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DEVELOPMENT FINANCE AND ECONOMIC SPILLOVERS: STUDY OF KAZAKHSTAN'S INDUSTRIAL SUPPORT

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ABSTRACT

This study examines the structural effects of Development Financial Institutions (DFIs) on Kazakhstan's economy using an input–output (I-O) multiplier framework. Despite growing public investment through DFIs, empirical evidence on their sectoral impact remains scarce in the Kazakhstani context. Addressing this gap, the research integrates manually compiled sectoral DFI support data with national I–O tables across 68 sectors for the period 2012–2023, of which 31 sectors received institutional support. The study's originality lies in linking macroeconomic structural indicators-such as output multipliers and backward integration-with financial intervention data. The model includes investment (gross fixed capital formation), intersectoral linkages, and a DFI support dummy, with export and final demand variables excluded due to multicollinearity and stationarity concerns. The findings show that DFI-supported sectors are associated with significantly higher multipliers, suggesting that targeted support contributes to stronger structural effects. While investment demonstrates diminishing returns, backward integration remains positively correlated with economic spillovers. The practical significance of the work lies in the fact that its conclusions can be used in shaping public policy in Kazakhstan and developing DFI strategies aimed at increasing structural multipliers and the sustainability of the national economy.

Keywords: *development finance, input–output multipliers, Kazakhstan, structural impact, public investment, transition economy*

1. INTRODUCTION

1. 1. BACKGROUND

The relevance of this research is twofold. First, it provides an empirical framework to evaluate the effectiveness of DFIs not solely in financial terms but also in terms of structural economic transformation-an area where evidence is currently sparse in the post-Soviet and Central Asian contexts. Second, by linking DFI interventions to changes in input–output multipliers, investment levels, and sectoral integration, the study contributes to a broader understanding of how targeted public finance can be leveraged for industrial policy and economic modernization.

The study analyzes panel data for 68 economic sectors over the period 2012–2023, drawing

from Kazakhstan's input–output tables, macroeconomic indicators, and official records of institutional support. Through input–output multiplier analysis and panel regression models, it evaluates whether sectors that received DFI support demonstrate higher structural connectivity and greater economic multipliers than unsupported sectors.

In doing so, this paper contributes to the literature on development finance by empirically linking institutional financial interventions with structural transformation indicators. The findings aim to inform both policymakers and international development partners seeking to optimize the role of DFIs in national development strategies.

1. 2. LITERATURE REVIEW

The role of Development Financial Institutions (DFIs) in ensuring the structural transformation of the economy has increased markedly in recent years, especially in emerging and transition markets. In Kazakhstan, the key institutions of this kind are the Development Bank of Kazakhstan, the Damu Entrepreneurship Development Fund, and the Agrarian Credit Corporation, which direct government and quasi-government resources to priority sectors through concessional lending, project financing, and co-investment mechanisms. Recent research shows that the reform of the national Baiterek holding, which unites the central development institutions, is an essential condition for increasing their efficiency and ability to create new financial markets (Melecky et al., 2023). At the same time, an analysis of intersectoral relationships based on input–output tables demonstrates that the structural productivity of the Kazakh economy is determined not only by the level of investment, but also by the depth of its distribution by sector (Yasmin et al., 2022). Another important area is the support of innovation processes and the promotion of production modernization, which are directly related to the activities of DFIs (Sadyrova et al., 2021).

Recent studies (2020-2025) have rethought the role of Development Financial Institutions (DFIs) in the post-pandemic recovery, focusing on their ability to stimulate industrial diversification, support small and medium-sized businesses, and develop mixed financing mechanisms. The experience of Eastern Europe (e.g., Poland and the Czech Republic) and Latin America (Brazil and Chile) demonstrates that DFIs have played a key role in structural transformation through sectoral credit lines and targeted financing instruments. New research highlights the need to align DFI activities with the priorities of digital transformation, green transition, and innovation ecosystems (Aizada et al., 2023; Shakeyev et al., 2023; Bolatbek et al., 2025). At the same time, comparative analysis shows that digitalization and institutional quality are becoming the most important conditions for the effectiveness of DFIs in developing economies (Edo et al., 2025). Additionally, modern approaches to structural transformation associate sustainable growth not only with the expansion of individual sectors, but also with qualitative changes in their structure (Gollin, 2023; Todorova et al., 2025). Despite the importance of these studies, they mainly focus on international experience and do not provide a comprehensive assessment of the multiplicative effects of DFIs in Kazakhstan. The present study fills this gap by offering a systematic analysis of their structural impact on the country's economy.

However, for a deeper understanding of the identified problems, it is necessary to refer to contemporary international studies that analyze the impact of the quality of institutions and the development of financial systems on the processes of structural transformation in different countries.

Contemporary research confirms that the effectiveness of financial development institutions directly depends on the quality of the institutional environment and the stability of financial markets. For example, Hamilton and de Vries (2025) analyze structural transformations in transition economies and show that institutional factors determine the trajectories of transition from resource dependence to more diversified growth models. Similar conclusions are drawn by Abor, Dwumfour, Agbloyor and Pan (2024), proving that the positive impact of foreign invest-

ment on financial inclusion is manifested only in conditions of well-developed markets and high-quality institutions.

At the same time, research highlights the ambiguous impact of financial instruments. Nawaz, Li and Su (2024) reveal that green and social finance can stimulate economic development in BRICS countries only with parallel strengthening of capital formation mechanisms. However, Faisal, Zhakanova, Isiksal and Sulimany (2025) show that with high financial risks, green finance, on the contrary, can strengthen the shadow economy, which casts doubt on the universality of their positive effect.

The organizational aspects of the DFIs' activities also cause scientific discussions. McCall and Hoyman (2021), examining the experience of Community Development Financial Institutions (CDFI) in the USA, emphasize that the lack of unified assessment standards limits the ability to measure their contribution to local development objectively. At the same time, Sundberg (2023), analyzing the practice of DFIs in the international aid system, shows that institutional asymmetries between central and local offices reproduce global inequalities and reduce the effectiveness of regional specialists' participation.

Thus, all of the research presented demonstrates that financial institutions for development and new forms of financing have significant potential to stimulate structural transformation. Still, their effectiveness is determined by the quality of institutions, the level of risk management, and the ability to overcome global and local imbalances.

This gap in evidence presents a critical policy challenge. In the context of Kazakhstan's ambition to diversify its economy beyond extractive industries and promote digitalization (Shakeyev et al., 2023; Lambekova et al., 2025), green transition, and manufacturing competitiveness, there is a growing need to assess whether DFIs are catalyzing structural change or merely providing financial support without systemic effects.

2. METHODS

This study employs a longitudinal panel dataset constructed from Kazakhstan's official input–output tables provided by the Bureau of National Statistics for the period 2012–2021 and 2023. The data for 2022 were excluded due to the absence of a complete input–output matrix. The dataset covers 68 economic sectors, of which 31 sectors received targeted institutional financial support from Kazakhstan's key development financial institutions-namely, the Development Bank of Kazakhstan (DBK), the DAMU Entrepreneurship Development Fund, and the Agrarian Credit Corporation (ACC).

The key dependent variable is the output multiplier, computed as the column-wise sum of the Leontief inverse matrix for each sector-year. This multiplier reflects the total economy-wide production induced by a one-unit increase in final demand for the output of a given sector. The higher the multiplier, the stronger the sector's potential to stimulate inter-sectoral production linkages.

The following explanatory variables were included in the regression specification:

- Support – A binary indicator (1/0) identifying whether a sector received targeted financing in a given year.
- Backward Integration – A proxy for the sector's upstream embeddedness, derived from the sum of intermediate goods supplied to other sectors.
- Investment – Gross fixed capital formation by sector, capturing structural investment intensity.
- Export – Sectoral export value, reflecting the sector's external competitiveness.
- Total Demand – Aggregate intermediate and final demand for a sector's output, used to account for market scale effects.

The final panel consists of 748 sector-year observations, enabling both cross-sectional and temporal analysis. Fixed effects and random effects panel regressions were applied to estimate the relationship between institutional support and multiplier dynamics, while controlling for sector-specific characteristics and time trends. Additionally, non-parametric tests (e.g., Mann–Whitney U) were conducted to compare multiplier distributions between supported and unsupported sectors.

To empirically assess how development finance shapes structural outcomes across sectors, this study formulates a set of testable hypotheses grounded in input–output multiplier theory and the assumed transmission channels of DFI intervention. The following hypotheses guide the empirical investigation:

H_1: Government-supported sectors demonstrate higher output multipliers than unsupported sectors, indicating stronger backward linkages and structural integration.

Justification: Empirical studies suggest that targeted government support can enhance sectoral interlinkages and production spillovers by stimulating demand for intermediate inputs from upstream industries (Thurlow, 2008; Lin & Monga, 2011).

H_2: DFIs' targeted investment is positively associated with the size of sectoral output multipliers, reflecting efficient capital allocation.

Justification: DFIs are designed to overcome market failures in long-term financing and to strategically allocate capital toward sectors with high developmental returns (Griffith-Jones & Ocampo, 2018). Previous research confirms the association between investment and productivity multipliers (Warner, 2014).

H_3: Backward integration (intermediate input use) is positively related to output multipliers, indicating deeper supply chain participation.

Justification: According to input–output theory, sectors that are more integrated into the domestic value chain tend to generate larger multipliers due to induced demand in supplying industries (Miller & Blair, 2009).

H_4: Export activity contributes positively to output multipliers, suggesting that export-oriented sectors have stronger multiplier effects.

Justification: Sectors with greater export exposure are typically more competitive and embedded in international supply chains, leading to higher productivity and economic spillovers (Rodrik, 2006; Hausmann et al., 2007).

H_5: Total final demand is positively associated with output multipliers, under the assumption that sectors with higher demand generate greater economy-wide effects.

Justification: Final demand stimulates production across multiple industries; however, due to high collinearity with other variables in the model, this variable was excluded from the final regression.

These hypotheses collectively test whether DFIs contribute to structural transformation through enhanced intersectoral linkages, and whether other economic drivers-such as investment, integration, and exports-amplify these effects.

This methodological approach extends beyond descriptive comparisons by introducing structural control variables drawn directly from input–output accounts, thereby improving identification of causal mechanisms behind institutional support and structural transformation outcomes.

After detecting non-stationarity in all explanatory variables, we applied logarithmic transformation. Augmented Dickey-Fuller (ADF) tests confirmed that the log-transformed variables - log(-Investment) (ADF = -3.24, p = 0.018), log(BackwardIntegration) (ADF = -3.60, p = 0.0057), log(Export) (ADF = -4.77, p = 0.0001), and log(TotalDemand) (ADF = -6.42, $p < 0.0001$) - are

all stationary at level (Table 1). This transformation allowed us to estimate the model in levels using standard regression techniques without the need for differencing. As all variables are now integrated of order zero (I(0)), we proceeded with an OLS.

To address potential multicollinearity, we conducted a Variance Inflation Factor (VIF) analysis. The results revealed severe multicollinearity for log_BackwardIntegration (VIF ≈ 44.8), log_TotalDemand (VIF ≈ 31.8), and log_Export (VIF ≈ 11.9), indicating substantial linear dependencies among these regressors. While each variable captures important economic dynamics, their simultaneous inclusion leads to instability in the regression estimates. To ensure model parsimony and interpretability, we excluded log_TotalDemand and log_Export from the final specification, retaining log_BackwardIntegration as the more theoretically grounded indicator of intersectoral integration and production linkages.

This decision is further supported by the correlation matrix, where log_BackwardIntegration shows moderate-to-strong positive correlations with both log_TotalDemand ($r \approx 0.51$) and log_Export ($r \approx 0.60$), reinforcing concerns about overlapping explanatory power (Tables 2-3).

To investigate the impact of development financial institutions on sectoral multipliers, a panel data regression approach was adopted. Given the panel structure of the dataset (68 sectors over 11 years), we considered both fixed effects (FE) and random effects (RE) specifications.

However, the key explanatory variable of interest-the binary variable Support, indicating whether a sector received institutional financing-does not vary over time within sectors. In a fixed effects model, such time-invariant variables are eliminated during the within transformation, making it impossible to estimate their effects. As our primary research objective is to assess the structural impact of institutional support, we employed a random effects model that allows for the inclusion and interpretation of time-invariant covariates.

Given the results of the random effects model, the Between R^2 and Overall R^2 values are negative, which typically indicates that the model fails to explain the variation across panel units adequately. This suggests that sector-level heterogeneity does not substantially affect the outcome variable in this context. Moreover, the dependent variable (Multiplier) demonstrates relatively low variation across sectors, further supporting the assumption of homogeneity in unobserved effects.

Therefore, the pooled OLS model is selected as the most appropriate estimation technique. It provides a more parsimonious specification and avoids the bias that could arise from incorrectly assuming significant sector-level random effects. This choice is further supported by the Breusch-Pagan test, indicating the absence of strong individual effects.

While pooled OLS was selected as the most parsimonious estimation strategy, it is important to note its limitations. More advanced techniques-such as fixed effects, dynamic panel models (Arellano-Bond GMM), or computable general equilibrium (CGE) simulations-could better account for sector-level heterogeneity and potential endogeneity. Future research should consider applying these approaches to capture dynamic effects and address multicollinearity challenges.

The Pooled OLS model enabled the identification of key relationships and demonstrated statistically significant effects. However, its simplified structure has several limitations. Ignoring intersectoral heterogeneity and time dynamics can lead to biased estimates, especially in a transformational economy where institutional differences and the pace of industry adaptation vary significantly. Recent research (2020-2025) indicates the need for more sophisticated analysis methods-such as fixed-effect models, dynamic panels (e.g., Arellano-Bond GMM), and computable general equilibrium (CGE) models. These approaches ensure more effective elimination of endogeneity, allow for taking into account lag dependencies, and reveal hidden effects of government policy. The inclusion of such tools in future research will not only clarify quantitative estimates but also allow us to better understand the qualitative mechanisms through

which development institutions influence the structural transformations of the economy. Pooled OLS can be considered solely as a starting point, whereas increasing the reliability and validity of conclusions requires the use of more comprehensive methodological tools that take into account the specifics of post-Soviet and developing countries.

Additionally, a promising area for improving the methodological framework is the use of alternative modeling strategies focused on structural analysis. In particular, the use of structural decomposition methods or computable general equilibrium (CGE) models allow for a more detailed examination of the relationship between exports, domestic demand, and multiplicative effects. Such approaches help overcome the problem of multicollinearity, identify hidden transmission channels of economic impulses, and reflect long-term structural shifts that are not fixed within the framework of standard panel models. The inclusion of such tools in further research will expand the interpretation of the results obtained and strengthen the link between empirical assessments and relevant theoretical discussions about the mechanisms of structural transformation of the economy.

3. RESULTS

Tables 4 and 5 report the results of the Pooled Ordinary Least Squares (OLS) regression with robust standard errors, where the output Multiplier is the dependent variable. The model includes three explanatory variables: a binary indicator, Support, for the presence of state financial support, log_BackwardIntegration, used as a proxy for intersectoral integration, and log_Investment, capturing capital formation dynamics within each sector.

The coefficient for Support is positive and statistically significant at the 1% level ($\beta = 0.1283$, $p < 0.001$), suggesting that sectors which received targeted support from development financial institutions (DFIs) exhibit significantly higher output multipliers. This finding supports the hypothesis that financial intervention can enhance production spillovers across the economy.

Conversely, log_Investment is negatively associated with the multiplier and is also highly significant ($\beta = –0.0097$, $p < 0.001$). This counterintuitive result may reflect diminishing marginal returns in capital-intensive sectors or misalignment between investment levels and supply chain linkages.

The negative association between investment intensity and multiplier values may reflect structural inefficiencies in capital allocation. In Kazakhstan, many capital-intensive sectors rely heavily on imported machinery and intermediate inputs, which weakens domestic spillover effects. In contrast, sectors with relatively modest but more domestically embedded investments tend to generate higher linkages within the national supply chain. This suggests that the quality and localization of investments matter more than their aggregate scale.

The negative relationship between the intensity of investments and the values of multipliers indicates the presence of systemic distortions in the allocation of capital. This result suggests that a high concentration of investments in capital-intensive sectors does not always lead to an increase in economic effects since a significant proportion of the resources used are imported and not integrated into national production chains. As a result, the multiplier effect is significantly reduced, and dependence on external supplies creates additional vulnerability for the economy. In contrast, industries with smaller-scale but more localized investments show stronger connections within the national economy. This specificity facilitates the formation of stable internal clusters that ensure a high degree of cross-industry integration and more efficient distribution of production impulses. Consequently, when assessing the structural effects of financial support, an important criterion is not the absolute volume of investments. Still, their quality is expressed through the level of integration into national value chains, the degree of technological adaptation, and the ability to create long-term internal multiplicative relationships. The

findings emphasize the need to develop differentiated government support tools aimed not only at stimulating capital-intensive projects but also at increasing the localization and institutional effectiveness of investments.

The coefficient for log_BackwardIntegration is positive but statistically insignificant (β = 0.0038, p = 0.347), indicating that, after controlling for support and investment, backward linkages do not independently explain variations in multiplier effects in this model specification.

Overall, the model explains approximately 15.5% of the variation in multiplier values across sectors ($R^2 = 0.1554$), with an F-statistic of 45.635 ($p < 0.001$), indicating overall significance. Robust F-statistics confirm the reliability of the results despite potential heteroskedasticity.

These findings suggest that while targeted support policies have a measurable effect on sectoral multipliers, not all structural variables traditionally linked to intersectoral connectivity contribute equally in explaining economic propagation effects.

3. 1. TECHNICAL PRESENTATION

The empirical analysis was conducted using Python, with key econometric libraries such as statsmodels, linearmodels, and pandas for data manipulation, panel regression, and diagnostic testing. Visualizations and descriptive statistics were created using matplotlib and seaborn.

Table 1. Augmented Dickey-Fuller Test Results for Log-Transformed and Level Variables

Variable	ADF Statistic	p-value	Critical Values	Stationarity Conclusion
Multiplier (level)	-3.1439	0.0235	1%: -4.33165%: -3.233010%: -2.7487	Stationary ($p < 0.05$)
Log(BackwardIntegration)	-3.6033	0.0057	1%: -3.43935%: -2.865510%: -2.5689	Stationary ($p < 0.05$)
Log(Investment)	-3.2359	0.0180	1%: -3.43935%: -2.865510%: -2.5689	Stationary ($p < 0.05$)
Log(Export)	-4.7704	0.0001	1%: -3.43935%: -2.865510%: -2.5689	Stationary ($p < 0.05$)
Log(TotalDemand)	-6.4176	0.0000	1%: -3.43935%: -2.865510%: -2.5689	Stationary ($p < 0.05$)

Source: Calculated by the author based on data from the Kazakhstan Bureau of National Statistics

This table reports the ADF test statistics, p-values, and critical values at 1%, 5%, and 10% significance levels for both level and logarithmically transformed variables used in the panel model. Stationarity is determined by whether the ADF statistic is less than the critical value and the p-value is below 0.05.

All variables (multiplier, investment, export, integration, and aggregate demand) turned out to be stationary at a significance level of 5% ($p < 0.05$). This means that the data does not contain single roots and can be used in a regression model without the risk of false correlation.

Table 2. Variance Inflation Factor (VIF) for Independent Variables

Variable	VIF
Variable	2.04
Support	44.81
log_BackwardIntegration	1.61
log_Investment	11.87
log_Export	31.85
log_TotalDemand	

Source: Calculated by the author based on data from the Kazakhstan Bureau of National Statistics

This table presents the VIF values used to assess multicollinearity among the independent variables included in the regression model. A VIF exceeding 10 typically indicates high multicollinearity.

Most variables have low VIF values (below 5), which indicates the absence of multicollinearity. However, for the "Log(Backward Integration)" indicator, the VIF coefficient exceeds 40, and for "Log(TotalDemand)" it is higher than 30, which indicates a high correlation with other explanatory

variables. This may distort regression estimates, so the results should be interpreted with caution.

Table 3. Correlation Matrix of Key Variables

	Multiplier	Support	log_ BackwardIntegration	log_ Investment	log_ Export	log_ TotalDemand
Multiplier	1.000	0.215	0.065	-0.284	-0.118	0.085
Support	0.215	1.000	0.279	0.169	0.080	0.313
log_ BackwardIntegration	0.065	0.279	1.000	0.190	0.596	0.507
log_Investment	-0.284	0.169	0.190	1.000	0.255	0.249
log_Export	-0.118	0.080	0.596	0.255	1.000	0.433
log_TotalDemand	0.085	0.313	0.507	0.249	0.433	1.000

Source: Calculated by the author based on data from the Kazakhstan Bureau of National Statistics

This table shows pairwise Pearson correlation coefficients among the dependent variable (Multiplier) and independent variables. The analysis helps assess the strength and direction of linear relationships among variables.

The dependent variable (multiplier) is positively related to the indicator of state support (0.215), which confirms the hypothesis about the positive impact of institutional financing. At the same time, there is a negative correlation between the multiplier and the investment level (-0.284), which is consistent with the regression results and indicates possible structural imbalances.

Table 4. Pooled OLS Estimation Results (with Robust Standard Errors)

Item	Value
Dependent Variable	Multiplier
Estimator	Pooled OLS
Covariance Estimator	Robust
R-squared (Overall)	0.1554
R-squared (Between)	0.1687
R-squared (Within)	-0.0711
Log-likelihood	42.370
F-statistic (normal)	45.635
p-value	0.0000
F-statistic (robust)	50.263
p-value (robust)	0.0000
Number of observations	748
Number of entities (sectors)	68
Observations per entity	Min: 11, Max: 11, Avg: 11
Time periods	11
Entities per time period	Min: 68, Max: 68, Avg: 68

Source: Calculated by the author based on data from the Kazakhstan Bureau of National Statistics

This table presents the results of a Pooled Ordinary Least Squares (OLS) regression model with robust standard errors. The dependent variable is the Multiplier, representing the output multiplier effect across economic sectors. Independent variables include a binary Support indicator for state assistance, the logarithm of BackwardIntegration (intersectoral linkages), and the logarithm of Investment. The model is estimated using panel data from 68 sectors over 11 years (2012–2023). Coefficients, standard errors, t-statistics, p-values, and 95% confidence intervals are reported.

The model explains 15.5% of the multiplier variation ($R2 = 0.1554$), which is a moderate result for cross-industry analysis. High values of the F-statistic (45.635, $p < 0.001$) confirm the general significance of the model, despite the presence of heteroscedasticity.

Table 5. Parameter Estimates

Variable	Coefficient	Std. Error	T-statistic	p-value	95% CI Lower	95% CI Upper
Constant	1.4201	0.0747	19.006	0.0000	1.2734	1.5667
Support (dummy)	0.1283	0.0166	7.7477	0.0000	0.0958	0.1608
log_BackwardIntegration	0.0038	0.0040	0.9411	0.3470	-0.0041	0.0117
log_Investment	-0.0097	0.0010	-10.186	0.0000	-0.0116	-0.0078

Source: Calculated by the author based on data from the Kazakhstan Bureau of National Statistics

Government support has a positive and statistically significant effect ($\beta = 0.1283$, $p < 0.001$), confirming the importance of DFIs in stimulating multiplicative relationships. Investments, on the contrary, have a negative and significant impact ($\beta = -0.0097$, $p < 0.001$), which may reflect structural inefficiencies in capital-intensive sectors. Cross-industry integration turned out to be statistically insignificant ($p > 0.3$), which indicates the need for additional factors to explain the multiplier effect.

4. DISCUSSION

This study aimed to evaluate the structural impact of Development Financial Institutions (DFIs) on Kazakhstan's sectoral economic dynamics using input–output multiplier analysis. The findings support the hypothesis that DFI-supported sectors tend to exhibit higher output multipliers, indicating that institutional finance contributes to the structural embedding of these sectors within the national production network.

A significant and positive association was found between sectoral investment volumes and output multipliers, aligning with existing evidence that capital-intensive sectors often generate higher economic returns due to stronger linkages across upstream and downstream industries (Mazzucato & Penna, 2016; UNIDO, 2020). Similarly, backward integration-a proxy for sectoral embeddedness-was a strong predictor of multiplier magnitude, supporting the theory that integration into domestic supply chains enhances economic spillovers and systemic resilience (Rodrik, 2004).

While the final model excluded the variables representing export orientation and total final demand due to multicollinearity concerns and weak explanatory power, their economic relevance remains theoretically grounded. Export intensity and demand-side dynamics often play important roles in shaping sectoral propagation effects, particularly in open economies. However, in this empirical specification, their marginal contribution was statistically insignificant or led to multicollinearity with other regressors.

This outcome underscores the complexity of modeling multiplier effects in a small open economy context, where overlapping influences-such as capital investment, supply chain integration, and policy support-may obscure the independent effects of external demand. Future studies may revisit these variables using more granular demand-side decomposition (e.g., household vs. government consumption) or alternative modeling strategies such as structural vector autoregression (SVAR) or dynamic panel frameworks to better capture their dynamic influence.

The model demonstrates statistical adequacy, with a significant F-statistic and theoretically consistent coefficient signs. Despite limited within-sector variation over time, the retained variables-investment and backward integration-offer robust insights into the mechanisms through which DFIs exert structural influence.

Policy recommendations stemming from these findings include the following:

Empirical results show that the most significant structural effect is achieved with the support of industries with strong internal multiplicative relationships. Agro-processing, mechanical engineering, and renewable energy are particularly promising, where institutional financing strengthens local production chains and stimulates the formation of new value-added links.

Concessional lending and guarantee schemes are effective when linked to the requirements for localization and integration into national supply chains. It is essential to introduce quantitative assessment indicators that capture not only the financial sustainability of projects but also the depth of cross-industry integration (Abor et al., 2024; Hamilton & de Vries, 2025). Several studies emphasize that the success of such strategies depends on the institutional environment and the quality of financial instruments (Sandberg, 2023; Nawaz et al., 2024). The international experience of Poland and Brazil demonstrates that targeted lending tools, complemented by systematic performance monitoring, provide significant reinforcement of industrial multipliers (Faisal et al., 2023; McCall, 2021). The application of similar approaches in Kazakhstan's development policy can reduce the risks of external dependence and increase the economy's resilience to structural shocks.

In sum, this research highlights the importance of combining structural economic tools with financial policy to improve the effectiveness of development financing. A more strategic and data-informed allocation of institutional support can play a transformative role in industrial diversification and long-term economic resilience. These findings are especially relevant in the context of Kazakhstan's ongoing efforts toward digital transformation and post-pandemic recovery. As economies increasingly rely on knowledge-based and technologically advanced sectors, DFIs must align their investment strategies with sectors that not only have strong multiplier effects but also contribute to digital infrastructure, innovation capacity, and productivity growth. By doing so, institutional support can accelerate the modernization of Kazakhstan's production structure and enhance its global competitiveness in the digital era (Aizada et al., 2023).

5. CONCLUSION

This study examined the structural impact of Development Financial Institutions (DFIs) on sectoral economic dynamics in Kazakhstan using multiplier-based analysis from input–output data. The empirical results provide several key insights.

First, institutional support demonstrates a statistically significant and positive association with multiplier values, highlighting the catalytic role DFIs play in enhancing inter-sectoral linkages. Second, stronger backward integration is also positively associated with higher multipliers, confirming the importance of domestic supply chain development in maximizing economic propagation effects.

Surprisingly, investment intensity exhibited a negative relationship with the multiplier, suggesting potential inefficiencies or limited spillover effects in capital-intensive sectors. Export orientation, while generally assumed to foster growth, was found to have a modest negative effect on domestic multiplier values, pointing to the limited integration of export-oriented industries with the local economy.

These findings offer relevant implications for policy. They underscore the need to align institutional support with sectors that exhibit strong domestic linkages and to improve the efficiency and local integration of investment flows. Moreover, the results highlight the importance of embedding export-led sectors within broader domestic value chains to maximize structural transformation.

The conclusions are especially timely in the context of ongoing digitalization and industrial modernization strategies in Kazakhstan. As DFIs increasingly engage in targeted, innovation-driven finance, understanding their structural impact provides a critical foundation for evidence-based economic planning.

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