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Industry vs. Services: Long- and Short-Run Growth Effects of FDI in Türkiye

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Abstract

This paper investigates how the sectoral composition of foreign direct investment (FDI) shapes economic growth in Türkiye. Using quarterly data and an autoregressive distributed lag (ARDL) framework, two separate models are estimated: one relating output to FDI in industry and the other to FDI in services. Bounds test results indicate the presence of a long-run cointegrating relationship in both specifications, allowing for a joint assessment of long- and short-run effects. The industry model shows that domestic capital has a positive long-run impact on output, while labour contributes negatively and industry-related FDI exerts a weakly negative or insignificant effect, suggesting limited or adverse growth spillovers from manufacturing FDI. By contrast, in the services model both capital and services-sector FDI have positive and significant long-run coefficients, and services FDI emerges as a key driver of growth. Short-run dynamics reveal hump-shaped responses of output to sectoral FDI, with initial gains or disruptions followed by partial reversals, whereas the error-correction terms are negative and highly significant, indicating reasonably fast convergence back to the long-run equilibrium in both models. The findings highlight that the growth payoff from FDI in Türkiye depends critically on its sectoral allocation.

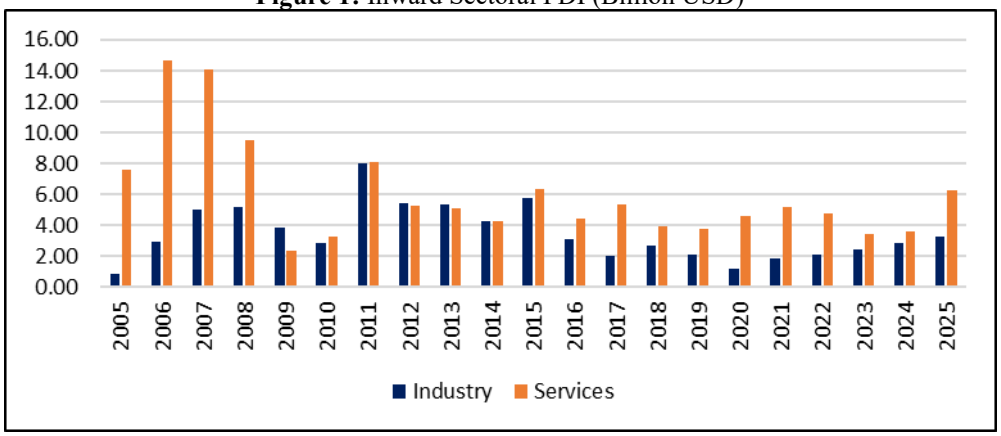
Keywords: ARDL bounds testing; economic growth; foreign direct investment (FDI); Sectoral FDI; ARDL bounds testing; Türkiye

Introduction

Foreign direct investment (FDI) has long been regarded as a potential engine of growth for emerging economies (Harrison, 2004; Hyun,2006) not only because it provides additional external finance but also because it can transfer technology, managerial know-how and access to international markets (De Mello,1997; Simiorescu and Naros,2011). Yet the empirical literature offers mixed evidence on whether and under which conditions FDI actually raises host-country growth. A central insight is that the impact of FDI is highly heterogeneous: it depends on the sectoral allocation of inflows, on the strength of vertical and horizontal linkages with domestic firms, and on the host economy's absorptive capacity in terms of human capital, institutions and infrastructure (Imsiraroj and Ulubaşoğlu, 2015) . In particular, a growing body of work disaggregates FDI by sector and estimates its growth effects separately for manufacturing, services and other industries, often reaching divergent conclusions rather than a uniform pattern (Akinlo, 2004; Vu and Noy, 2009; Wang, 2009; Aykut and Sayek, 2008; Ullah et al., 2023; Marasco et al., 2024). Many studies report that the sign and magnitude of FDI spillovers vary across sectors and country contexts, highlighting that no single sector—whether manufacturing or services—can be regarded as universally superior in terms of its growth impact.

Türkiye provides a compelling setting in which to revisit these issues. Since the early 2000s, the country has pursued an active FDI-promotion strategy as part of its broader integration into global value chains and convergence towards high-income status. Over this period, Türkiye has experienced large swings in FDI inflows and profound changes in their sectoral composition. Figure 1, which plots inward FDI to industry and services, highlights three salient features: a sharp surge in inflows during the pre-crisis boom years, a marked decline and subsequent volatility in the aftermath of the 2009 global financial crisis, and a persistent dominance of services-sector FDI over its industrial counterpart for most of the sample. These patterns raise important questions for growth policy. If the bulk of FDI has increasingly been directed towards services rather than manufacturing, what does this imply for Türkiye's long-run growth prospects, and does the sectoral shift enhance or weaken the overall contribution of FDI to output? Are the benefits of sectoral FDI confined to short-run fluctuations, or do they underpin stable long-run relationships with output and domestic factor accumulation?

Figure 1: Inward Sectoral FDI (Billion USD)



Source: Central Bank Republic of Türkiye (CBRT)

Motivated by these considerations, this paper investigates the long- and short-run growth effects of sectoral FDI in Türkiye by estimating separate Autoregressive Distributed Lag (ARDL) models for industry- and services-related inflows. The analysis is based on quarterly data and relates real output to sectoral FDI, domestic gross fixed capital formation and employment, while also incorporating dummy variables to capture the structural breaks associated with the 2009 crisis and 2020 pandemic. The ARDL bounds-testing framework is particularly well suited to this context because it allows for regressors that are integrated of different orders, performs reliably in small samples and provides a convenient error-correction representation that distinguishes between long-run equilibrium relationships and short-run adjustment dynamics. By comparing the estimated long-run coefficients and short-run responses across the industry and services models, the paper addresses two core research questions: (i) do FDI inflows into industry and services affect Türkiye's output growth differently; (ii) are these effects primarily short-lived or do they manifest in stable long-run relationships?

In answering these questions, the study seeks to contribute to the broader debate on FDI-led development in two ways. First, it moves beyond aggregate FDI measures by explicitly distinguishing between industrial and services inflows, thereby shedding light on whether the composition of FDI matters for growth in a large emerging economy. Second, it uses a time-series approach that jointly models long-run cointegration and short-run dynamics, allowing for a richer characterisation of how sectoral FDI, domestic factors and output interact over the business cycle and in response to major shocks.

Building on this introduction, the rest of the paper is organised as follows. In Section 2, the existing literature on FDI, sectoral composition and

economic growth is reviewed, with particular attention to evidence from emerging economies and to studies that distinguish between manufacturing and services FDI. Section 3 presents the empirical model and methodology, outlining the ARDL specification, the unit root and bounds testing procedures, the data sources and variable definitions. Section 4 reports the estimation results for the two sectoral ARDL models, detailing both the long-run coefficients and the short-run error-correction dynamics, together with the associated diagnostic and stability tests. Section 5 discusses the main findings in light of the theoretical and empirical literature, interpreting the different roles of industry and services FDI. Section 6 concludes by summarising the key results, drawing out their policy implications for Türkiye's FDI and growth strategy, and suggesting directions for future research.

Literature Review

The literature on the FDI–growth nexus is vast and heterogeneous, and it does not yield a clear consensus on whether foreign direct investment systematically promotes or hinders economic performance in host economies. Early contributions, framed within neoclassical and endogenous growth theories, typically view FDI as a key engine of growth because it augments the domestic capital stock and facilitates the diffusion of advanced technologies, managerial practices and organizational know-how (De Mello, 1997). In these models, foreign investors can help relax the savings constraint in capital-scarce economies and, more importantly, generate knowledge spillovers that raise total factor productivity and shift the economy to a higher long-run growth path (Akinlo, 2004; Yimer, 2023). This mechanism is particularly emphasized in endogenous growth frameworks, where human capital and innovation are central and returns to knowledge are not necessarily diminishing.

Empirical studies that follow this optimistic view often employ cross-country or panel data and find a positive and statistically significant relationship between FDI and growth. Pioneering works by De Gregorio (1992) Blömström et al. (1994) and Balasubramanyam et al.(1996) , show that countries receiving larger FDI inflows tend to experience faster output growth, especially when foreign investment is oriented towards export-oriented manufacturing industries. These studies argue that foreign affiliates introduce more sophisticated technologies, improve managerial efficiency (Jovarcik, 2004), and stimulate competition, thereby forcing domestic firms to upgrade their production processes. The positive effect is frequently found to be stronger in economies that are more open to trade, suggesting that FDI and export-led strategies can be mutually reinforcing (Balasubramanyam et al.,1996; Akinlo, 2004).

However, a substantial strand of the literature has challenged the view that FDI is unconditionally growth-enhancing. Meta-analytical work reviewing a large number of empirical studies concludes that the evidence is highly mixed: while a non-negligible share of papers reports a positive impact, many others find a negative or statistically insignificant relationship (Iamsiraroj and Ulubaşoğlu, 2015). This has shifted attention towards the role of "absorptive capacity" and structural conditions in shaping the FDI–growth link. A number of studies point out that the benefits of FDI crucially depend on the quality of human capital (Balasubramanyam et al.,1996; Basu et al., 2003) the depth of financial markets (Hermes and Lensink, 2003; Azman-Saini and Law,2010; Alfaro et al., 2010) the degree of trade openness and the strength of institutions in the host country (Melynk, et al., 2014; Çiftçi and Durusu-Çiftci, 2021). When domestic firms have adequate skills and access to finance, and when the regulatory environment is stable and transparent, they are better able to learn from foreign partners, form backward and forward linkages, and internalise technology spillovers. In contrast, if these conditions are weak, foreign firms may remain enclaves with limited integration into the local economy, and the expected productivity gains may fail to materialise.

Other contributions go further and document cases where FDI is associated with adverse growth outcomes. Studies such as those by Carkovic and Levine (2005), Akinlo (2004), and Shittu et al. (2022) report that in many developing and fragile economies the long-run effect of FDI on output is zero or even negative. Several mechanisms are proposed to explain these findings. First, foreign firms may crowd out domestic producers when they enjoy generous tax incentives (Herzer and Klasen, 2008), preferential access to credit or regulatory advantages that local firms do not receive (Iwasaki and Tokunaga, 2014). Under such circumstances, FDI can displace rather than complement domestic investment, leading to a net reduction in local entrepreneurial activity. Second, large and persistent profit remittances, interest payments and other income outflows can weaken the balance of payments over time, offsetting the initial positive impact of capital inflows (Akinlo, 2004). Third, substantial FDI inflows can contribute to real exchange-rate appreciation and Dutch-disease-type effects, whereby resources shift away from tradable sectors such as manufacturing and agriculture towards non-tradable services, undermining long-term competitiveness (Findlay,1978). Fourth, when multinational enterprises acquire significant market power, they may engage in rent-seeking behaviour and limit technology transfer, further reducing the potential growth benefits for the host economy (Akinlo, 2004).

The sectoral composition of FDI has emerged as a particularly important dimension in explaining divergent results. Empirical research that

differentiates between primary, manufacturing and services FDI generally finds that not all types of foreign investment are equally conducive to growth. Aykut and Sayek (2008), Vu and Noy (2009), Ullah et al. (2023) and Marasco et al. (2024) show that FDI in manufacturing tends to generate stronger positive spillovers because it is more closely linked to export activities, has deeper backward and forward linkages with domestic suppliers, and often embodies more advanced technologies. In contrast, FDI concentrated in natural resources or non-tradable services such as real estate, retail trade or some segments of finance can have weak or even negative growth effects. In resource-based sectors, high rents and enclave-type production structures often limit local linkages and may reinforce volatility (Akinlo, 2004; Yimer, 2023). In non-tradable services, foreign investment may be oriented towards capturing domestic market share rather than building export capacity, and productivity spillovers to local firms may remain limited.

Table.1 displays the empirical literature regarding to Türkiye. Empirical studies on Türkiye analyse the FDI–growth nexus at an aggregate level, without distinguishing between different sectors. For example, Bildirici et al. (2010) and Ilgın et al. (2010) use time-series techniques such as cointegration and VAR models and generally find that total FDI has a positive effect on industrial production or real GDP growth. Subsequent work employing cointegration analysis or VAR frameworks over longer samples similarly reports that aggregate FDI is positively associated with real GDP or GDP per capita in Türkiye, although a few recent contributions document statistically insignificant links once additional macroeconomic controls are introduced. Overall, this country-specific literature mirrors the international evidence by delivering mixed results, but it treats FDI as a single, economy-wide variable and focuses on total rather than sector-specific inflows.

Table 1: Empirical Literature Related to Türkiye

	Data Coverage	**Dependent Variable**	**Methodology**	**Result**
Bildirici et al. (2010)	1992-2008	Industrial Production	Treshold cointegration	Positive
İlgün et al. (2010)	1980-2004	Real GDP growth	VAR and causality tests	Positive
Ekinci (2011)	1980-2010	Real GDP	Cointegration analysis	Positive
Arısoy (2012)	1960-2005	Real GDP growth	Cointegration analysis	Positive
Aga (2014)	1980-2012	GDP per capita (USD)	Cointegration analysis	Positive
Cambazoğlu and Karaalp (2014)	1980-2010	Real GDP growth	VAR analysis	Positive
Demirsel et al. (2014)	2002-2014	Real GDP	Cointegration analysis	No significant relationship
Gökmen (2021)	1970-2019	Real GDP	Cointegration analysis	No significant relationship
Kurul (2021)	1984-2018	Real GDP growth	Non-linear ARDL	Positive

A common limitation of these studies is that they do not disaggregate FDI into industry, services and other sectors, even when the dependent

variable is industrial production. As a result, they cannot address whether the growth impact of FDI depends on the sector in which foreign capital is deployed, nor can they compare the roles of manufacturing versus services FDI in shaping Türkiye's growth performance. The present paper fills this gap by constructing separate series for industry and services FDI and estimating distinct ARDL models for each, thereby providing a systematic assessment of how the sectoral composition of FDI influences both the long-run equilibrium relationship between FDI and output and the short-run adjustment dynamics. In this way, the study extends the Turkish literature from an aggregate to a sectorally disaggregated perspective.

Empirical Model and Methodology

The empirical analysis relies on a standard FDI-augmented growth framework in which aggregate output depends on physical capital, labour input and foreign direct investment. The long-run relationship is derived from a Cobb–Douglas type production function and specified in logarithmic form as,

$$LY_t = \alpha_0 + \alpha_1 LK_t + \alpha_2 LLAB_t + \alpha_3 LFDI_t + u_t \quad (1)$$

where LY_t denotes the log of real GDP, LK_t is the log of real gross fixed capital formation. $LLAB_t$represents the log of employment, $LFDI_t$is a generic FDI term, and u_t is an error term. In order to capture the potentially different roles of sectoral foreign investment, two separate versions of this equation are estimated: in the first, $LFDI_t$ refers to FDI inflows into the industrial sector, while in the second it denotes FDI inflows into the services sector. In both cases, FDI inflows are converted to Turkish lira using the average quarterly exchange rate and deflated by the domestic GDP deflator, so that the resulting series measure real sectoral FDI. FDI data is obtained from CBRT, the others are obtained from TurkStat.

In line with the theoretical and empirical literature, the baseline expectation is that higher real investment in physical capital and a larger labour input should be associated with higher real output in the long run, implying positive coefficients on gross fixed capital formation (α_1 and employment α_2 in the growth equation). For FDI, however, the anticipated effects are more nuanced and depend on the sector considered. Industrial FDI is expected to foster output by expanding productive capacity, facilitating technology transfer and strengthening backward and forward linkages with domestic firms, so a positive long-run coefficient would be consistent with the conventional view that manufacturing-oriented foreign investment is growth-enhancing (Bergoui and Murshed, 2023). By contrast, the impact of

services-sector FDI is a priori ambiguous: while foreign entry in finance, telecommunications and other services can improve efficiency and support overall economic activity, FDI concentrated in non-tradable, low-productivity services may generate limited spillovers and could even crowd out domestic firms (Morasco et al.,2024). Consequently, the empirical analysis is designed to test whether the Turkish experience aligns with the optimistic scenario in which both types of FDI support growth, or instead reveals asymmetric effects across sectors.

The empirical analysis is conducted using quarterly macroeconomic data for Türkiye covering the period from 2005Q1 to 2025Q4. The choice of quarterly frequency allows the model to capture short-run dynamics in output, investment, labour and FDI that would be obscured in an annual setting, while the 2005Q1 starting point is dictated by data availability for the sectoral FDI and labour market series. Using quarterly data makes it possible to track the timing of shocks and to model short-run fluctuations in output and FDI more precisely than in an annual setting. Real GDP and gross fixed capital formation have been seasonally adjusted using the X-13 ARIMA-SEATS procedure to remove regular intra-year fluctuations and obtain series that are more suitable for quarterly time-series analysis.

This study employs the ARDL approach for several reasons. First, the time-series are relatively short and display a mixture of integration orders, with some variables being stationary in levels while others become stationary only after first differencing. In such settings, conventional cointegration techniques that require all variables to be integrated of the same order are not appropriate, whereas the ARDL–bounds testing framework of Pesaran et al. (2001) allows for a flexible treatment of I(0) and I(1) regressors within a single model. Second, the ARDL specification is well suited to quarterly data, as it captures rich short-run dynamics through distributed lags while simultaneously identifying the long-run equilibrium relationship between output, capital, labour and FDI. This dual representation is particularly useful in the context of FDI-driven growth, where short-run effects of capital inflows may differ substantially from their long-run impact. Third, compared with alternative cointegration methods, ARDL performs well in small samples and yields unbiased long-run estimates and valid t-statistics even when the sample size is limited, which is a relevant consideration given the length of the quarterly data set used in this study.

Within this framework, the baseline ARDL growth equation is specified as;

$$\Delta LY_t = \beta_0 + \sum_{i=1}^{p} \beta_{1i} \Delta LY_{t-i} + \sum_{i=0}^{p} \beta_{2i} \Delta LK_{t-i} + \sum_{i=0}^{p} \beta_{3i} \Delta LLAB_{t-i} + \sum_{i=0}^{p} \beta_{4i} \Delta LFDI_{t-i} + \beta_5 LY_{t-1} + \beta_6 LK_{t-1} + \beta_7 LLAB_{t-1} + \beta_8 LFDI_{t-1} + \gamma D_{2009} + \gamma D_{2020} + u_t \quad (2)$$

In equation (2), ΔLY_t denotes the quarterly growth rate of real output (log-difference of real GDP), while ΔLK_t, $\Delta LLAB_t$ and $\Delta LFDI_t$ are the first differences of the logarithms of gross fixed capital formation, employment and sectoral FDI, respectively. The summation terms with the differenced variables capture short-run dynamics, allowing past changes in output, capital, labour and FDI to affect current output growth. The lagged level terms LY_{t-1}, LK_{t-1}, $LLAB_{t-1}$ and $LFDI_{t-1}$enter the equation to represent the long-run relationship among these variables; their joint significance is used in the ARDL bounds test for cointegration. The coefficient on the lagged output level, together with the coefficients on the other lagged levels, forms the error-correction term that measures the speed at which deviations from the long-run equilibrium are corrected. Finally, D_{2009} and D_{2020} are the dummy variables in order to control crisis and pandemic. The short-run dynamics and the associated error-correction representation of the ARDL model can be written as follows:

$$\Delta LY_t = \delta_0 + \sum_{i=1}^{p} \delta_{1i} \Delta LY_{t-i} + \sum_{i=1}^{p} \delta_{2i} \Delta LK_{t-i} + \sum_{i=1}^{p} \delta_{3i} \Delta LLAB_{t-i} + \sum_{i=1}^{p} \delta_{4i} \Delta LFDI_{t-i} + \varphi ECM_{t-1} + u_t \quad (3)$$

Results

Before presenting the ARDL bounds test and coefficient estimates, time-series properties of the data has to be examined. ARDL bounds test allows to model I(0) and I(1) varibles together. However, unit root test has to ensure that none of the variables is integrated of order two, as the presence of I(2) series would invalidate the bounds testing procedure (Ouattara, 2004).

Table 2: Unit Root Test Results

	ADF		PP	
	Level	1st difference	Level	1st difference
LY	-0.38 (0.90)	-12.07*** (0.00)	-0.42 (0.89)	-12.06*** (0.00)
LK	-1.15	-8.90***	-1.20	-8.95***

	(0.69)	(0.00)	(0.67)	(0.00)
LLAB	-0.67 (0.85)	-7.58*** (0.00)	-0.67 (0.85)	-7.59*** (0.00)
FDI_IND	-6.71*** (0.00)	-	-6.67*** (0.00)	-
FDI_SER	-8.40*** (0.00)	-	-8.56*** (0.00)	-

***Denotes significant at 1% and ** denotes significant at %5. The probability values could be followed in parenthesis. The models reported are the models with intercept, but the other models also reveal the same result.

The ADF and PP unit root test results in Table 2 indicate that all variables are stationary either in levels or after first differencing, and none of them is integrated of order two. This confirms that there are no issues with the time-series properties of the data and that the ARDL bounds testing framework can be validly applied.

Two separate ARDL models are estimated: Model 1 relates output to FDI in industry, whereas Model 2 relates output to FDI in services. Based on the Akaike Information Criteria (AIC), the optimal lag structure for the industry specification is ARDL(6,1,2,8), while the services specification is represented by ARDL(1,1,1,5). The presence of a long-run equilibrium relationship among the variables in each model is examined using the ARDL bounds testing procedure proposed by Pesaran, Shin and Smith (2001). Given the trending behaviour of the series, both specifications include an unrestricted constant and a linear time trend to adequately capture deterministic components of the long-run dynamics, and the resulting bounds test statistics together with their corresponding critical value bounds are reported in Table 3.

Table 3: Bounds Test Results

$H_0 = \beta_5 = \beta_6 = \beta_7 = \beta_8$ *(no cointegration)*		**Bounds Critical Values**		
Model 1	***Model 2***		**I(0)**	**I(1)**
k=3	k=3	10%	3.58	4.60
7.10***	6.82***	5%	4.20	5.32
		1%	5.62	6.36

****means statistical significance at the 1% level and k is the number of regressors.*
Note: Critical values are drawn from Narayan (2004)

The bounds test results reported in Table 3 indicate that the calculated F-statistics for both models are well above the upper critical value at the 1 per cent significance level. This implies that the null hypothesis of no cointegration among output, capital, labour and sectoral FDI can be rejected for both the industry (Model 1) and services (Model 2) specifications. Consequently, a stable long-run equilibrium relationship is found to exist between output and its determinants in each model, justifying

the estimation of long-run coefficients and the associated short-run error-correction representations. Table 4 represents both short and long run results of the two models.

Table 4: Estimated Long and Short Run Results

	Model 1 (6,1,2,8)		**Model 2 (1,1,1,5)**	
	Coefficient	**P-value**	**Coefficient**	**P-value**
Dependent Variable: LY				
Long-run Coefficients				
LK	0.52***	0.00	0.27***	0.01
LLAB	-0.49**	0.02	-0.07	0.79
FDI_IND	-0.05***	0.01		
FDI_SER			0.05***	0.00
Short-run Coefficients				
Δ *LY (-1)*	-0.21***	0.01		
Δ *LY (-2)*	-0.19***	0.00		
Δ *LY (-3)*	-0.17**	0.02		
Δ *LY (-4)*	-0.11*	0.09		
Δ LY (-5)	-0.07	0.18		
Δ LK (-1)	0.38***	0.00	0.33***	0.00
Δ LLAB	0.33***	0.00	0.75***	0.00
Δ LLAB (-1)	0.31***	0.00		
Δ LFDI_IND	-0.01	0.45		
Δ LFDI_IND (-1)	0.02***	0.00		
Δ LFDI_IND (-2)	0.02***	0.00		
Δ LFDI_IND (-3)	0.02***	0.00		
Δ LFDI_IND (-4)	0.01***	0.00		
Δ LFDI_IND (-5)	0.01***	0.00		
Δ LFDI_IND (-6)	0.01***	0.01		
Δ LFDI_IND (-7)	0.01***	0.01		
Δ LFDI_SER			0.01***	0.00
Δ LFDI_SER(-1)			-0.01***	0.00
Δ LFDI_SER (-2)			-0.01***	0.00
Δ LFDI_SER (-3)			-0.01*	0.08
Δ LFDI_SER (-4)			-0.01*	0.09
DUM2009	0.18	0.32	0.01	0.71
DUM2020	-0.03***	0.00	-0.02**	0.02
C	7.14***	0.00	7.09***	0.00
TREND	0.01***	0.00	0.01***	0.00
ECM	-0.48***	0.00	-0.47***	0.00
Dignostic Tests				
	F- Test	**P- Value**	**F- Test**	**P- Value**
Serial Correlation (Breusch-Godfrey)	0.20	0.81	1.38	0.25
Heteroskedasticity (Breusch-Pagan-Godfrey)	1.04	0.43	0.99	0.47
Model Specification (Ramsey RESET)	3.57	0.12	0.20	0.65
Normality of Residuals (Jarque-Bera)	4.50	0.11	4.94	0.10

****denotes significance at 1%, ** denotes significance at 5% and * denotes significance at 10%*

In the industry model (Model 1), the long-run coefficient on capital is positive and statistically significant, indicating that higher real gross fixed capital formation is associated with higher output in the long run, in line with standard growth theory. The long-run coefficient on labour is negative and significant, which may reflect diminishing returns to labour, structural rigidities in the labour market and suggests that increases in labour without commensurate capital deepening may reduce labour productivity and overall output. Industry-related FDI has a negative but statistically insignificant long-run coefficient, implying that, once domestic capital and labour are controlled for, FDI in industry does not exert a robust long-run effect on aggregate output, possibly because technology spillovers and efficiency gains are offset by crowding-out or profit repatriation effects.

Regarding short-run dynamics, short-run dynamics are characterised by significant lagged changes in output and in industry-related FDI. Several lags of output growth enter with alternating signs, indicating pronounced output persistence and cyclical adjustment: positive shocks to growth tend to be followed by partial reversals before the system converges back towards its long-run path. Changes in industry FDI display a mixed pattern as well; the first lag has a positive and statistically significant coefficient, suggesting that an increase in industry-sector FDI initially boosts output growth, but subsequent significant lags carry negative signs, implying that these gains are later offset as adjustment costs, competitive restructuring or profit repatriation start to dominate. Taken together, the short-run coefficients point to a hump-shaped response of output to industry FDI, with short-lived expansions followed by some payback in later quarters.

The deterministic components of the model also provide useful insights. The estimated constant term is positive and significant. The time trend enters with a positive and statistically significant coefficient, suggesting the presence of an underlying upward drift in output that may be interpreted as exogenous technological progress or other gradual structural improvements that are not explicitly modelled. By contrast, the 2009 crisis dummy is statistically insignificant. The 2020 dummy, however, is negative and significant, pointing to a distinct break in output associated with the pandemic period.

In the services model (Model 2), the long-run coefficient on capital is positive and statistically significant, indicating that higher real gross fixed capital formation is associated with higher output in the long run, even after controlling for labour and services-sector FDI. This finding is consistent with standard growth theory and underscores the importance of capital deepening in supporting services-led growth. By contrast, the long-run coefficient on labour is statistically insignificant. The long-run coefficient on services FDI remains positive and highly significant, implying that sustained increases in

FDI inflows to the services sector are strongly associated with higher output and that services-oriented FDI constitutes an important driver of long-run growth alongside domestic capital.

In the short run, changes in services FDI affect output growth at several lags, but the signs of the significant coefficients are mixed rather than uniformly positive. Early lags tend to have negative and statistically significant effects, while later lags turn positive and significant, indicating that an increase in services FDI may initially dampen output growth before generating stronger positive effects as new investments are absorbed and productivity gains materialise. Short-run output growth also exhibits notable persistence through its own significant lag, suggesting that positive or negative shocks to growth propagate into subsequent quarters rather than being immediately reversed. Together with the negative and highly significant error-correction term, these results imply that although services FDI can cause sizeable short-run fluctuations—both downward and upward—the system ultimately converges back towards the long-run equilibrium path at a steady pace.

The deterministic components and adjustment mechanisms further clarify the behaviour of the services model. The constant term is positive and significant. The trend coefficient is positive and statistically significant, indicating an underlying upward drift in output that may be interpreted as reflecting autonomous technological progress or gradual institutional and structural improvements. With respect to crisis episodes, the dummy for the 2020 pandemic period is negative and significant, signalling a discrete downward shift in output during the pandemic over and above what can be explained by movements in capital, labour and services FDI, while the 2009 dummy is (as in the industry model) statistically insignificant. The error-correction term is negative and highly significant, confirming the existence of a stable long-run equilibrium and indicating that deviations of output from its long-run path are partially corrected each quarter, so shocks to the services-growth relationship have only transitory effects.

For both the industry and services models, standard diagnostic checks suggest that the ARDL specifications are statistically adequate. The Breusch–Godfrey LM test statistics fail to reject the null of no serial correlation in either case, indicating that the residuals are free from problematic autocorrelation. Likewise, the Breusch–Pagan–Godfrey heteroskedasticity tests do not reject the null hypothesis of homoskedastic errors, suggesting that the disturbance variance is stable over time. The Ramsey RESET test statistics are also insignificant for both models, implying that there is no evidence of functional form misspecification. Finally, the Jarque–Bera normality tests indicate that the residuals are approximately normally distributed at conventional significance levels.

In addition to these formal tests, CUSUM and CUSUM of Squares plots for both the industry and services models are reported in the Appendix. The stability curves remain within the 5 per cent significance bounds throughout the sample period, providing further evidence that the estimated coefficients are structurally stable and that no major parameter instability or structural break has been left unmodelled.

Discussion

The empirical results reveal several important aspects of the relationship between sectoral FDI and output growth in Türkiye. First, the industry model points to a short-run positive but long-run negative effect of industrial FDI on output. In the short run, new FDI projects in manufacturing can boost activity through construction, installation, and the rapid expansion of production capacity, which shows up as higher quarterly growth. Over the longer horizon, however, the negative long-run coefficient suggests that these benefits may be outweighed by adverse channels such as the displacement of less competitive domestic firms, increased import dependence in intermediate goods, or the repatriation of profits abroad (Akinlo, 2004; Carkovic and Levine, 2005; Shittu et al.,2022). This configuration is consistent with a scenario in which industrial FDI initially stimulates demand and investment, but later leads to a restructuring of the production base that does not necessarily translate into sustained gains in domestic value added.

Second, the contrast between the two sectoral models is striking: while industry-related FDI exerts a negative long-run effect, services-sector FDI has a positive and statistically significant impact on output in the long run. One plausible interpretation is that services FDI is more closely associated with technology diffusion, managerial know-how, and improvements in backbone services such as finance, telecommunications, transport and business services, which raise productivity across the entire economy (Morasco et al.,2004). In contrast, industrial FDI in a middle-income economy may be concentrated in relatively low value-added assembly activities or enclave-type operations, limiting spillovers to local suppliers. The results therefore suggest that the composition of FDI matters for growth: attracting efficiency-enhancing and knowledge-intensive FDI into services could be more growth-friendly than relying primarily on traditional manufacturing FDI.

Third, the negative contribution of labour in the industry model hints at important labour-market frictions. The significant long-run coefficient on labour with a negative sign suggests that increases in total employment have coincided with lower output per worker, which may reflect a deterioration in average skill levels or a mismatch between the skills demanded by

FDI-intensive sectors and those supplied by the domestic workforce. One natural explanation is related to brain drain: while total headcount employment may have risen, high-skilled workers could have emigrated or shifted into more dynamic service activities, leaving the industrial sector with a larger but relatively less productive pool of labour. In such a context, additional low-skilled employment may contribute little to, or even detract from, overall productivity, so that output falls once capital and FDI are held constant (Yu, 2021; Docquier and Rapport, 2012) This interpretation underscores the importance of retaining and upgrading human capital if industrial FDI is to generate durable growth benefits.

These findings are broadly consistent with the mixed evidence in the literature on FDI–growth linkages in developing and emerging economies, which emphasises that the sign and magnitude of FDI spillovers depend critically on sectoral composition and host-country absorptive capacity (Vu and Noy, 2009; Yimer, 2023).

At the same time, the analysis is subject to several limitations. First, the empirical work relies on FDI flows rather than sectoral stocks of foreign capital, because sufficiently long and consistent quarterly stock series are not available; as a result, the cumulative effects of FDI on production capacity and productivity may be only partially captured. Second, the industrial FDI aggregate cannot be disaggregated into more detailed manufacturing subsectors, even though spillovers are likely to differ markedly between, for example, automotive, textiles and machinery; the negative long-run impact found for industry as a whole may therefore mask substantial heterogeneity across subsectors.

Conclusions and Policy Implications

This study has examined the growth effects of sectoral FDI in Türkiye using an ARDL framework that accommodates a mixture of I(0) and I(1) variables and small-sample quarterly data. The bounds tests strongly support the existence of long-run cointegrating relationships in both the industry- and services-based models, validating the use of an error-correction representation to distinguish between short-run dynamics and long-run equilibrium effects. In the industry model, domestic capital exerts a positive and significant long-run impact on output, while labour enters with a negative coefficient and industry-related FDI is signifcantly negative. In contrast, in the services model both capital and services-sector FDI have positive and significant long-run coefficients, and services FDI emerges as a particularly important engine of growth, whereas labour remains insignificant.

These findings yield several policy implications. First, the weak or adverse long-run impact of industry-related FDI suggests that Türkiye’s

manufacturing-oriented FDI strategy should move beyond the sheer volume of inflows and instead prioritise projects that create stronger local linkages, foster technology transfer and upgrade domestic suppliers—for example through structured supplier-development programmes and closer collaboration between foreign investors, local firms and universities. Second, the robust positive effect of services-sector FDI indicates that reforms encouraging high-quality investment in backbone and knowledge-intensive services—such as finance, telecommunications, logistics and business services—can play a central role in sustaining growth, provided that regulatory frameworks promote competition, transparency and avoid excessive market concentration.

Future research could build on these results in several directions. One avenue would be to disaggregate industrial FDI further and estimate separate ARDL models for key manufacturing subsectors—such as automotive, textiles or machinery—in order to identify which segments drive the negative long-run effect and whether some niches generate more favourable spillovers than others. Another promising extension would be to complement flow-based measures of FDI with sectoral stocks of foreign capital, which may better capture the cumulative impact of FDI on production capacity and productivity, especially in capital-intensive industries.

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References:

1. Aga, A. A. K. (2014). The impact of foreign direct investment on economic growth: A case study of Türkiye 1980–2012. International Journal of Economics and Finance, 6(7), 71-84.
2. Akinlo, A. E. (2004). Foreign direct investment and growth in Nigeria: An empirical investigation. Journal of Policy modeling, 26(5), 627-639.
3. Alfaro, L., Chanda, A., Kalemli-Ozcan, S., & Sayek, S. (2004). FDI and economic growth: the role of local financial markets. Journal of international economics, 64(1), 89-112.
4. Alfaro, L., Chanda, A., Kalemli-Ozcan, S., & Sayek, S. (2010). Does foreign direct investment promote growth? Exploring the role of financial markets on linkages. Journal of development Economics, 91(2), 242-256.

5. Arısoy, İ. (2012). The impact of foreign direct investment on total factor productivity and economic growth in Türkiye. The Journal of Developing Areas, 46(1), 17-29.
6. Aykut, D., & Sayek, S. (2007). The role of the sectoral composition of foreign direct investment on growth. Do multinationals feed local development and growth, 22, 35-62.
7. Azman-Saini, W. N. W., & Law, S. H. (2010). FDI and economic growth: New evidence on the role of financial markets. Economics letters, 107(2), 211-213.
8. Balasubramanyam, V. N., Salisu, M., & Sapsford, D. (1996). Foreign direct investment and growth in EP and IS countries. The economic journal, 106(434), 92-105.
9. Basu, P., Chakraborty, C., & Reagle, D. (2003). Liberalization, FDI, and growth in developing countries: A panel cointegration approach. Economic Inquiry, 41(3), 510-516.
10. Bergougui, B., & Murshed, S. M. (2023). Spillover effects of FDI inflows on output growth: An analysis of aggregate and disaggregated FDI inflows of 13 MENA economies. Australian Economic Papers, 62(4), 668-692.
11. Bildirici, M., Aykaç-Alp, E., & Kayıkçı, F. (2010, November). Effects of Foreign Direct Investment on Growth in Türkiye. In International Conference on Eurasian Economies, Istanbul, November (pp. 4-5).
12. Blomström, M., Kokko, A., & Zejan, M. (1994). Host country competition, labor skills, and technology transfer by multinationals. Review of World Economics, 130(3), 521-533.
13. Borensztein, E., De Gregorio, J., & Lee, J. W. (1998). How does foreign direct investment affect economic growth? Journal of international Economics, 45(1), 115-135.
14. Cambazoglu, B., & Simay Karaalp, H. (2014). Does foreign direct investment affect economic growth? The case of Türkiye. International Journal of Social Economics, 41(6), 434-449.
15. Carkovic, M., & Levine, R. (2005). Does foreign direct investment accelerate economic growth. Does foreign direct investment promote development, 195, 220.
16. Ciftci, C., & Durusu-Ciftci, D. (2022). Economic freedom, foreign direct investment, and economic growth: The role of sub-components of freedom. The Journal of International Trade & Economic Development, 31(2), 233-254.
17. De Gregorio, J. (1992). Economic growth in latin america. Journal of development economics, 39(1), 59-84.

18. De Mello Jr, L. R. (1997). Foreign direct investment in developing countries and growth: A selective survey. The journal of development studies, 34(1), 1-34.
19. Demirsel, M. T., Adem, Ö., & Mucuk, M. (2014, October). The effect of foreign direct investment on economic growth: the case of Türkiye. In Proceedings of International Academic Conferences
20. Docquier, F., & Rapoport, H. (2012). Globalization, brain drain, and development. Journal of economic literature, 50(3), 681-730.
21. Ekinci, A. (2011). Doğrudan yabancı yatırımların ekonomik büyüme ve istihdama etkisi: Türkiye uygulaması (1980-2010). Eskişehir Osmangazi Üniversitesi İİBF Dergisi, 6(2), 71-96.
22. Findlay, R. (1978). Relative backwardness, direct foreign investment, and the transfer of technology: a simple dynamic model. The Quarterly Journal of Economics, 92(1), 1-16.
23. Gokmen, O. (2021). The relationship between foreign direct investment and economic growth: A case of Türkiye. arXiv preprint arXiv:2106.08144.
24. Harrison, M. J. (2003). Can Corrupt Countries Attract Foreign Direct Investment? A Comparison of FDI Inflows Between Corrupt and Non-Corrupt Countries. International Business & Economics Research Journal (Iber), 2(9).
25. Hermes, N., & Lensink, R. (2003). Foreign direct investment, financial development and economic growth. The journal of development studies, 40(1), 142-163.
26. Herzer, D., & Klasen, S. (2008). In search of FDI-led growth in developing countries: The way forward. Economic Modelling, 25(5), 793-810.
27. Hyun, H. J. (2006). Quality of institutions and foreign direct investment in developing countries: Causality tests for cross-country panels. Journal of Business Economics and management, 7(3), 103-110.
28. Iamsiraroj, S., & Ulubaşoğlu, M. A. (2015). Foreign direct investment and economic growth: A real relationship or wishful thinking? Economic modelling, 51, 200-213.
29. Ilgun, E., Karl-Josef, K. O. C. H., & Orhan, M. (2010). How Do Foreign Direct Investment And Growth Interact In Türkiye?. Eurasian Journal of Business And Economics, 3(6), 41-55.
30. Iwasaki, I., & Tokunaga, M. (2014). Macroeconomic impacts of FDI in transition economies: A meta-analysis. World Development, 61, 53-69.

31. Javorcik, B. S. (2004). Does foreign direct investment increase the productivity of domestic firms? In search of spillovers through backward linkages. American economic review, 94(3), 605-627.
32. Kurul, Z. (2021). Türkiye'de doğrudan yabancı yatırım girişleri ve yurtiçi yatırım ilişkisi: Doğrusal olmayan ARDL yaklaşımı. Sosyoekonomi, 29(49), 271-292.
33. Marasco, A., Khalid, A. M., & Tariq, F. (2024). Does technology shape the relationship between FDI and growth? A panel data analysis. Applied Economics, 56(21), 2544-2567.
34. Melnyk, L., Kubatko, O., & Pysarenko, S. (2014). The impact of foreign direct investment on economic growth: case of post communism transition economies. Problems and perspectives in Management, (12, Iss. 1), 17-24.
35. Narayan, P. K. (2005). The saving and investment nexus for China: evidence from cointegration tests. Applied economics, 37(17), 1979-1990.
36. Ouattara, B. (2004). Modelling the long run determinants of private investment in Senegal (No. 04/05). Credit Research Paper.
37. Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. Journal of applied econometrics, 16(3), 289-326.
38. Shittu, W. O., Musibau, H. O., & Jimoh, S. O. (2022). The complementary roles of human capital and institutional quality on natural resource-FDI—economic growth Nexus in the MENA region. Environment, Development and Sustainability, 24(6), 7936-7957.
39. Simionescu, M., & Naroş, M. S. (2019). The role of foreign direct investment in human capital formation for a competitive labour market. Management Research and Practice, 11(1), 5-14.
40. Ullah, S., Luo, R., Ali, K., & Irfan, M. (2023). How does the sectoral composition of FDI induce economic growth in developing countries? The key role of business regulations. Economic research-Ekonomska istraživanja, 36(2).
41. Vu, T. B., & Noy, I. (2009). Sectoral analysis of foreign direct investment and growth in the developed countries. Journal of International Financial Markets, Institutions and Money, 19(2), 402-413.
42. Wang, M. (2009). Manufacturing FDI and economic growth: evidence from Asian economies. Applied Economics, 41(8), 991-1002.

43. Yimer, A. (2023). The effects of FDI on economic growth in Africa. The Journal of International Trade & Economic Development, 32(1), 2-36.
44. Yu, W. (2021). Brain drain and economic growth: evidence of productivity growth from brain circulation. European Journal of Government and Economics (EJGE), 10(2), 128-145.

Appendix

The stability of the estimated ARDL models is examined using the cumulative sum (CUSUM) and cumulative sum of squares (CUSUMSQ) tests. For both the industry and services specifications, the plots reported below show that the recursive residuals remain within the 5 per cent significance bands over the entire sample period. This indicates that there is no evidence of structural instability or parameter drift in either model and that the long-run coefficients and short-run dynamics reported in the main text can be regarded as stable and reliable.

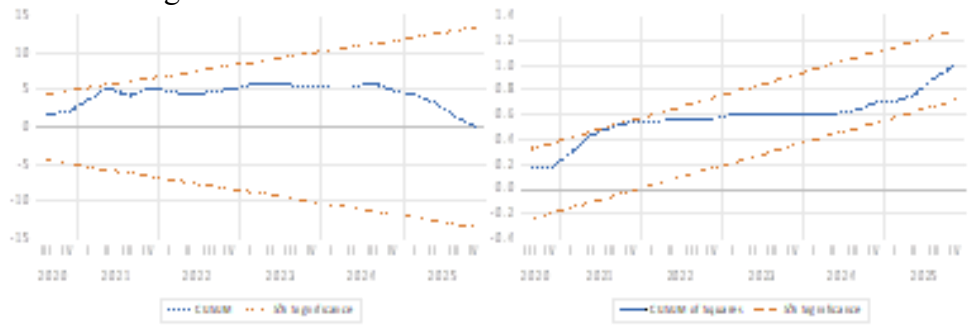

Figure A.1 Cusum and Cusum Square Test Results- Industry

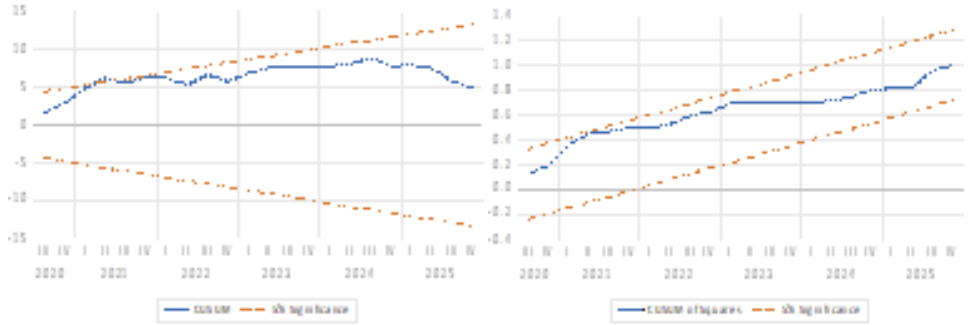

Figure A.2 Cusum and Cusum Square Test Results- Services