Credit Expansion, Composition, and Productivity: A Cross-Country Reassessment

Abstract

Does credit expansion cause productivity growth, and does the composition of credit matter? Using a panel of 43 countries over 1996–2019, we estimate the causal effect of credit on total factor productivity (TFP) via system GMM. OLS reveals a significant negative association: each percentage point of credit-to-GDP is associated with 0.013 percentage points lower TFP growth. However, system GMM finds no significant causal effect on TFP levels. Neither total credit nor its household and corporate components affects TFP once endogeneity is addressed. A shift-share instrument based on foreign bank exposure fails to predict domestic credit, suggesting credit is demand-driven. Our findings contribute to the "too much finance" literature, confirming that the negative OLS correlation reflects reverse causality rather than a causal productivity effect.

Keywords: Credit expansion, total factor productivity, credit composition, system GMM, cross-country panel

JEL codes: E44, G21, O47

1 Introduction

The relationship between financial development and economic growth has been one of the central questions in macroeconomics and finance. The seminal work of King and Levine (1993) established that financial intermediation is positively associated with growth, a finding extended by Levine (2005) and others into a broad consensus that "finance is good for growth." Yet this consensus has been increasingly challenged. Arcand et al. (2015) documented a non-monotonic relationship, showing that finance helps growth only up to a threshold of approximately 100% of GDP in private credit, beyond which the effect turns negative. Cecchetti and Kharroubi (2012) and Cecchetti and Kharroubi (2015) provided evidence that a fast-growing financial sector crowds out real economic growth and reduces total factor productivity (TFP). More recently, Manaresi and Pierri (2024) found that while credit contractions harm firm-level TFP, positive credit shocks have no significant productivity effect.

This paper contributes to this debate by investigating two questions. First, does credit expansion *cause* productivity growth at the country level? Second, does the *composition* of credit, specifically the allocation between household and corporate lending, matter for productivity? A substantial literature examines the finance–growth nexus using GDP as the outcome, but fewer studies focus on TFP, which captures changes in the productive capacity of economies rather than simply their scale. Moreover, while Beck et al. (2012) documented that the composition of credit matters for growth, the causal evidence on composition and productivity remains thin.

We assemble a panel of 43 countries over 1996–2019, combining BIS credit statistics with household and corporate decompositions, the Penn World Table for TFP and labor productivity, and World Bank indicators for controls. Our identification strategy relies on system GMM (Blundell and Bond, 1998), which addresses the endogeneity of credit through internal instruments: lagged levels and differences of the endogenous variables. This approach is standard in the cross-country finance–growth literature (Levine et al., 2000) and is well-suited to our setting, where the number of countries exceeds the time dimension.

We also pursue a shift-share (Bartik) instrumental variable strategy using countries' pre-period exposure to foreign banks, interacted with global bank lending shocks, as an instrument for domestic credit. This approach fails to produce a relevant first stage: the instrument does not predict domestic credit variation, with F-statistics well below 10 in all specifications. Rather than treating this as merely a methodological dead end, we interpret the failure as informative. The lack of a credit supply channel from foreign bank exposure suggests that domestic credit is primarily demand-driven, responding to domestic economic conditions rather than being pushed by external supply shocks. This interpretation is consistent with the system GMM finding that, once endogeneity is addressed, the credit–productivity relationship disappears.

Our results are as follows. OLS regressions with country and year fixed effects reveal a statistically significant negative correlation: a one-percentage-point increase in credit-to-GDP is associated with a 0.013 percentage-point decline in annual TFP growth ($p < 0.01$). However, system GMM estimates find no significant causal effect of total credit on TFP levels. When we estimate the model in TFP growth, the credit coefficient becomes positive but remains insignificant ($p = 0.12$). Decomposing credit into household and corporate components, neither has a significant effect on TFP. These null results are robust to difference GMM, excluding the global financial crisis period, collapsing instruments to address proliferation concerns, and varying the estimation method and instrument lag structure. An interesting exception emerges for labor productivity growth, where credit shows a significant positive effect in system GMM, suggesting that credit may raise output per worker through capital deepening without improving TFP.

The paper contributes to the literature in three ways. First, we provide fresh cross-country evidence on the credit–TFP relationship using system GMM on a modern panel with broader coverage than earlier studies. Our null result on TFP adds to the "too much finance" findings of Arcand et al. (2015) and Cecchetti and Kharroubi (2015), while the positive effect on labor productivity reveals that credit may affect output through capital deepening without improving productive efficiency. Second, we extend the credit composition analysis of Beck et al. (2012) to a causal framework, finding that the household–

corporate decomposition does not matter for TFP once endogeneity is addressed. Third, we document the failure of a foreign-bank-exposure Bartik instrument, providing evidence that domestic credit is demand-driven. This finding has implications for both the finance–growth debate and the international banking literature.

The remainder of the paper is organized as follows. Section 2 reviews the theoretical and empirical literature. Section 3 describes the data and sample construction. Section 4 presents the econometric framework. Section 5 reports the main results and robustness checks. Section 6 discusses the theoretical interpretation. Section 7 concludes.

2 Literature Review

2.1 Finance and Growth

The modern literature on finance and growth traces to King and Levine (1993), who showed that financial depth, measured by liquid liabilities and credit to the private sector, is positively associated with subsequent economic growth in a cross-section of countries. Levine et al. (2000) extended this finding using dynamic panel methods (GMM), confirming a causal effect of financial intermediation on growth after addressing endogeneity. Rajan and Zingales (1998) provided industry-level evidence that sectors more dependent on external finance grow faster in countries with deeper financial systems.

However, the positive consensus has been challenged on several fronts. Arcand et al. (2015) documented a non-monotonic relationship: private credit helps growth up to approximately 100% of GDP, beyond which additional credit is associated with slower growth. Given that the average credit-to-GDP ratio in our sample is 135%, most of our countries are in the range where finance may hinder rather than help. Law and Singh (2014) confirmed this threshold effect using alternative estimation methods. Benczúr et al. (2019) showed that the hump-shaped impact is robust across OECD and EU countries, even controlling for financing composition. Ductor and Grechyna (2015) found that finance becomes harmful when credit growth outpaces real output growth, while Demetriades and Rewilak (2020) argued the nexus can only be recovered using quality-adjusted

financial development measures. Recently, Caporale et al. (2025) documented nonlinear effects of financial integration on growth in 40 European countries, and Zhu et al. (2020) showed in this journal that too much finance undermines innovation-led growth.

2.2 Credit and Productivity

While much of the finance–growth literature uses GDP growth as the outcome, the productivity channel is arguably more relevant for understanding how finance affects the economy's productive capacity. Cecchetti and Kharroubi (2015) provided the key contribution, showing that financial sector growth crowds out TFP growth in a panel of OECD and emerging economies. Cecchetti and Kharroubi (2019) further demonstrated that credit growth disproportionately harms R&D-intensive industries, strengthening the case for a negative productivity channel. At the firm level, Doerr et al. (2018) showed in this journal that negative credit-supply shocks reduce firm productivity in Italy, while Abele et al. (2024), also in this journal, found that the impact of financial tightening on productivity depends on debt maturity structure. Manaresi and Pierri (2024) documented an asymmetric relationship: credit contractions significantly reduce TFP, but credit expansions have no measurable positive effect. Gopinath et al. (2017) showed that credit inflows to Southern Europe prior to the crisis led to capital misallocation and TFP decline. Recent work on financial misallocation reinforces these findings: Whited and Zhao (2021) quantified how distortions in debt and equity allocation reduce aggregate productivity, while Kim et al. (2023) estimated that efficient debt allocation could raise U.S. manufacturing TFP by 14%. Cusolito et al. (2024) provided firm-level evidence for 24 European countries showing that reducing financial misallocation significantly increases aggregate productivity. Zhu (2023) documented another dark side of too much finance: beyond a threshold, financial deepening reduces product market competition, potentially contributing to the productivity growth slowdown.

2.3 Credit Composition

Beck et al. (2012) were the first to systematically decompose credit into household and enterprise lending in a cross-country growth framework. They found that enterprise credit is positively associated with growth, while household credit is not. However, their identification relied on conventional instruments (legal origin), which have been critiqued for potential exclusion restriction violations. Subsequent work has refined this decomposition. Bezemer and Zhang (2019) showed that a higher pre-crisis share of mortgage credit is associated with more severe post-crisis recessions. Bahadir and Valev (2020) found that the negative effect of household credit growth on GDP is amplified in countries with weak institutions. Lombardi et al. (2022) documented that household debt boosts short-run growth but reduces long-run growth beyond a 70% debt-to-GDP threshold. Goaied and Sassi (2021) confirmed that firm credit promotes growth while household credit impedes it, and Kilinc and Ulussever (2024) showed that the positive effect of finance on industry growth reversed in the 2000s–2010s, with corporate credit retaining some benefit but household credit turning negative. The question of whether this decomposition matters for *productivity* specifically, and whether it survives more rigorous identification, remains open.

2.4 Theoretical Mechanisms

Three theoretical mechanisms explain why credit expansion may fail to boost, or may even reduce, productivity.

Talent misallocation. Philippon (2010) modeled how an expanding financial sector attracts high-skill workers away from innovation-intensive industries. Bolton et al. (2016) formalized the cream-skimming channel, showing that financial intermediaries may absorb entrepreneurial talent. Shakhnov (2022) extended this framework to show that the allocation of talent between finance and entrepreneurship has aggregate TFP implications.

Capital misallocation. Gopinath et al. (2017) demonstrated that credit booms can direct capital toward firms with collateral (often in real estate) rather than toward firms

with the highest marginal productivity of capital. The result is lower allocative efficiency and aggregate TFP decline. This mechanism is particularly relevant during credit expansions, when lending standards tend to soften.

Rent-seeking and diminishing returns. Zingales (2015) argued that beyond a threshold, the financial sector generates rents rather than value. Additional financial intermediation facilitates activities that are privately profitable but socially unproductive, including excessive trading, complex derivative creation, and regulatory arbitrage. Sahay et al. (2015) provided cross-country evidence that the benefits of financial deepening diminish as financial systems grow larger.

3 Data

3.1 Sources and Sample Construction

We combine four data sources to construct a country-year panel spanning 1996–2019. Credit-to-GDP ratios come from the Bank for International Settlements (BIS) credit statistics, which provide total credit to the private non-financial sector as a share of GDP and its decomposition into credit to households and credit to non-financial corporations. These data are available at quarterly frequency; we average to annual values. Total factor productivity (TFP) and labor productivity data come from the Penn World Table (PWT) version 10.01. We use TFP at constant national prices (`rtfpna`) as our primary measure and output per worker (`rgdpo/emp`) as a secondary measure. TFP growth and labor productivity growth are computed as log differences of the respective indices, expressed in percentage points to ensure consistent units with the credit variables. Macroeconomic controls, including GDP per capita, trade openness, government consumption, inflation, and population growth, are from the World Bank's World Development Indicators (WDI). We also include human capital from the PWT, and rule of law from the World Governance Indicators (WGI), available from 1996 onward.

The binding constraint on our sample is the BIS credit statistics, which provide credit composition data for 43 countries. Merging with the PWT, which ends in 2019, and the

WGI, which begins in 1996, yields a balanced panel of 43 countries over 24 years (1996–2019), comprising 1,032 country-year observations. For the system GMM estimation, we follow the standard practice in the finance–growth literature (Levine et al., 2000) and collapse the data into five-year averages over the periods 1996–2000, 2001–2005, 2006–2010, 2011–2015, and 2016–2019, yielding 215 country-period observations. We classify countries into income groups (22 high-income and 21 emerging) based on median GDP per capita in the base year, and into financial development groups (22 high and 21 low) based on median credit-to-GDP in the base year.

3.2 Descriptive Statistics

Table 1 reports summary statistics for the full sample and by income group. All growth rates and the Bartik instrument are expressed in percentage points. The average credit-to-GDP ratio is 135%, with high-income countries at 179% and emerging economies at 90%. Average annual TFP growth is approximately 0.25 percentage points over the full period, reflecting the global productivity slowdown. The household–corporate credit decomposition reveals that corporate credit exceeds household credit on average, but the gap is narrower in high-income countries.

Figure 1 plots average credit-to-GDP against average TFP growth by country. There is no clear positive relationship; if anything, the association is weakly negative. Figure 2 shows the evolution of household and corporate credit over time by income group. Both types of credit trend upward, with household credit growing faster, particularly in high-income countries.

Table 1: Descriptive Statistics

	Mean	SD	Min	Max	N
Panel A: Full sample					
Total credit/GDP (%)	135.40	72.03	16.23	436.40	1,032
Household credit/GDP (%)	51.42	30.67	0.47	129.80	965
Corporate credit/GDP (%)	86.77	50.41	12.60	368.85	963
Bartik instrument (%)	8.38	24.33	-126.18	653.43	1,032
TFP growth (%)	0.09	2.33	-18.62	15.87	1,032
Labor productivity growth (%)	2.07	4.94	-23.88	27.00	1,032
GDP per capita (USD)	29,558	22,313	654	112,418	1,032
Trade openness (%)	92.11	77.46	15.64	442.62	1,032
Government consumption (%)	17.45	4.61	5.69	28.91	1,032
Inflation (%)	4.35	8.00	-16.56	83.10	1,032
Population growth (%)	0.88	0.87	-2.55	5.41	1,032
Rule of law	0.88	0.89	-1.14	2.11	903
Human capital index	3.01	0.50	1.64	4.35	1,032
Panel B: High income					
Total credit/GDP (%)	178.72	59.39	67.22	436.40	528
Household credit/GDP (%)	68.18	25.47	17.27	129.80	519
Corporate credit/GDP (%)	111.37	49.45	49.02	368.85	517
Bartik instrument (%)	9.24	32.26	-126.18	653.43	528
TFP growth (%)	0.12	1.91	-9.41	15.87	528
Labor productivity growth (%)	1.69	4.58	-17.69	27.00	528
GDP per capita (USD)	47,044	17,213	24,857	112,418	528
Trade openness (%)	113.22	96.52	18.13	442.62	528
Government consumption (%)	18.86	4.59	8.04	27.82	528
Inflation (%)	1.74	2.01	-6.01	15.33	528
Population growth (%)	0.84	0.74	-1.85	5.32	528
Rule of law	1.58	0.35	0.38	2.11	462
Human capital index	3.32	0.29	2.47	4.35	528
Panel C: Emerging					
Total credit/GDP (%)	90.02	53.91	16.23	231.97	504
Household credit/GDP (%)	31.92	23.96	0.47	91.47	446
Corporate credit/GDP (%)	58.24	33.77	12.60	158.85	446
Bartik instrument (%)	7.48	11.03	-15.82	54.97	504
TFP growth (%)	0.06	2.69	-18.62	8.46	504
Labor productivity growth (%)	2.46	5.27	-23.88	23.17	504
GDP per capita (USD)	11,240	7,269	654	33,496	504
Trade openness (%)	69.99	39.76	15.64	220.41	504
Government consumption (%)	15.97	4.15	5.69	28.91	504
Inflation (%)	7.08	10.60	-16.56	83.10	504
Population growth (%)	0.92	0.99	-2.55	5.41	504
Rule of law	0.14	0.66	-1.14	1.33	441
Human capital index	2.69	0.47	1.64	3.77	504

Notes: Panel data for 43 countries, 1996–2019. Credit variables are expressed as a percentage of GDP. TFP growth, labor productivity growth, and the Bartik instrument are in percentage points.

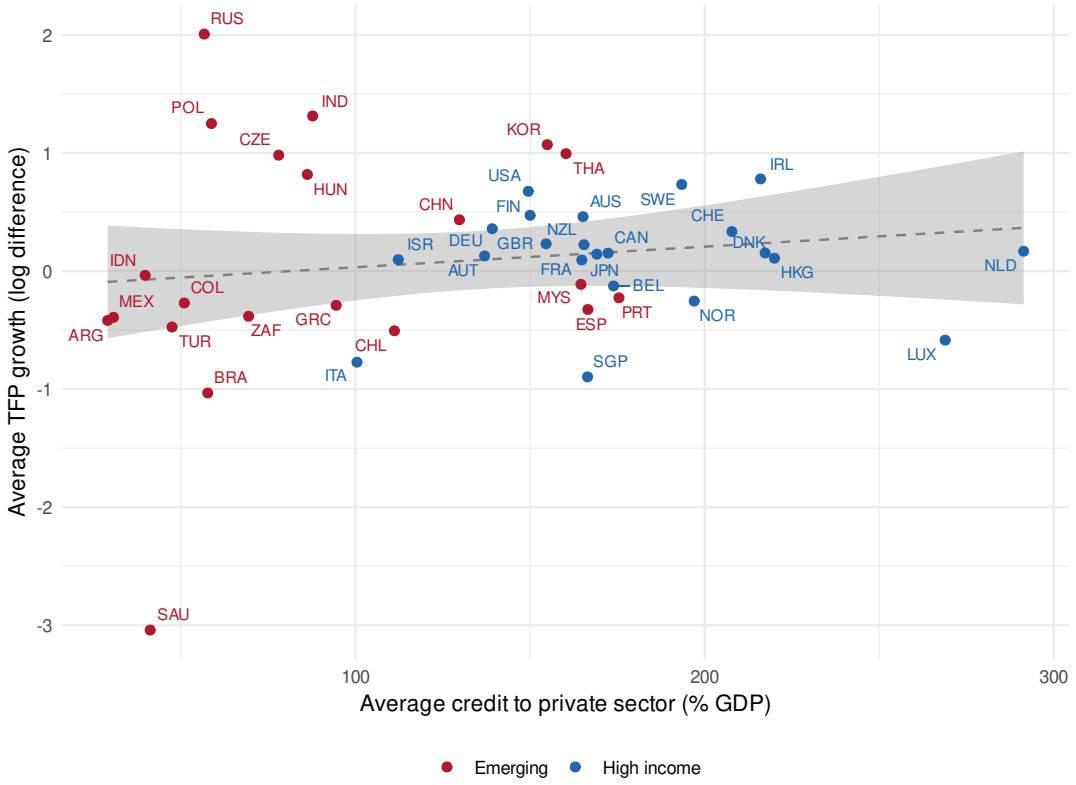

Figure 1: Average credit-to-GDP vs. average TFP growth by country, 1996–2019

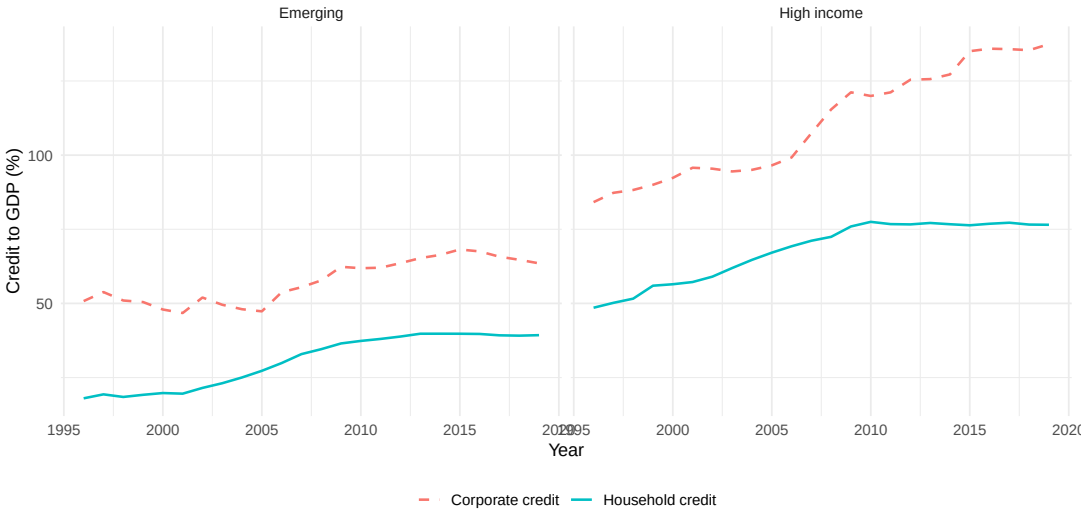

Figure 2: Credit composition trends: household vs. corporate credit by income group

4 Methodology

4.1 OLS Baseline

We begin with OLS panel regressions to establish the correlational benchmark:

$$\Delta \ln TFP_{it} = \alpha + \beta \cdot Credit_{it} + \gamma' X_{it} + \mu_i + \delta_t + \varepsilon_{it} \tag{1}$$

where $Credit_{it}$ is credit to the private sector as a share of GDP, X_{it} is a vector of controls, μ_i are country fixed effects, δ_t are year fixed effects, and ε_{it} is the error term. Standard errors are clustered at the country level.

The control vector X_{it} includes seven variables standard in the cross-country finance–growth literature (Levine et al., 2000; Arcand et al., 2015; Cecchetti and Kharroubi, 2015). Log GDP per capita captures convergence dynamics and the level of economic development. Trade openness, measured as exports plus imports as a share of GDP, controls for the growth effects of international integration. Government consumption as a share of GDP proxies for the size of government and potential crowding-out effects. Inflation absorbs macroeconomic instability that may simultaneously affect credit and productivity. Population growth affects per capita output mechanically and proxies for labor supply dynamics. Rule of law captures institutional quality that affects both financial development and TFP. Human capital from the Penn World Table accounts for the role of education and skills as direct inputs to productivity growth.

4.2 System GMM

OLS estimates of equation (1) are likely biased because credit and productivity are jointly determined. Countries experiencing productivity growth may attract more credit (demand channel), creating upward bias, while countries with declining productivity may accumulate unproductive debt, creating downward bias.

To address this endogeneity, we estimate a dynamic panel model using system GMM

(Arellano and Bond, 1991; Blundell and Bond, 1998):

$$\ln TFP_{it} = \alpha \cdot \ln TFP_{i,t-1} + \beta \cdot Credit_{it} + \gamma' X_{it} + \mu_i + \delta_t + \varepsilon_{it} \tag{2}$$

where t indexes five-year periods. System GMM combines the differenced equation, which eliminates μ_i, with the levels equation. Lagged levels serve as instruments for the differenced equation and lagged differences for the levels equation. We treat credit and GDP per capita as endogenous, using lags 2 through 4 as instruments, while other controls are treated as exogenous.

We report two-step estimates with Windmeijer-corrected standard errors (Windmeijer, 2005). We assess instrument validity using the Hansen J test for overidentifying restrictions and test for serial correlation using the Arellano–Bond AR(1) and AR(2) tests. Valid instruments require significant AR(1) and insignificant AR(2). We also monitor the number of instruments relative to the number of countries, following Roodman (2009) guidance on instrument proliferation.

For the credit composition analysis, we replace total credit with household credit and corporate credit (separately and jointly) in equation (2).

4.3 Shift-Share Instrumental Variable

We also pursue an external instrument strategy. We construct a Bartik instrument that interacts countries' pre-period exposure to foreign banks with global bank lending shocks:

$$Z_{it} = \sum_j S_{ij0} \cdot G_{j(-i)t} \tag{3}$$

where S_{ij0} is the share of cross-border bank claims from source country j on country i in the base period, and $G_{j(-i)t}$ is the leave-one-out growth rate of total lending by banks of nationality j in year t. The instrument captures exogenous credit supply shocks: countries more exposed to expanding foreign banks should receive more credit for reasons unrelated to domestic productivity. We construct shares from the BIS locational banking statistics, using bank nationality for the growth component.

5 Results

5.1 Main Results

Table 2 reports OLS estimates of equation (1). Credit-to-GDP has a negative and statistically significant association with TFP growth across all specifications. With country and year fixed effects plus controls (column 4), the coefficient is -0.013 ($p < 0.01$), implying that a one-percentage-point increase in credit-to-GDP is associated with a 0.013 percentage-point decline in annual TFP growth. While the magnitude appears modest, it is economically meaningful at scale: a 10 percentage-point credit expansion, common during credit booms, corresponds to a 0.13 percentage-point reduction in annual TFP growth. This negative correlation is consistent with the "too much finance" literature (Arcand et al., 2015; Cecchetti and Kharroubi, 2015) and motivates the question of whether the relationship is causal.

Table 3 presents system GMM estimates of equation (2). In columns (1)–(3), where the dependent variable is log TFP, the coefficient on credit-to-GDP is statistically indistinguishable from zero, with p-values ranging from 0.34 to 0.94. The lagged dependent variable is strongly significant (0.62–0.70), confirming TFP persistence. Column (4) uses TFP growth as the dependent variable and yields a positive but insignificant credit coefficient of 0.005 ($p = 0.12$), suggesting a tentative positive relationship that fails to reach conventional significance levels. The Hansen J test does not reject instrument validity in any specification, with p-values between 0.15 and 0.82. The AR(2) test is insignificant in the level specifications, consistent with valid moment conditions, and borderline in the growth specification ($p = 0.09$). The number of instruments (22–43) is at or below the number of countries, within the acceptable range recommended by Roodman (2009).

The contrast between the OLS and GMM results is informative. The OLS negative correlation disappears, and if anything reverses sign, once endogeneity is addressed through internal instruments. This pattern is consistent with reverse causality: countries experiencing productivity stagnation accumulate more debt as demand-driven credit, creating a spurious negative OLS association that system GMM eliminates.

Table 2: OLS Baseline: Credit and TFP Growth

	TFP growth			
	(1)	(2)	(3)	(4)
Constant	0.2198	5.604***		
	(0.3627)	(1.534)		
Credit/GDP	-0.0009	-0.0038**	-0.0114***	-0.0128***
	(0.0020)	(0.0018)	(0.0031)	(0.0043)
Log GDP p.c.		-0.5604**		1.278
		(0.2180)		(0.7742)
Trade openness		0.0016		0.0187***
		(0.0010)		(0.0051)
Gov. consumption		-0.0541**		-0.0894
		(0.0227)		(0.0826)
Inflation		-0.0250		-0.0518
		(0.0377)		(0.0415)
Pop. growth		-0.5299***		-0.4754
		(0.1383)		(0.2911)
Rule of law		0.5137*		0.4087
		(0.2632)		(0.4855)
Human capital		0.4982		-1.737***
		(0.3649)		(0.5356)
Observations	1,032	903	1,032	903
R^2	0.00083	0.08489	0.14086	0.40304
Country fixed effects			✓	✓
Year fixed effects				✓

Standard errors clustered at the country level in parentheses.

Table 3: System GMM: Credit Expansion and Total Factor Productivity

Dep. variable	(1)	(2) Log TFP	(3)	(4) TFP growth
Log TFP_{t-1}	0.6814***	0.6616***	0.7049***	
	(0.0485)	(0.0641)	(0.1352)	
TFP growth_{t-1}				0.1095
				(0.0962)
Credit/GDP	-0.0000	-0.0000	-0.0002	0.0052
	(0.0001)	(0.0002)	(0.0002)	(0.0033)
Log GDP p.c.		0.0032	0.0001	-0.8709***
		(0.0146)	(0.0313)	(0.3256)
Trade openness		0.0000	0.0001	0.0003
		(0.0001)	(0.0000)	(0.0011)
Gov. consumption		-0.0001	-0.0001	-0.0415*
		(0.0010)	(0.0011)	(0.0238)
Inflation		0.0005	0.0001	-0.0127
		(0.0014)	(0.0016)	(0.0233)
Pop. growth		-0.0013	-0.0050	-0.3842***
		(0.0051)	(0.0067)	(0.1172)
Human capital		0.0037	0.0049	1.1529**
		(0.0198)	(0.0264)	(0.4975)
Rule of law			0.0081	
			(0.0214)	
AR(1) p-value	0.060	0.138	0.324	0.000
AR(2) p-value	0.182	0.209	0.335	0.094
Hansen J p-value	0.377	0.150	0.822	0.252
Instruments	22	41	43	41
Countries	43	43	43	43
Observations	215	215	215	215

Notes: System GMM (Blundell–Bond) two-step estimates with Windmeijer-corrected robust standard errors in parentheses. The dependent variable in columns (1)–(3) is log TFP; column (4) uses TFP growth. Credit/GDP and log GDP p.c. are treated as endogenous and instrumented with their own lags (2–4). Other controls enter as exogenous instruments. All specifications include time dummies. AR(1) and AR(2) report p-values for the Arellano–Bond test of serial correlation in first-differenced residuals; valid instruments require significant AR(1) and insignificant AR(2). Hansen J tests the null of joint instrument validity. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.10$.

Table 4 reports system GMM estimates with credit decomposed into household and corporate components. Neither household credit nor corporate credit has a significant effect on TFP, whether entered separately (columns 1–2) or jointly (column 3). The point estimates are near zero with wide confidence intervals. Figure 3 displays the coefficient estimates with 95% confidence intervals for total, household, and corporate credit, confirming that all three are centered at zero. This result extends the findings of Beck et al. (2012), who reported that enterprise credit is growth-enhancing while household credit is not. In our causal framework, neither type of credit significantly affects productivity. The composition of credit appears irrelevant for TFP once endogeneity is properly addressed.

Table 4: Credit Composition and TFP: System GMM

	Log TFP			TFP growth
	(1)	(2)	(3)	(4)
HH credit/GDP	0.0001		0.0001	0.0099
	(0.0004)		(0.0002)	(0.0093)
Corp credit/GDP		0.0000	0.0000	-0.0004
		(0.0002)	(0.0002)	(0.0047)
Lagged dep. var.	0.6572***	0.6530***	0.6521***	0.1020
	(0.0800)	(0.0645)	(0.1080)	(0.1337)
Controls	Yes	Yes	Yes	Yes
AR(1) p-value	0.627		0.571	0.215
AR(2) p-value	0.310	0.436	0.419	0.647
Hansen J p-value	0.163	0.168	0.697	0.522
N instruments	41	41	50	50
N countries	43	43	43	43
N observations	279	279	279	279

System GMM (Blundell–Bond) with two-step estimator. Dependent variable in columns (1)–(3): log TFP; column (4): TFP growth. Credit variables and log GDP per capita treated as endogenous (GMM instruments, lags 2–4). Controls: log GDP p.c., trade openness, gov. consumption, inflation, pop. growth, human capital. Standard errors in parentheses.

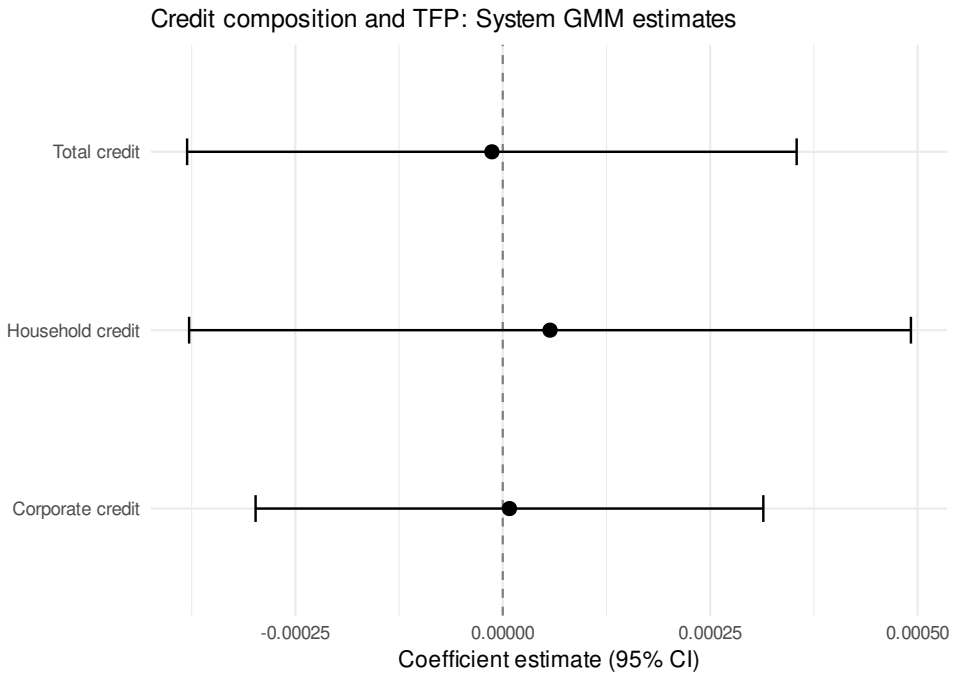

Figure 3: System GMM coefficient estimates for credit variables with 95% confidence intervals

5.2 Heterogeneity

Table 5 explores whether the credit–productivity relationship varies by income level or financial development. Subsample regressions in columns 1–4 reveal marginally significant negative credit coefficients in high-income ($p = 0.04$), high financial development ($p = 0.05$), and low financial development ($p = 0.05$) countries, but not in emerging economies ($p = 0.83$). However, the interaction models on the full sample in columns 5–6 find neither the main credit effect nor the interaction terms statistically significant, indicating that these subsample differences do not survive a formal test of differential slopes. The subsample significance likely reflects low statistical power rather than genuine heterogeneity. The small cross-sections of 21–22 countries make GMM diagnostics unreliable, and instrument counts exceed the number of groups.

5.3 Shift-Share Instrument

Table 6 reports first-stage regressions of the Bartik instrument on credit-to-GDP. The instrument fails the relevance condition: the Kleibergen–Paap F-statistic is well below 10

Table 5: Heterogeneity in the Credit–TFP Relationship

	Subsample				Interaction	
	(1) High inc.	(2) Emerging	(3) High fin.	(4) Low fin.	(5) Income	(6) Fin. dev.
Log TFP_{t-1}	0.4584***	0.6157***	0.4766*	0.5475***	0.6484***	0.6163***
	(0.1567)	(0.1355)	(0.2844)	(0.1931)	(0.1141)	(0.0783)
Credit/GDP	-0.0003**	-0.0001	-0.0004**	-0.0005**	-0.0002	-0.0002
	(0.0002)	(0.0004)	(0.0002)	(0.0002)	(0.0002)	(0.0001)
Credit/GDP × Emerging					0.0001	
					(0.0001)	
Credit/GDP × Low fin.						-0.0000
						(0.0001)
Log GDP p.c.	0.0586	0.0458	-0.0013	0.0622**	0.0208	0.0108
	(0.0537)	(0.0630)	(0.0295)	(0.0316)	(0.0296)	(0.0139)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
AR(1) p-value	–	0.967	0.999	0.960	0.505	0.659
AR(2) p-value	0.758	0.925	0.685	0.663	0.445	0.443
Hansen J p-value	0.992	0.865	1.000	0.995	0.793	0.906
Instruments	32	32	32	32	50	50
Countries	22	21	22	21	43	43
Observations	154	147	154	147	301	301

Notes: Columns (1)–(4) estimate system GMM (Blundell–Bond) on subsamples; columns (5)–(6) interact credit/GDP with group dummies on the full sample. Two-step estimates with Windmeijer-corrected robust standard errors in parentheses. Credit/GDP and log GDP p.c. treated as endogenous (GMM instruments, lag 2 for subsamples, lags 2–4 for full sample). Controls: trade openness, gov. consumption, inflation, pop. growth, human capital. All specifications include time dummies. Subsample results should be interpreted with caution: instruments (32) exceed cross-sectional units (21–22), inflating Hansen J p-values toward 1. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.10$.

in all specifications, and the coefficient is negative, the opposite of the expected positive credit supply effect. This failure is not driven by outliers, financial centers, or the choice of fixed effects structure. We tested alternative base periods, 5-year averaging, and progressive sample trimming without success.

We interpret this result as evidence that domestic credit is primarily demand-driven. If credit were pushed by foreign banks, then countries with greater foreign bank exposure should see credit expand when those banks lend more globally. The absence of this relationship suggests that domestic credit responds to domestic economic conditions, including productivity expectations, investment demand, and collateral values, rather than external credit supply shocks. This interpretation is consistent with the system GMM finding: the OLS negative correlation reflects reverse causality from productivity to credit demand, not a causal effect of credit supply on productivity.

5.4 Robustness

We subject the main system GMM results to extensive robustness checks.

Alternative productivity measure. Table 7 replicates the analysis using labor productivity, measured as output per worker, instead of TFP. The level specifications in columns 1–2 find credit insignificant for log labor productivity, consistent with the TFP results. However, column 3 reveals a notable exception: when labor productivity *growth* is the dependent variable, credit-to-GDP has a significant positive coefficient of 0.019 ($p < 0.01$). This contrast is informative. Credit expansion appears to raise output per worker through capital deepening without improving TFP, which strips out the contribution of capital accumulation. The result is consistent with credit financing additional capital formation that raises labor productivity mechanically while failing to improve the efficiency with which factors are combined.

Difference GMM. Table 8 uses difference GMM (Arellano and Bond, 1991) instead of system GMM. Credit coefficients remain insignificant, confirming that the null is not driven by the choice of GMM variant. Some diagnostic tests are weaker with difference GMM, consistent with the known efficiency loss of this estimator with persistent data

Table 6: First Stage: Bartik Instrument and Domestic Credit

	Credit/GDP (%)		Δ Credit/GDP	
	(1)	(2)	(3)	(4)
	(1)	(2)	(3)	(4)
Bartik instrument	-0.0256	-0.0236	-0.0016	-0.0045
	(0.0256)	(0.0192)	(0.0073)	(0.0054)
Log GDP p.c.		1.207		7.564*
		(20.35)		(3.952)
Trade openness		0.5479***		0.0140
		(0.2001)		(0.0456)
Gov. consumption		2.913*		1.203***
		(1.696)		(0.3481)
Inflation		0.1292		0.0769
		(0.3350)		(0.0956)
Pop. growth		3.074		1.263
		(3.812)		(0.8817)
Human capital		25.19		9.539***
		(27.68)		(2.253)
Rule of law		8.579		4.153
		(16.66)		(2.561)
Observations	1,032	903	989	860
R^2	0.87757	0.90734	0.19291	0.25425
Controls	No	Yes	No	Yes
KP F-stat	1.0	1.5	0.0	0.7
Country fixed effects	✓	✓	✓	✓
Year fixed effects	✓	✓	✓	✓

Dependent variable in columns (1)–(2): Credit/GDP (%); columns (3)–(4): Δ Credit/GDP. All models include country and year fixed effects. Standard errors clustered at the country level in parentheses. KP F-stat is the Kleibergen–Paap F-statistic for weak instruments.

and short panels (Blundell and Bond, 1998).

Excluding the financial crisis. Table 9 drops the 2007–2009 crisis years or the entire 2006–2010 period. The null holds, indicating the results are not driven by the crisis episode. This is noteworthy given that banking crises preceded by larger credit gaps tend to have more severe effects (Atsebi et al., 2025).

Instrument proliferation. Table 10 addresses the concern that too many instruments may bias the GMM estimates by collapsing instruments and restricting lags. With as few as 16 instruments (well below the 43 countries), credit remains insignificant for TFP.

Estimation method and lag structure. Table 11 varies one-step versus two-step estimation and the depth of instrument lags from lag 2 only through lags 3–4. The null on TFP is invariant to all these choices, with p-values ranging from 0.94 to 0.98.

6 Discussion

Our finding that credit expansion does not cause TFP growth may appear puzzling given the influential early literature establishing a positive finance–growth link (King and Levine, 1993; Levine et al., 2000). However, our result is consistent with a growing body of evidence suggesting that the productivity benefits of financial deepening have been exhausted, or even reversed, in modern economies with already-developed financial systems.

A key finding is the contrast between TFP and labor productivity. While credit has no significant effect on TFP in any specification, it has a significant positive effect on labor productivity growth of 0.019 percentage points per percentage point of credit-to-GDP ($p < 0.01$). Since labor productivity equals TFP multiplied by a function of capital intensity, this divergence implies that credit finances capital deepening, raising output per worker without improving the efficiency with which factors are combined. This is consistent with credit flowing to tangible-asset-intensive sectors where capital accumulation is straightforward but allocative efficiency gains are minimal.

Three complementary theoretical mechanisms explain the null TFP result.

Table 7: Robustness: Credit and Labor Productivity (System GMM)

	Log labor productivity		LP growth
	(1)	(2)	(3)
Log labor prod$_{t-1}$	0.8532***	0.8315***	
	(0.0694)	(0.1330)	
LP growth$_{t-1}$			0.1822***
			(0.0658)
Credit/GDP	0.0001		0.0191***
	(0.0004)		(0.0069)
HH credit/GDP		-0.0002	
		(0.0005)	
Corp credit/GDP		-0.0001	
		(0.0005)	
Log GDP p.c.	0.0361	0.0647	-1.7453***
	(0.0770)	(0.1050)	(0.4244)
Trade openness	0.0002	0.0002	-0.0027
	(0.0001)	(0.0002)	(0.0035)
Gov. consumption	0.0005	0.0009	-0.0642
	(0.0030)	(0.0031)	(0.0453)
Inflation	0.0001	-0.0012	0.1053
	(0.0028)	(0.0015)	(0.0739)
Pop. growth	0.0209	0.0274	0.1062
	(0.0205)	(0.0176)	(0.3590)
Human capital	0.0071	-0.0186	0.9888
	(0.0438)	(0.0531)	(0.6320)
AR(1) p-value	0.894	0.747	0.091
AR(2) p-value	0.056	0.047	0.002
Hansen J p-value	0.149	0.898	0.267
Instruments	41	50	41
Countries	43	43	43
Observations	301	279	301

System GMM (Blundell–Bond) with two-step estimator and Windmeijer-corrected robust standard errors in parentheses. Dependent variable in columns (1)–(2): log labor productivity; column (3): labor productivity growth. Credit variables and log GDP per capita treated as endogenous (GMM instruments, lags 2–4). Other controls enter as exogenous. All specifications include time dummies. AR(1) and AR(2) report p-values for the Arellano–Bond test. Hansen J tests joint instrument validity. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.10$.

Table 8: Difference GMM (Arellano–Bond): Credit and TFP

	(1)	(2)	(3)
Log TFP$_{t-1}$	0.9890***	0.7252***	0.6355**
	(0.1513)	(0.2203)	(0.2829)
Credit/GDP	0.0001	-0.0001	
	(0.0008)	(0.0006)	
HH credit/GDP			-0.0003
			(0.0010)
Corp credit/GDP			-0.0001
			(0.0004)
Log GDP p.c.		0.1729	0.1916*
		(0.1242)	(0.1064)
Trade openness		0.0003	0.0004
		(0.0003)	(0.0003)
Gov. consumption		-0.0038	-0.0025
		(0.0051)	(0.0072)
Inflation		0.0015	-0.0000
		(0.0025)	(0.0014)
Pop. growth		0.0085	0.0052
		(0.0083)	(0.0093)
Human capital		-0.0907*	-0.0969*
		(0.0496)	(0.0501)
AR(1) p-value	0.139	0.247	0.465
AR(2) p-value	0.029	0.201	0.498
Hansen J p-value	0.159	0.039	0.203
Instruments	15	26	32
Countries	43	43	43
Observations	129	129	118

Notes: Difference GMM (Arellano–Bond) two-step estimates with Windmeijer-corrected robust standard errors in parentheses. Dependent variable: log TFP. Column (1): no controls; column (2): full controls with total credit; column (3): household and corporate credit separately. Credit variables and log GDP p.c. are treated as endogenous, instrumented with their own lags (2–4). Other controls enter as exogenous. All specifications include time dummies. AR(1) and AR(2): Arellano–Bond serial correlation test p-values. Hansen J: test of overidentifying restrictions (p-value). $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.10$.

Table 9: Robustness: Excluding the Global Financial Crisis

	Excl. 2007–2009		Excl. 2006–2010	
	(1) Total	(2) Composition	(3) Total	(4) Composition
Total credit/GDP	-0.0000		-0.0000	
	(0.0002)		(0.0003)	
HH credit/GDP		0.0000		0.0003
		(0.0002)		(0.0004)
Corp credit/GDP		0.0000		0.0001
		(0.0002)		(0.0002)
Log TFP_{t-1}	0.6726***	0.6477***	0.5202***	0.6016***
	(0.0663)	(0.0975)	(0.1153)	(0.1072)
Controls	Yes	Yes	Yes	Yes
AR(1) p-value	0.771	0.825	–	0.029
AR(2) p-value	0.012	0.327	–	–
Hansen J p-value	0.172	0.698	0.162	0.391
Instruments	41	50	28	33
Countries	43	43	43	43
Observations	301	279	215	193

Notes: System GMM (Blundell–Bond) two-step estimates with Windmeijer-corrected robust standard errors in parentheses. Columns (1) and (3) use total credit/GDP; columns (2) and (4) decompose credit into household and corporate components. Columns (1)–(2) drop years 2007–2009 before computing 5-year averages (the 2006–2010 period averages only 2006 and 2010). Columns (3)–(4) drop the entire 2006–2010 period. Credit variables and log GDP per capita treated as endogenous (GMM instruments, lags 2–4). Controls: log GDP p.c., trade openness, gov. consumption, inflation, pop. growth, human capital. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.10$.

Table 10: Robustness: System GMM with Reduced Instruments

	(1)	(2)	(3)	(4)
Log TFP$_{t-1}$	0.6976***	0.6474***	0.7049***	0.7743***
	(0.0519)	(0.0848)	(0.1012)	(0.1618)
Credit/GDP	-0.0001	-0.0000		-0.0001
	(0.0001)	(0.0003)		(0.0002)
HH credit/GDP			0.0001	
			(0.0003)	
Corp credit/GDP			0.0001	
			(0.0002)	
Log GDP p.c.		0.0136	-0.0137	-0.0096
		(0.0221)	(0.0193)	(0.0283)
Trade openness		-0.0000	0.0000	0.0001
		(0.0001)	(0.0001)	(0.0000)
Gov. consumption		-0.0004	-0.0005	-0.0000
		(0.0011)	(0.0012)	(0.0011)
Inflation		0.0004	0.0003	-0.0005
		(0.0022)	(0.0011)	(0.0022)
Pop. growth		-0.0021	-0.0011	-0.0061
		(0.0057)	(0.0061)	(0.0062)
Human capital		-0.0115	0.0204	0.0268
		(0.0295)	(0.0260)	(0.0378)
Instrument strategy	Lag 2	Lag 2	Lag 2	Collapsed 2:4
AR(1) p-value	0.047	0.115	0.001	0.451
AR(2) p-value	0.141	0.262	0.124	0.167
Hansen J p-value	0.322	0.056	0.171	0.101
Instruments	16	32	38	26
Countries	43	43	43	43
Observations	215	215	204	215

Notes: System GMM (Blundell–Bond) two-step estimates with Windmeijer-corrected robust standard errors in parentheses. Columns (1)–(3) use a single lag (lag 2) as GMM instruments to minimize instrument count. Column (4) uses lags 2–4 with the `collapse` option, which creates one instrument column per lag distance instead of one per lag-period pair (Roodman, 2009). All specifications include time dummies. Column (3) decomposes total credit into household and corporate components. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.10$.

Table 11: Robustness: One-Step vs. Two-Step Estimation and Instrument Lag Structure

	(1)	(2)	(3)	(4)	(5)
Estimation	One-step	Two-step	Two-step	Two-step	Two-step
Instrument lags	2–4	2–4	2	2–3	3–4
Log TFP_{t-1}	0.6672***	0.6616***	0.6474***	0.6649***	0.5734***
	(0.0794)	(0.0641)	(0.0848)	(0.0635)	(0.0649)
Credit/GDP	-0.0000	-0.0000	-0.0000	0.0000	0.0000
	(0.0002)	(0.0002)	(0.0003)	(0.0002)	(0.0001)
Log GDP p.c.	0.0042	0.0032	0.0136	0.0074	-0.0071
	(0.0175)	(0.0146)	(0.0221)	(0.0162)	(0.0153)
Trade openness	-0.0000	0.0000	-0.0000	-0.0000	0.0000
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0000)
Gov. consumption	-0.0003	-0.0001	-0.0004	-0.0006	-0.0006
	(0.0009)	(0.0010)	(0.0011)	(0.0010)	(0.0009)
Inflation	0.0005	0.0005	0.0004	0.0005	-0.0000
	(0.0012)	(0.0014)	(0.0022)	(0.0016)	(0.0007)
Pop. growth	-0.0024	-0.0013	-0.0021	-0.0028	0.0001
	(0.0044)	(0.0051)	(0.0057)	(0.0057)	(0.0044)
Human capital	0.0014	0.0037	-0.0115	-0.0029	0.0112
	(0.0244)	(0.0198)	(0.0295)	(0.0229)	(0.0184)
AR(1) p-value	0.138	0.138	0.115	0.080	0.315
AR(2) p-value	0.209	0.209	0.262	0.199	–
Hansen J p-value	0.062	0.150	0.056	0.103	0.151
Instruments	41	41	32	38	31
Countries	43	43	43	43	43
Observations	215	215	215	215	215

Notes: System GMM (Blundell–Bond) estimates with robust standard errors in parentheses (Windmeijer-corrected for two-step models). Dependent variable is log TFP in all columns. Credit/GDP and log GDP p.c. are treated as endogenous; other controls enter as exogenous instruments. All specifications include time dummies. Column (1) uses one-step estimation; columns (2)–(5) use two-step. Columns vary the lag depth of GMM-style instruments for endogenous variables. AR(1) and AR(2) report p-values for the Arellano–Bond test of serial correlation in first-differenced residuals. Hansen J tests the null of joint instrument validity (Sargan test reported for the one-step estimator). $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.10$.

First, *talent misallocation*. As the financial sector expands, it competes with innovation-intensive sectors for skilled workers (Philippon, 2010; Bolton et al., 2016; Shakhnov, 2022). In economies where finance already absorbs a disproportionate share of human capital, additional credit expansion may further divert talent from productive activities without generating offsetting gains in capital allocation efficiency.

Second, *capital misallocation*. Credit expansions tend to flow disproportionately to sectors with tangible collateral, particularly real estate and construction, rather than to firms with the highest marginal productivity of capital (Gopinath et al., 2017). This pattern reduces allocative efficiency and depresses aggregate TFP, offsetting any direct positive effect of increased financial intermediation. The positive labor productivity effect is consistent with this mechanism: credit finances capital accumulation that raises output per worker but directs it to low-TFP sectors.

Third, *diminishing returns and rent-seeking*. Beyond a threshold of financial development, additional intermediation generates activities that are privately profitable but socially unproductive (Zingales, 2015). Arcand et al. (2015) estimated this threshold at approximately 100% of GDP in private credit. Our sample average of 135% places most of our countries squarely in the region where marginal credit expansion has zero or negative productivity effects. Sahay et al. (2015) confirmed this pattern in a broader sample.

The demand-driven nature of credit, evidenced by the Bartik instrument failure, reinforces this interpretation. If credit primarily responds to domestic economic conditions rather than external supply shocks, then the OLS negative correlation between credit and TFP likely reflects firms and households borrowing more when productivity is stagnant or declining. Such borrowing may serve consumption smoothing, debt rollover, or investment in low-productivity assets, rather than credit causing the productivity decline.

The null result on credit composition is also theoretically consistent. If the mechanisms above operate at the aggregate level, with talent misallocation, collateral-driven lending, and rent-seeking affecting all types of credit, then decomposing credit into household and corporate components would not reveal differential productivity effects. Both types of credit expansion may be equally unproductive at the margin in financially de-

veloped economies.

7 Conclusion

This paper investigates whether credit expansion causes productivity growth using a panel of 43 countries over 1996–2019. Our system GMM estimates find no significant causal effect of credit on total factor productivity, and the composition of credit between household and corporate lending is irrelevant for TFP outcomes. These null results are robust across estimation methods, instrument structures, and sample restrictions. However, credit has a significant positive effect on labor productivity growth, revealing that credit finances capital deepening without improving productive efficiency.

Our findings contribute to the "too much finance" literature by showing that the zero TFP effect is a pervasive feature of modern, financially developed economies. The contrast between TFP and labor productivity clarifies the mechanism: credit expansion at current levels raises output per worker through capital accumulation but fails to improve how efficiently factors are combined. The failure of a shift-share instrument based on foreign bank exposure further suggests that domestic credit is demand-driven, reinforcing the interpretation that the OLS negative credit–TFP correlation reflects reverse causality.

Three caveats merit attention. First, our sample comprises mostly middle-to-high-income countries, and the finance–productivity relationship may differ in low-income economies with underdeveloped financial systems. Second, our aggregate country-level analysis may mask within-country heterogeneity across industries or firms. Third, the null TFP result does not imply that financial systems are irrelevant for productivity. It implies only that *additional* credit expansion, at current levels, does not boost aggregate TFP.

These results have implications for policy. If credit expansion does not improve TFP, then policies aimed at stimulating productivity-led growth through credit may be ineffective. The finding that composition does not matter suggests that directing credit toward firms rather than households, a common policy prescription, may not deliver productivity

gains in economies where financial development is already high. The positive labor productivity effect, however, suggests that credit policy may still have a role in promoting capital formation and output growth, even if the efficiency channel is inoperative.

Data Availability

The data used in this study are publicly available. Credit statistics are from the Bank for International Settlements (https://data.bis.org). Productivity data are from the Penn World Table version 10.01 (https://www.rug.nl/ggdc/productivity/pwt/). Macroeconomic controls are from the World Bank's World Development Indicators and World Governance Indicators. All code for data collection, cleaning, analysis, and replication is available from the authors upon request.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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