality. By contrast, PPP investment demonstrates a positive and significant long-run impact on GDP growth, indicating that higher levels of financing mobilize resources, improve infrastructure, and stimulate productivity. Although the number of PPP projects in Morocco remains relatively limited, the volume of investment is concentrated in a few large-scale operations, reflecting the country's focus on strategic infrastructure. This suggests that Morocco's PPP strategy is oriented more toward transformative, capital-intensive projects than toward a high frequency of smaller initiatives.

In the short run, the number of PPPs exerts a positive and significant effect on GDP growth, while unemployment shows a strong negative impact both contemporaneously and with a lag. Gross fixed capital formation is insignificant, and the error correction term, negative and highly significant, confirms a rapid adjustment toward long-run equilibrium following short-run shocks.

To validate the robustness of the model, several diagnostic tests were performed. The Jarque–Bera, Breusch–Godfrey LM, and Breusch–Pagan–Godfrey tests confirmed the absence of residual non-normality, autocorrelation, and heteroskedasticity. Moreover, the CUSUM and CUSUMQ tests confirmed the stability of the estimated parameters over the study period.

A key limitation of this study lies in the absence of project-level performance indicators for PPPs. The empirical strategy relies on aggregate measures such as the number of PPP projects and the total volume of PPP investment, which do not reflect differences in project quality, implementation efficiency, governance arrangements, risk allocation, or sectoral characteristics. Consequently, although the negative long-run coefficient associated with the number of PPPs may suggest potential issues related to project effectiveness or institutional bottlenecks, the present analysis cannot verify these mechanisms empirically. The explanation remains indicative rather than causal. Future research should incorporate granular indicators such as cost–benefit performance, completion delays, sectoral breakdown, or institutional quality metrics to more accurately capture how individual PPP characteristics affect growth dynamics.

Overall, these findings highlight the importance of PPP investment as a lever for sustainable economic growth in Morocco. From a policy standpoint, the results point to the necessity of reinforcing PPP investment

strategies that emphasize quality, efficiency, and long-term developmental impacts. Future research could extend this analysis by incorporating indicators of governance and institutional quality, including measures of project efficiency, examining PPPs in specific sectors such as health, energy, or transport, and conducting comparative studies with other MENA economies to better capture the regional dynamics of PPP growth.

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