Trade, Financial Frictions, and the Missing Manufacturing Window*

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Abstract

Why do some economies experience a pronounced manufacturing phase during structural transformation, while others move more directly into low-skilled services? This paper shows that financial underdevelopment, by shaping export competitiveness and domestic investment demand, is a quantitatively important driver of flat-manufacturing paths. Motivating evidence links financial depth to manufacturing activity and export performance. We then quantify the mechanism in a dynamic multi-country model of structural transformation and trade, where financial underdevelopment both weakens competitiveness in finance-dependent sectors and lowers demand for manufacturing-intensive investment goods. Moving flat-manufacturing economies halfway to the financial frontier closes over a quarter of the observed flat–steep peak gap; it raises real output per worker by 13 to 17 percent and real consumption per worker by 8 to 12 percent. Paired with lower nonfinancial trade costs, the same financial improvement closes almost three quarters of the peak gap, as finance shapes the manufacturing response that openness amplifies.

Keywords: International trade, Financial frictions, Structural transformation
JEL codes: F12, F14, F36, F43, O14, O16

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1 Introduction

In the canonical path of structural transformation, economies move out of agriculture into manufacturing before shifting toward services. Yet this classic pattern is far from universal. In many developing economies, the rise of manufacturing has been muted, short-lived, or altogether absent, with labor shifting instead into low-skilled services at relatively low income levels. This matters because such trajectories are associated with weaker aggregate performance. Existing explanations for these flat-manufacturing trajectories emphasize the timing of industrialization, exposure to global competition, sector-biased technological change, and productivity differences across sectors and countries. But these forces do not fully account for the substantial heterogeneity observed within both early and late industrializers. Countries at similar income levels and with comparable exposure to global markets often display markedly different sectoral trajectories, suggesting that flat manufacturing paths also reflect constraints that shape sectoral expansion.

This paper asks whether financial development helps explain why otherwise similar economies follow different structural transformation paths, and what those paths imply for output and consumption. We argue that it does so through two connected margins: comparative advantage in world markets and domestic demand for investment goods. The first arises because manufacturing and high-skilled services rely more heavily on external finance than agriculture and low-skilled services. The second arises because investment goods are highly manufacturing-intensive. Financial underdevelopment both weakens competitiveness in finance-intensive sectors and raises the effective cost of manufacturing-intensive investment. Economies with weaker financial systems face an external and a domestic disadvantage that result in a smaller window of opportunity for manufacturing sector growth, with consequences for output and consumption.

Financial development is systematically associated with the sectoral allocations that distinguish steep and flat transformation paths. Using harmonized sectoral and trade data, we show that, conditional on GDP per worker, financial development is closely related to employment in manufacturing and high-skilled services. The relationship with manufacturing is hump-shaped, while high-skilled services become increasingly associated with financial depth beyond the lowest part of the distribution. Economies with greater financial depth also export more, especially in sectors with greater external-finance dependence. These facts suggest that finance is connected not only to participation in world markets, but also to the broader allocation of activity across sectors during structural transformation.

We quantify the role of finance in a dynamic multi-country model of open-economy structural transformation. The model combines non-homothetic demand, country-sector productivity paths, nonfinancial trade costs, and capital accumulation, so sectoral reallocation is shaped by income effects, relative prices, comparative advantage, and investment demand. This structure allows us to ask whether financial development matters once the standard demand, productivity, trade, and investment forces are already present.

Financial frictions enter the model through an export-finance margin and an investment-demand margin. On the export-finance margin, firms in financially underdeveloped economies face higher effective costs of serving foreign markets in sectors that rely more heavily on external finance, especially manufacturing and high-skilled services.

This creates a comparative disadvantage in finance-intensive tradables and limits world-market participation. On the investment-demand margin, financial underdevelopment raises the effective cost of investment and slows capital accumulation. Because investment goods are strongly manufacturing-intensive, weaker investment demand reduces manufacturing demand and narrows the manufacturing window. This structure allows the quantitative exercise to distinguish finance as a force for world-market participation from finance as a force for domestic manufacturing demand.

The counterfactuals quantify these mechanisms by varying financial development within the same calibrated baseline economy. In the benchmark exercise, financial development improves for flat-manufacturing economies and affects both financial margins: it lowers the effective cost of investment and reduces the finance-induced component of export costs. The channel decomposition exercises use the same financial-development path but hold one margin at its baseline value, separating the domestic investment-demand margin from the export-finance margin. Throughout the finance-only exercises, recovered productivity paths, preferences, labor, initial capital, nonfinancial trade costs, and residual transition wedges remain fixed. We then pair the same financial-development improvement with lower nonfinancial trade costs, keeping all else fixed, to ask how openness operates once finance has changed comparative advantage and domestic investment demand.

The counterfactuals show that financial development changes both the sectoral trajectory of development and its aggregate output implications. In the benchmark experiment, flat-manufacturing economies move one-half of the way to the year-specific financial frontier. Manufacturing employment rises throughout the transition, and the resulting peak gain closes 28.3 percent of the empirical flat–steep peak gap. The same counterfactual raises output per worker by about 13 to 17 percent across periods and consumption per worker by about 8 to 12 percent. Financial underdevelopment therefore matters not only for where labor goes, but also for the output and consumption associated with that path.

The two financial margins account for these effects in different ways. In the channel decomposition, the investment-demand margin accounts for about two thirds of the decrease in the mean peak-gap between flat and steep economies: by lowering the effective cost of investment, financial development raises demand for manufacturing-intensive capital goods. It also generates most of the gains in output, consumption, and investment. The export-finance margin accounts for about one third of the peak-gap response. It also expands exports and world-market participation by reducing finance-induced disadvantages in externally finance-dependent sectors, with smaller but positive effects on output and consumption.

The trade exercises sharpen the paper's position on globalization: lower nonfinancial trade costs become strongly pro-manufacturing once financial development changes the economy on which openness operates. A common view is that global competition narrows the manufacturing window for developing economies (Rodrik 2016). We do not find this to be the case, especially when we combine openness with improved financial development. Pairing the benchmark financial-development counterfactual with lower nonfinancial trade costs raises the manufacturing-employment peak sharply in flat-manufacturing economies, closing nearly three quarters of the empirical flat–steep peak gap. This is not purely the additive effect of both channels – the interaction adds over 1.5 percentage points to the manufacturing path. Openness therefore magnifies the sectoral incentives created by financial development. Once finance improves export competitiveness and investment demand, lower trade frictions expand the manufacturing window. Autarky diagnostics reinforce this interpretation: financial development delivers larger gains in the baseline open economy than in the closed-economy counterfactual.

This paper contributes to the literature on heterogeneous structural transformation by identifying financial development as a constraint that changes both the shape and the scale of development. Canonical work emphasizes income effects, relative prices, and sectoral productivity growth (Ngai and Pissarides (2007) and Herrendorf, Rogerson, and Valentinyi (2014)). Recent work studies flat and premature manufacturing paths through the timing of development, sector-biased technological change, demand, and globalization (Rodrik (2016), Huneeus and Rogerson (2024), Fujiwara and Matsuyama (2024), Nguyen (2024), and Sposi, Yi, and Zhang (2026)), open-economy structural change (Matsuyama (2009), Cravino and Sotelo (2019), Lewis et al. (2022), Lee (2026), and Vries et al. (2026)), and service-led or skill-biased transformations (Buera et al. (2022), Fang and Herrendorf (2021), Fan, Peters, and Zilibotti (2023), and Peters, Zhang, and Zilibotti (2026)). We build on this literature by asking what shapes the comparative advantage and domestic demand that openness amplifies. The answer we emphasize is financial development: financially underdeveloped economies face both weaker competitiveness in externally finance-dependent tradables and lower demand for manufacturing-intensive investment goods.

This financial-development constraint builds on finance mechanisms that have mostly been studied outside the structural-transformation question. A large literature shows that financial development matters for industry growth, comparative advantage, and export performance in sectors that rely more heavily on external finance (Rajan and Zingales (1998), Beck (2002, 2003), and Manova (2013)). Related quantitative work shows that financial frictions affect aggregate and sectoral productivity, while capital accumulation and the sectoral composition of investment are themselves important for structural change and for the dynamic gains from trade (Buera, Kaboski, and Shin (2011), Bustos, Garber, and Ponticelli (2020), Herrendorf, Rogerson, and Valentinyi (2021), and Ravikumar, Santacreu, and Sposi (2019)). We embed these mechanisms in a dynamic multi-country model with non-homothetic demand, capital accumulation, and manufacturing-intensive investment, building on models of sectoral reallocation over development (Comin, Lashkari, and Mestieri (2021) and García-Santana, Pijoan-Mas, and Villacorta (2021)). This allows us to quantify how financial development changes export competitiveness, domestic investment demand, sectoral reallocation, and real output and consumption within the same framework.

The rest of the paper is organized as follows. Section 2 documents the empirical facts on heterogeneous structural transformation paths, financial development, and sectoral exports. Section 3 presents the model. Section 4 describes the calibration and identification of the financial friction parameters. Section 5 evaluates model fit. Section 6 reports the main counterfactuals and mechanism diagnostics. Section 7 concludes.

2 Data and Empirical Analysis

This section documents three facts that motivate the quantitative analysis. The first fact is about the object to be explained: flat-manufacturing paths are not simply late-manufacturing paths. Economies with muted manufacturing expansions appear among both early and late industrializers, just as steep-manufacturing economies do. The second fact links this heterogeneity to financial development: conditional on income per worker and fixed effects, financial development is systematically related to the sectoral composition of employment. The third fact connects the same force to the open-economy margin. Drawing on an established finance-and-trade literature, we explain why exporting is especially sensitive to external-finance constraints and why this sensitivity can differ across sectors. We then show that the broad-sector patterns in our data are consistent with this mechanism: financially more developed economies export more relative to output, particularly in manufacturing and high-skilled services. Together, the facts motivate a model in which financial development shapes both domestic sectoral reallocation and world-market sectoral demand.

2.1 Data and sample

The empirical analysis combines harmonized sectoral employment and value-added data from the GGDC 10-Sector Database, the GGDC/UNU-WIDER Economic Transformation Database (ETD), WIOD, EU KLEMS, and OECD data. The GGDC 10-Sector Database provides long-run sectoral series for countries in Africa, Asia, Latin America, the Middle East, Europe, and the United States. The ETD provides developing-country coverage from 1990 to 2018 and is used where its series overlap with earlier GGDC observations (Vries et al. 2021; Kruse et al. 2023). For countries covered by WIOD, the series use the WIOD 2016 release for 2000–2014 (Timmer et al. 2016) and the WIOD 2013 release for 1995–1999 (Timmer et al. 2015), with EU KLEMS used to extend the pre-1995 series where available. The most recent years are completed with EU KLEMS 2023 and OECD National Accounts for the countries for which those sources provide the relevant sectoral information.

Countries are classified as steep-manufacturing economies when their observed manufacturing path reaches a sufficiently high peak (27.5 percent) or remains high at the end of the sample (25 percent); the remaining economies are classified as flat-manufacturing economies. The same classification rule defines both the baseline groups used in the quantitative section and the broader 83-country empirical classification used to organize the empirical analysis. Appendix A reports the country lists and the precise screens. The flat group includes some countries that industrialized early, like Peru and Brazil, and even one high-income country, Greece.

Financial development is measured using the IMF Financial Institutions Index from the IMF Financial Development Database (Svirydzenka 2016). Descriptive financial-development moments use the observed IMF index from 1980 to 2018, while the employment regressions use the completed financial-development series over 1970–2018. The index ranges from zero to one and summarizes the depth, access, and efficiency of financial institutions, including bank credit, non-bank financial institutions, access to financial services, and intermediation efficiency. This is also the financial-development object used in the baseline calibration. Appendix B reports robustness checks using the broader IMF Financial Development Index and private credit to GDP.

Trade data are used to relate financial development to export performance. Trade in agriculture, manufacturing, and high-skilled services is based on WIOD whenever available. Agriculture and manufacturing trade data are complemented with UN COMTRADE before 1995 and BACI from 1995 to 2018 (Gaulier and Zignago 2010). High-skilled-services trade is completed with data from the OECD-WTO Balanced Trade in Services dataset. Export values are combined with aggregate output to form export-to-output ratios by country, year, and sector. GDP per worker in the employment regressions is constructed from Penn World Table output and employment.

Fact 1: *Flat manufacturing is not only a late-industrialization phenomenon.*

We begin by defining the two types of structural-transformation paths that organize the rest of the paper. Steep-manufacturing economies experience a pronounced manufacturing phase as labor leaves agriculture: manufacturing rises substantially, reaches a clear hump, and then gives way to a later expansion of high-skilled services. Flat-manufacturing economies experience a much more muted manufacturing expansion. Their movement out of agriculture is absorbed to a greater extent by low-skilled services, and high-skilled services do not compensate for the missing manufacturing phase at comparable stages of the transition.[1]

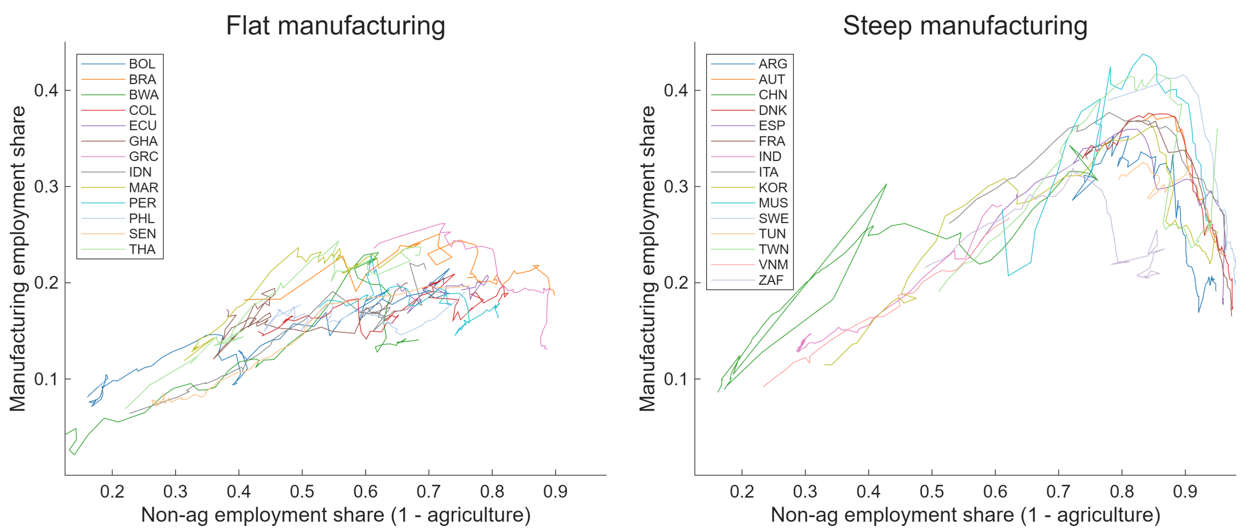

Figure 1: Manufacturing employment versus non-agricultural employment share

Source: GGDC 10-Sector Database; GGDC/UNU-WIDER Economic Transformation Database (ETD); EU KLEMS; World Input-Output Database (WIOD).

Figure 1 plots the manufacturing employment share against the non-agricultural employment share. The horizontal axis is a measure of progress out of agriculture, so the figure describes the shape of structural transformation rather than the calendar timing of industrialization. Steep-manufacturing economies display the familiar manufacturing hump: manufacturing expands strongly during the transition out of agriculture and reaches a high peak before declining. Flat-manufacturing economies follow a different path. Manufacturing rises only modestly and remains compressed over the transition, so the movement out of agriculture does not generate a comparable

1. Figures 1–3 plot selected country trajectories so that the contrast between steep and flat paths remains visible.

industrialization window.

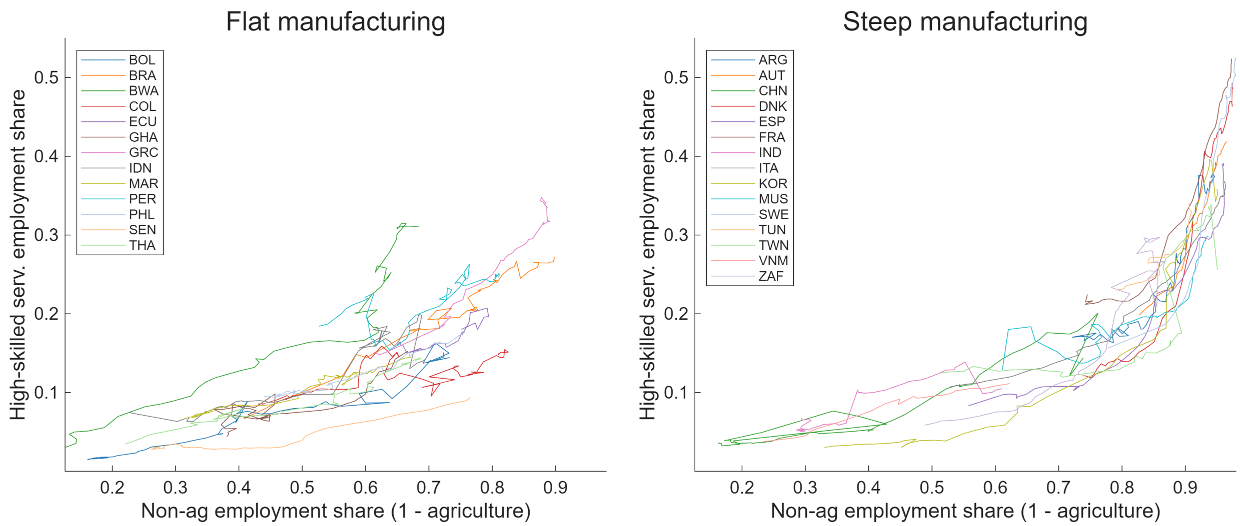

Figure 2: High-skilled services employment versus non-agricultural employment share

Source: GGDC 10-Sector Database; GGDC/UNU-WIDER Economic Transformation Database (ETD); EU KLEMS; World Input-Output Database (WIOD).

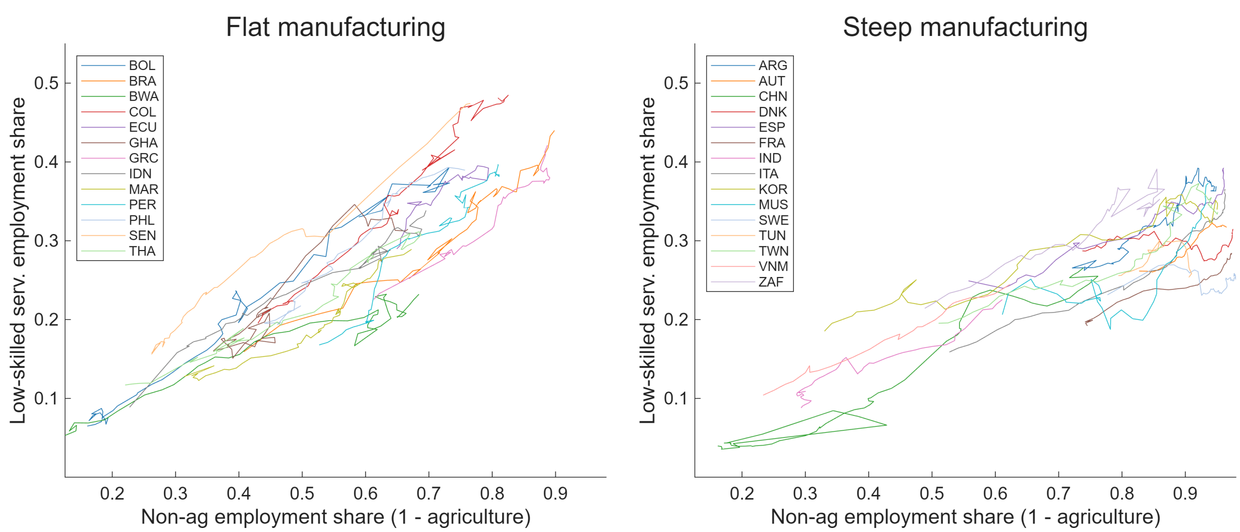

Figure 3: Low-skilled services employment versus non-agricultural employment share

Source: GGDC 10-Sector Database; GGDC/UNU-WIDER Economic Transformation Database (ETD); EU KLEMS; World Input-Output Database (WIOD).

Figures 2 and 3 show the service-sector counterpart to this classification. Steep-manufacturing economies are associated with a later and stronger expansion of high-skilled services, after the manufacturing phase has already taken shape. Flat-manufacturing economies are instead characterized by a larger and more persistent movement into low-skilled services. The missing manufacturing phase is therefore not offset by an early high-skilled-services transition. It is associated instead with a different form of non-agricultural reallocation, in which labor leaves agriculture but is absorbed disproportionately by low-skilled services.

Figure 4 then asks whether the distinction between flat and steep trajectories is simply a distinction between late and early industrialization.[2] It shows peak manufacturing employment by the year when this peak occurred (on the left-hand panel) and by the year when the country crossed 40 percent agricultural employment (on the right-hand panel), a proxy for structural transformation being underway. Recent work on premature deindustrialization emphasizes that later industrializers face a different global environment, with trade and specialization altering the scope for manufacturing expansion (Rodrik 2016; Sposi, Yi, and Zhang 2026). We find the timing channel to be important, but it does not exhaust the facts: manufacturing peaks vary substantially among both early and late industrializers. Some economies reach the non-agricultural transition relatively early but nevertheless experience only muted manufacturing expansions, while some later industrializers generate much steeper manufacturing humps. The relevant heterogeneity is therefore not only when countries industrialize, but also how labor is reallocated once agriculture declines. The paper accordingly treats flat manufacturing as a distinct structural-transformation path, rather than as a mechanical implication of reaching the manufacturing phase later in calendar time.

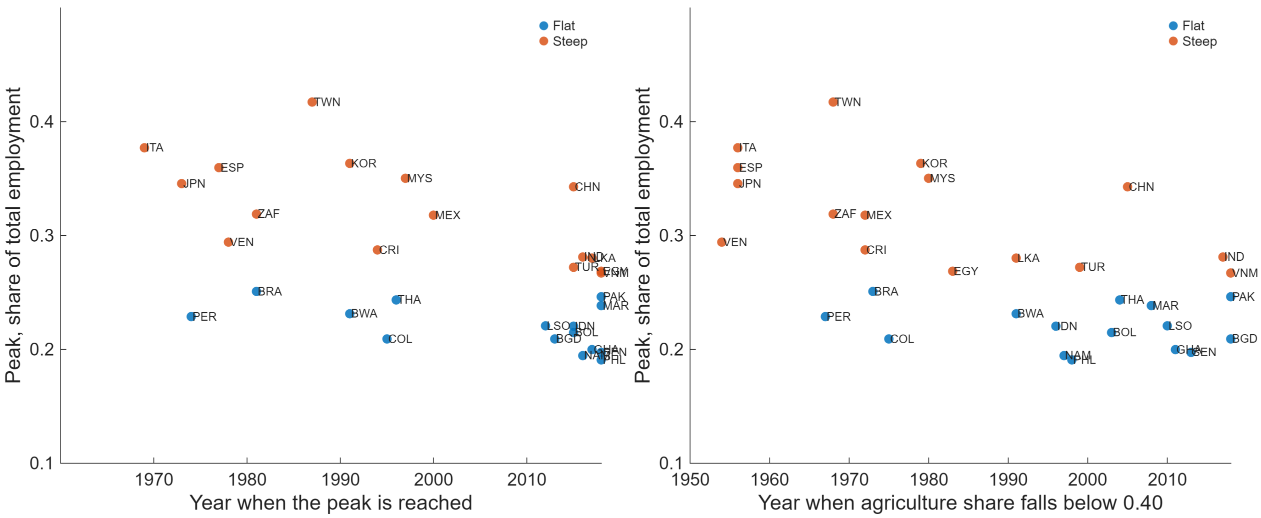

Figure 4: Maximum manufacturing share of employment

Source: GGDC 10-Sector Database; GGDC/UNU-WIDER Economic Transformation Database (ETD); EU KLEMS; World Input-Output Database (WIOD).

Fact 2: *Financial development is systematically related to sectoral composition.*

The flat- and steep-manufacturing groups differ sharply in financial development. Table 1 summarizes the IMF Financial Institutions Index within the broader empirical classification, restricting the moments to country-year observations for which the index is observed between 1980 and 2018.[3] The average index is 0.43 in the full sample,

2. Figure 4 uses 31 countries from the empirical panel with 1) at least ten annual observations, 2) at least nine observations before the manufacturing peak, and 3) observations on both sides of a 40 percent agricultural-employment threshold.

3. On the same country-year support, alternative-measure moments (mean, median, standard deviation) are as follows. For the IMF Financial Development Index: all countries 0.355, 0.310, 0.229; flat-manufacturing economies 0.195, 0.142, 0.137; steep-manufacturing economies 0.470, 0.442, 0.213. For private credit to GDP before taking logs, measured in percent of GDP: all countries 54.53, 41.89, 45.06; flat-manufacturing economies 29.06, 19.31, 32.64; steep-manufacturing economies

0.26 among flat-manufacturing economies, and 0.55 among steep-manufacturing economies. This difference is large relative to the overall dispersion of the index and points to finance as a natural candidate explanation for the cross-country heterogeneity documented above. It is not, however, sufficient on its own: countries differ in income levels, long-run institutions, and common global shocks. The regressions below therefore condition on GDP per worker and include country and year fixed effects.

Table 1: Financial Institutions Index by manufacturing-path group

Group	Mean	Median	SD
All	0.43	0.37	0.24
Flat	0.26	0.21	0.14
Steep	0.55	0.54	0.22

Notes: Moments are computed over non-missing country-year observations of the IMF Financial Institutions Index from 1980 to 2018. The broader empirical classification contains 34 flat-manufacturing economies and 49 steep-manufacturing economies, as reported in Appendix A.

Table 2 reports regressions of sectoral employment shares on the IMF Financial Institutions Index. The dependent variables are the shares of total employment in agriculture, manufacturing, low-skilled services, and high-skilled services. All specifications include country and year fixed effects and control for log GDP per worker. Panel A allows the financial-development relationship to be nonlinear through the level and square root of the index. Panel B adds the square root of log GDP per worker, allowing the income profile itself to be more flexible. Because financial development enters nonlinearly, the coefficients on the financial-development terms are best interpreted through the implied partial relationship rather than as separate constant marginal effects. In Appendix B, we report several robustness exercises. First, we estimate alternative specifications in which we replace the square-root terms with quadratic terms. Second, we consider alternative measures of financial development: the IMF Financial Development Index and the private-credit-to-GDP ratio. Third, we repeat the baseline analysis after excluding China, Japan, and South Korea, three countries in which major industrial policies may confound the estimated relationship between financial development and structural transformation. Finally, we control for trade openness and the domestic expenditure share.

The fitted relationships are shown in Figure 5. The left panel shows the manufacturing profile. Over the part of the financial-development distribution in which many economies are still building industrial capacity, higher financial development is associated with a larger manufacturing employment share. At the upper end of the distribution, the relationship flattens and eventually turns down. This non-monotonicity is informative because it remains after conditioning on income per worker and fixed effects: financial development is associated with the composition of employment at a given level of development, not merely with the level of development itself. The right panel shows high-skilled services. The fitted profile is also nonlinear: it is flat to slightly declining at the

72.69, 66.00, 43.90.

Table 2: Sectoral employment shares and the IMF Financial Institutions Index

	Panel A				Panel B			
	Agric.	Manuf.	LS serv.	HS serv.	Agric.	Manuf.	LS serv.	HS serv.
ln(GDPpw)	-0.08***	0.03*	0.01	0.03**	0.80***	-0.99***	-0.50***	0.69***
	(0.018)	(0.013)	(0.009)	(0.009)	(0.207)	(0.199)	(0.116)	(0.131)
$\ln(\text{GDPpw})^{1/2}$					-5.35***	6.24***	3.15***	-4.03***
					(1.220)	(1.200)	(0.687)	(0.772)
Fin Dev	0.78***	-0.72***	-0.49***	0.42***	0.51***	-0.40***	-0.33***	0.22**
	(0.120)	(0.110)	(0.073)	(0.085)	(0.111)	(0.091)	(0.070)	(0.072)
$\text{Fin Dev}^{1/2}$	-0.95***	0.78***	0.58***	-0.41***	-0.67***	0.45***	0.42***	-0.20*
	(0.159)	(0.145)	(0.091)	(0.109)	(0.148)	(0.118)	(0.086)	(0.088)
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.98	0.83	0.93	0.97	0.98	0.87	0.94	0.97
Observations	3,261	3,261	3,261	3,261	3,261	3,261	3,261	3,261

Notes: Fin Dev is the completed IMF Financial Institutions Index. Standard errors clustered at the country level are reported in parentheses. All specifications include country and year fixed effects. Significance codes are ***: 0.001, **: 0.01, *: 0.05, .: 0.1.

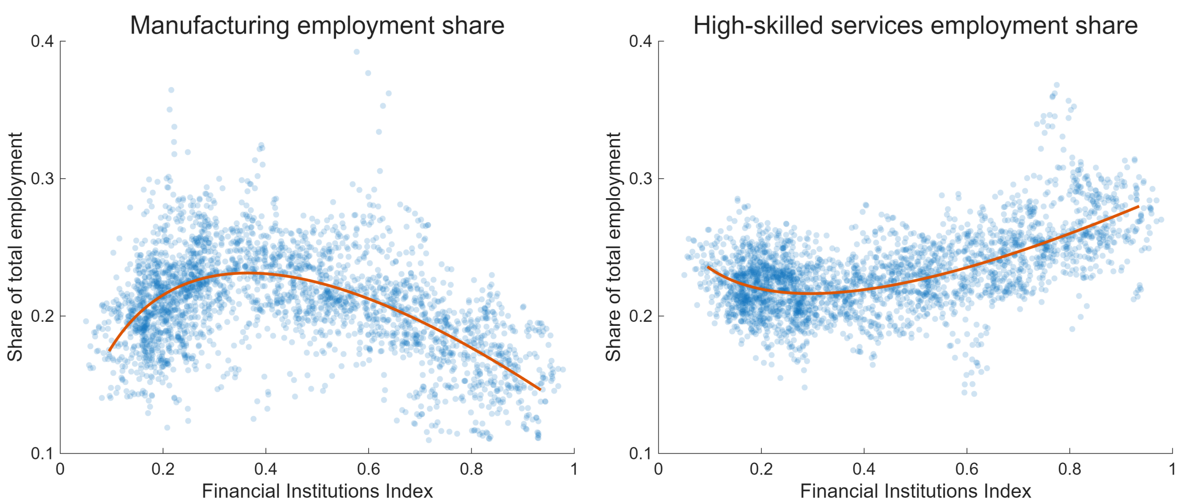

Figure 5: Sectoral allocation as explained by financial development

Source: GGDC 10-Sector Database; GGDC/UNU-WIDER Economic Transformation Database (ETD); EU KLEMS; World Input-Output Database (WIOD); IMF Financial Development Database; Penn World Table.

lowest levels of financial development, but rises over most of the observed range. Together, the two panels suggest that financial development is tied to sectoral reallocation in a way that differs across sectors: it is associated with greater employment in sectors with stronger financing needs, while manufacturing also reflects the hump-shaped forces of structural transformation.

The panel regressions above relate financial development to sectoral employment shares within countries over time. A remaining concern is that financial development may itself respond to the manufacturing path. To address this concern directly, we ask whether financial development measured before a country's manufacturing peak predicts the height of that peak.

Let

$$t_i^{peak} = \arg\max_t m_{i,t}, \qquad m_i^{peak} = \max_t m_{i,t},$$

where $m_{i,t}$ is the manufacturing share of employment. For $q \in \{5, 10, 15\}$, we estimate the cross-sectional specifications

$$m_i^{peak} = \alpha + \beta FD_{i,t_i^{peak}-q} + \gamma_1 \ln(GDPpw)_{i,t_i^{peak}-q} + \gamma_2 m_{i,t_i^{peak}-q} + \varepsilon_i,$$
$$m_i^{peak} = \alpha + \beta FD_{i,t_i^{peak}-q} + \gamma_1 \ln(GDPpw)_{i,t_i^{peak}-q} + \gamma_2 \ln(GDPpw)^2_{i,t_i^{peak}-q} + \gamma_3 m_{i,t_i^{peak}-q} + \varepsilon_i.$$

Each regression has one observation per country and uses heteroskedasticity-robust standard errors. The controls measure the country's income and manufacturing share at the same pre-peak date as financial development. Countries enter a given horizon only if the lookback year is observed and the required financial-development and control variables are non-missing.

Table 3: Financial development before the manufacturing peak: horizon $q = 10$

	Panel A: Linear specification			Panel B: Quadratic specification		
	Priv. Cred. / GDP	IMF FD	IMF institutions	Priv. Cred. / GDP	IMF FD	IMF institutions
FD	0.02**	0.11***	0.10*	0.02**	0.11***	0.10*
	(0.01)	(0.03)	(0.05)	(0.01)	(0.03)	(0.04)
y_{init}	0.00	0.00	0.00	0.21*	0.26**	0.29**
	(0.01)	(0.01)	(0.01)	(0.08)	(0.08)	(0.08)
y^2_{init}				-0.01*	-0.01**	-0.02**
				(0.00)	(0.00)	(0.00)
m_{init}	0.82***	0.87***	0.81***	0.81***	0.85***	0.79***
	(0.11)	(0.09)	(0.11)	(0.10)	(0.09)	(0.11)
Constant	0.04	0.10	0.05	-0.93*	-1.14**	-1.27**
	(0.07)	(0.07)	(0.08)	(0.39)	(0.37)	(0.39)
Observations	46	46	46	46	46	46
Adjusted R^2	0.86	0.85	0.84	0.86	0.87	0.86

Notes: Heteroskedasticity-robust standard errors are reported in parentheses. The dependent variable is the peak manufacturing employment share, $m_i^{peak} = \max_t m_{i,t}$. Financial development and controls are measured $q = 10$ years before the peak, at $t_i^{peak} - 10$. Columns use log private credit to GDP, the IMF Financial Development Index, and the IMF Financial Institutions Index; private credit is measured in percent of GDP before taking logs. In Panel A, the estimated specification is $m_i^{peak} = \alpha + \beta FD_{i,t_i^{peak}-10} + \gamma_1 y_{\text{init}} + \gamma_2 m_{\text{init}} + \varepsilon_i$. In Panel B, the specification additionally includes y^2_{init}. Significance codes are ***: 0.001, **: 0.01, *: 0.05, .: 0.1.

Table 3 reports the baseline horizon, $q = 10$. The coefficient on financial development is positive for all three measures and remains positive when the income control is allowed to be quadratic. The exercise is not a causal design, but it shows that the association between finance and the manufacturing window is already visible before the realized peak. Appendix B reports the corresponding $q = 5$ and $q = 15$ horizons.

Fact 3: *Financial frictions disproportionately restrict exports in financially vulnerable tradable sectors.*

The third fact motivates the export-finance margin in the quantitative model. A large finance-and-trade literature shows that financial development shapes export performance and comparative advantage. Kletzer and Bardhan (1987) provide an early theory in which credit-market imperfections affect patterns of international trade, while Svaleryd and Vlachos (2005) show that financial development shapes industrial specialization and comparative advantage, and Ju and Wei (2011) characterize theoretically when the quality of the financial system becomes a source of comparative advantage. Beck (2002) finds that economies with better-developed financial systems have a comparative advantage in manufacturing, while Beck (2003) shows that financially developed economies have higher export shares and trade balances in industries that rely more heavily on external finance. Building on this insight, Manova (2013) develops a heterogeneous-firm model in which credit constraints affect trade through domestic production, entry into export markets, and exporters' foreign sales. Only 20–25 percent of the effect of credit constraints on trade operates through lower aggregate output. Of the remaining trade-specific effect, around one-third reflects reduced entry into exporting and two-thirds reflect lower sales by exporters. Financial frictions therefore affect foreign sales above and beyond their impact on domestic production.

The mechanism is intuitive. Relative to domestic sales, exporting requires firms to finance additional fixed and variable costs before foreign revenues are realized. These include market-access costs and working-capital needs associated with production, inventories, shipment, and payment delays. Using Chilean data, Kohn, Leibovici, and Szkup (2016) document substantial differences between exporters and non-exporters: 83.8 percent of exporters are paid after delivery, compared with 57.4 percent of non-exporters, and exporters hold inventories equivalent to 55.6 days of production, compared with 38.7 days among non-exporters. In the same Chilean setting, Kohn et al. (2026) show that trade-finance arrangements and learning within exporter–importer relationships shape export dynamics. Related firm-level studies show that credit constraints and credit-supply shocks reduce export performance, including Minetti and Zhu (2011), Amiti and Weinstein (2011), Paravisini et al. (2015), and Matray et al. (2024); sector-level crisis evidence in Chor and Manova (2012) points in the same direction. These findings support modeling weak financial development as an additional barrier to serving foreign markets rather than as a symmetric distortion to all production.

The literature also suggests that this export-finance barrier should vary across sectors. The standard approach is to discipline financial vulnerability using external-finance dependence, capital intensity, working-capital requirements, and asset tangibility (Rajan and Zingales (1998), Beck (2003), and Manova (2013)). In a multi-industry quantitative model, Leibovici (2021) shows that differences in capital intensity generate differences in external-finance dependence and that financial development reallocates trade toward capital-intensive industries. These results provide a strong basis for allowing the export-finance wedge to vary across tradable sectors. They do not, however, imply a direct empirical ranking across the broad agriculture, manufacturing, and high-skilled-services aggregates used in our model. We therefore estimate sector-specific exposure parameters in the quantitative analysis rather than imposing a common wedge or a predetermined ordering.

Against this background, Figure 6 provides a descriptive counterpart using the broad sectors in our data.

Manufacturing exports relative to output rise strongly with the IMF Financial Institutions Index, as do high-skilled-services exports. Agricultural exports display a much flatter relationship. These correlations are not intended to identify the structural wedges used in the model. Their role is more limited: they show that the broad-sector patterns in our data are consistent with the mechanisms documented in the previous literature and motivate allowing export-finance exposure to differ across sectors.

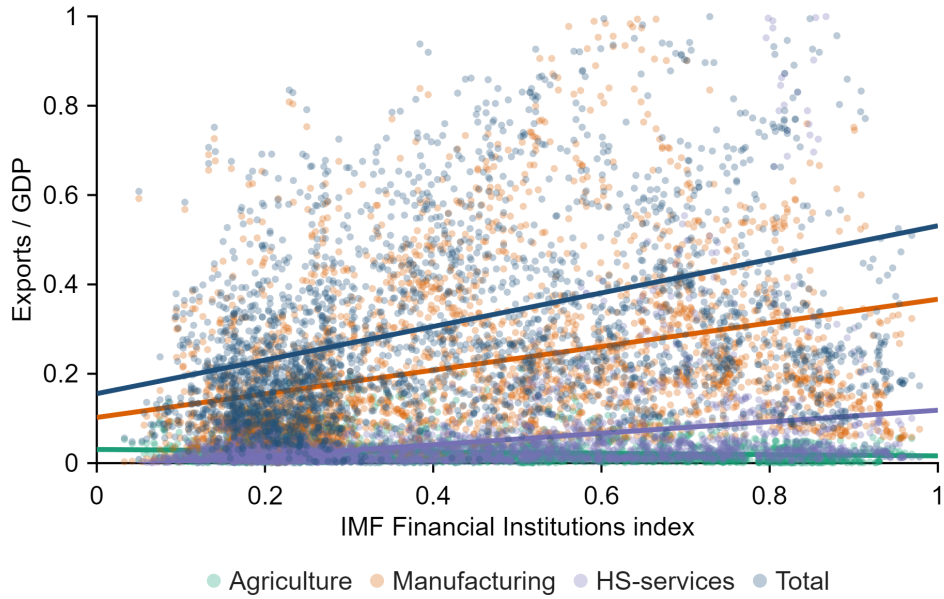

Figure 6: Sectoral exports and financial development

Source: BACI; UN COMTRADE; WTO International Trade in Services; OECD-WTO Balanced Trade in Services; IMF Financial Development Database; Penn World Table.

Taken together, the three facts motivate the two financial margins in the quantitative model. Fact 1 shows that flat manufacturing is a distinct structural-transformation path, rather than only a consequence of industrializing late. Fact 2 shows that financial development is systematically related to sectoral composition after controlling for income and fixed effects. Fact 3 draws on the established finance-and-trade literature and on descriptive broad-sector evidence to motivate an export-finance wedge that varies across tradable activities. The model below asks whether this export-finance margin, together with the domestic investment-demand margin, is quantitatively important for the structural-transformation paths of financially underdeveloped economies.

3 Model

3.1 Environment

Time is discrete and indexed by t. The world economy consists of N countries indexed n and i (destination and origin). Each country is populated by a representative household of size $L_{n,t}$, which owns the domestic labor endowment, the aggregate capital stock, and domestic firms. There is no aggregate uncertainty; agents have perfect foresight over the exogenous paths.

There are four sectors,

$$j \in \mathcal{J} \equiv \{a, m, ls, hs\},$$

corresponding to agriculture, manufacturing, low-skilled services, and high-skilled services. Agriculture, manufacturing, and high-skilled services are tradable; low-skilled services are non-tradable. Let $\mathcal{T} \equiv \{a, m, hs\}$ denote the set of tradable sectors. Sectoral composite goods are used both for final consumption and for the production of the investment good.

Production takes place through monopolistically competitive variety producers. A firm in country i, sector j, and period t combines capital and effective labor with a country-sector productivity shifter $A^j_{i,t}$ and an idiosyncratic productivity draw. Capital intensity is sector-specific: sector j has Cobb–Douglas capital share

$$\alpha_j \in (0, 1), \qquad j \in \mathcal{J}.$$

The factor shares $\{\alpha_j\}_{j\in\mathcal{J}}$ are constant over time and common across countries. Allowing factor intensities to vary across sectors introduces a factor-proportions channel into structural transformation: changes in wages and rental rates affect sectoral costs differently, and reallocation across sectors changes aggregate factor demand. Labor and capital are allocated across sectors within each country, but neither factor is mobile internationally.

The model also distinguishes agricultural headcount employment from the effective labor supplied by agricultural workers. Let $L^j_{i,t}$ denote headcount employment in sector j, and define efficiency units per worker as

$$s^j_{i,t} = \begin{cases} s^a_{i,t} \in (0, 1], & j = a, \\ 1, & j \neq a. \end{cases} \tag{1}$$

Effective labor employed in sector j is

$$\widetilde{L}^j_{i,t} = s^j_{i,t} L^j_{i,t}. \tag{2}$$

Aggregate effective labor is therefore

$$\widetilde{L}_{i,t} \equiv \sum_{j\in\mathcal{J}} \widetilde{L}^j_{i,t} = s^a_{i,t} L^a_{i,t} + \sum_{k\neq a} L^k_{i,t} = L_{i,t} - (1 - s^a_{i,t}) L^a_{i,t}. \tag{3}$$

The wage $w_{i,t}$ is the price of one efficiency unit of labor. Accordingly, the labor earnings associated with one agricultural worker are $w_{i,t}s^a_{i,t}$, whereas the earnings associated with one non-agricultural worker are $w_{i,t}$. The term $s^a_{i,t}$ is a parsimonious reduced-form mapping between agricultural headcounts and productive market labor services, motivated by the large and persistent agricultural productivity gaps documented in the development literature.[4] Since firms minimize costs over efficiency units, $s^a_{i,t}$ does not enter unit costs, price indices, or trade

4. Using national accounts and micro data, Gollin, Lagakos, and Waugh (2014) document that value added per worker is substantially lower in agriculture than outside agriculture, especially in poor economies. Adjustments for sectoral differences in hours worked and human capital reduce the measured gap but do not eliminate it. In our framework, $s^a_{i,t}$ may capture differences in effective market labor per worker, selection, informality, rural attachment, home-production margins, or labor mobility frictions. We do not model the underlying occupational-choice problem explicitly; the wedge should not be interpreted as frictionless reallocation of ex ante identical workers facing different headcount earnings.

shares. Its role is to capture a salient feature of structural transformation: in low- and middle-income economies, agriculture commonly accounts for a much larger share of employment than of value added. It therefore improves the mapping from agricultural revenues to agricultural employment without forcing the model to absorb the observed employment gap through agricultural demand, trade costs, or productivity.

Financial development is country-specific and time-varying. It is summarized by $\lambda_{i,t} \in (0, 1]$, with higher values corresponding to better financial development. It affects the economy through two structural margins. First, it distorts the intertemporal investment decision. Second, it raises the variable cost of serving foreign markets in sectors that rely more heavily on external finance.

3.2 Households

In each country n, the representative household chooses aggregate consumption, aggregate investment, next period's capital stock, and the intratemporal sectoral composition of consumption to maximize

$$\sum_{t=0}^{\infty} \beta^t L_{n,t} \log\left(\frac{C_{n,t}}{L_{n,t}}\right), \tag{4}$$

where $C_{n,t}$ is aggregate final consumption and $\beta \in (0, 1)$ is the discount factor.

Let $P^c_{n,t}$ denote the average price of final consumption and $P^x_{n,t}$ the price of the investment good. The household-facing period budget constraint is

$$P^c_{n,t} C_{n,t} + (1 + \psi_{n,t}) P^x_{n,t} X_{n,t} = w_{n,t} \widetilde{L}_{n,t} + r_{n,t} K_{n,t} + \Pi_{n,t} + T^I_{n,t}, \tag{5}$$

where $X_{n,t}$ is aggregate investment, $K_{n,t}$ is the aggregate capital stock, $r_{n,t}$ is the rental rate of capital, and $\Pi_{n,t}$ denotes profits rebated by domestic firms. The term $\psi_{n,t}$ is an investment wedge. It raises the price relevant for the household's investment decision but does not absorb resources. The corresponding revenue is rebated lump-sum:

$$T^I_{n,t} = \psi_{n,t} P^x_{n,t} X_{n,t}. \tag{6}$$

The household takes $T^I_{n,t}$ as given when choosing investment. Therefore, the rebate does not undo the distortion to the intertemporal margin. After substituting equation (6) into the household budget, the post-rebate household budget identity is

$$P^c_{n,t} C_{n,t} + P^x_{n,t} X_{n,t} = w_{n,t} \widetilde{L}_{n,t} + r_{n,t} K_{n,t} + \Pi_{n,t}. \tag{7}$$

Thus, $\psi_{n,t}$ distorts the timing of investment without destroying investment goods. The model also includes a residual intertemporal wedge that captures distortions to capital accumulation not accounted for by the structural investment wedge; like the structural wedge, it does not absorb resources and therefore does not appear in either (5) or (7).

Capital accumulates through a Lucas–Prescott investment technology,

$$X_{n,t} = \Phi(K_{n,t+1}, K_{n,t}) = \delta^{1-\frac{1}{\nu}} \left(\frac{K_{n,t+1}}{K_{n,t}} - (1 - \delta)\right)^{\frac{1}{\nu}} K_{n,t}. \tag{8}$$

The parameter $\delta \in (0,1)$ is the depreciation rate and $\nu \in (0,1]$ governs the curvature of the adjustment technology. When $\nu = 1$, capital accumulation is linear: $K_{n,t+1} = (1-\delta)K_{n,t} + X_{n,t}$.

Let

$$\Phi_1(K', K) \equiv \frac{\partial \Phi(K', K)}{\partial K'}, \qquad \Phi_2(K', K) \equiv \frac{\partial \Phi(K', K)}{\partial K}.$$

These derivatives enter the household's intertemporal optimality condition, which is defined by

$$\begin{aligned}(1+\omega_{n,t})(1+\psi_{n,t})\frac{P^x_{n,t}}{P^c_{n,t}} \\ = \beta\left[\frac{L_{n,t+1}}{L_{n,t}}\frac{C_{n,t}}{C_{n,t+1}}\frac{P^x_{n,t+1}}{P^c_{n,t+1}}\left(\frac{r_{n,t+1}/P^x_{n,t+1} - (1+\psi_{n,t+1})\Phi_2(K_{n,t+2}, K_{n,t+1})}{\Phi_1(K_{n,t+1}, K_{n,t})}\right)\right].\end{aligned} \tag{9}$$

where $\psi_{n,t}$ and $\omega_{n,t}$ are an investment friction and a residual wedge, both defined in Section 3.6.

3.3 Final consumption

Following Comin, Lashkari, and Mestieri (2021), aggregate final consumption is defined implicitly as a non-homothetic CES bundle over the four sectoral composites. The household allocates consumption expenditure across sectoral goods $\{c^j_{n,t}\}_{j\in\mathcal{J}}$ according to

$$\sum_{j\in\mathcal{J}} \gamma^j_n \left(\frac{C_{n,t}}{L_{n,t}}\right)^{\frac{1-\sigma}{\sigma}\epsilon^j} \left(\frac{c^j_{n,t}}{L_{n,t}}\right)^{\frac{\sigma-1}{\sigma}} = 1. \tag{10}$$

The parameter σ governs substitution across sectoral composites, ϵ^j governs how demand for sector j varies with the scale of consumption, and γ^j_n is a country-specific, time-invariant weight. When the scale elasticities differ across sectors, changes in consumption per worker shift sectoral expenditure shares even at fixed relative prices. We summarize the intratemporal allocation through the average expenditure price of aggregate consumption, $P^c_{n,t}$, defined by

$$P^c_{n,t} C_{n,t} = \sum_{j\in\mathcal{J}} P^j_{n,t} c^j_{n,t}. \tag{11}$$

Conditional on $C_{n,t}$ and sectoral prices, expenditure minimization gives

$$P^c_{n,t} = \left[\sum_{j\in\mathcal{J}} (\gamma^j_n)^\sigma (P^j_{n,t})^{1-\sigma} \left(\frac{C_{n,t}}{L_{n,t}}\right)^{(1-\sigma)(\epsilon^j-1)}\right]^{\frac{1}{1-\sigma}}, \tag{12}$$

and sectoral expenditure shares

$$\frac{P^j_{n,t} c^j_{n,t}}{P^c_{n,t} C_{n,t}} = (\gamma^j_n)^\sigma \left(\frac{P^j_{n,t}}{P^c_{n,t}}\right)^{1-\sigma} \left(\frac{C_{n,t}}{L_{n,t}}\right)^{(1-\sigma)(\epsilon^j-1)}. \tag{13}$$

Equivalently, sectoral consumption demand is

$$c^j_{n,t} = C_{n,t}(\gamma^j_n)^\sigma \left(\frac{P^j_{n,t}}{P^c_{n,t}}\right)^{-\sigma} \left(\frac{C_{n,t}}{L_{n,t}}\right)^{(1-\sigma)(\epsilon^j-1)}. \tag{14}$$

3.4 Investment good

The same sectoral composites are used to assemble the aggregate investment bundle. In each country and period, a single investment-bundle producer combines sectoral composites $\{x^j_{n,t}\}_{j\in\mathcal{J}}$ into $X_{n,t}$ according to a non-homothetic CES technology:

$$\sum_{j\in\mathcal{J}} \omega^x_{n,j} \left(\frac{X_{n,t}}{L_{n,t}}\right)^{\frac{1-\sigma_x}{\sigma_x}\epsilon^j_x} \left(\frac{x^j_{n,t}}{L_{n,t}}\right)^{\frac{\sigma_x-1}{\sigma_x}} = 1. \tag{15}$$

The parameter σ_x governs substitution across sectoral composites in investment, ϵ^j_x governs how the use of sector j varies with the scale of investment per worker, and $\omega^x_{n,j}$ is a country-specific, time-invariant investment weight.

Because equation (15) is generally non-constant-returns to scale, the investment-bundle market requires an explicit pricing convention. Following the contestable-market formulation in Sposi, Yi, and Zhang (2026), which builds on Baumol, Panzar, and Willig (1982), we assume one investment-bundle producer in each country. The producer takes total demand $X_{n,t}$ and sectoral composite prices $\{P^j_{n,t}\}_{j\in\mathcal{J}}$ as given and chooses the least-cost input mix. Its total assembly cost is

$$\begin{aligned}\Omega^x_{n,t}\left(\{P^j_{n,t}\}_{j\in\mathcal{J}}, X_{n,t}\right) &\equiv \min_{\{x^j_{n,t}\}_{j\in\mathcal{J}}} \left\{\sum_{j\in\mathcal{J}} P^j_{n,t} x^j_{n,t} \ : \ (15)\right\} \\ &= L_{n,t}\left[\sum_{j\in\mathcal{J}} (\omega^x_{n,j})^{\sigma_x} (P^j_{n,t})^{1-\sigma_x} \left(\frac{X_{n,t}}{L_{n,t}}\right)^{(1-\sigma_x)\epsilon^j_x}\right]^{\frac{1}{1-\sigma_x}}.\end{aligned} \tag{16}$$

The bundle producer operates in a contestable market: the threat of entry rules out positive profits. It therefore charges a posted bundle price equal to average cost,

$$P^x_{n,t} X_{n,t} = \Omega^x_{n,t}\left(\{P^j_{n,t}\}_{j\in\mathcal{J}}, X_{n,t}\right) = \sum_{j\in\mathcal{J}} P^j_{n,t} x^j_{n,t}. \tag{17}$$

Consequently, the price of one investment bundle is

$$P^x_{n,t} = \left[\sum_{j\in\mathcal{J}} (\omega^x_{n,j})^{\sigma_x} (P^j_{n,t})^{1-\sigma_x} \left(\frac{X_{n,t}}{L_{n,t}}\right)^{(1-\sigma_x)(\epsilon^j_x-1)}\right]^{\frac{1}{1-\sigma_x}}. \tag{18}$$

Cost minimization implies sectoral investment expenditure shares

$$h^{x,j}_{n,t} \equiv \frac{P^j_{n,t} x^j_{n,t}}{P^x_{n,t} X_{n,t}} = (\omega^x_{n,j})^{\sigma_x} \left(\frac{P^j_{n,t}}{P^x_{n,t}}\right)^{1-\sigma_x} \left(\frac{X_{n,t}}{L_{n,t}}\right)^{(1-\sigma_x)(\epsilon^j_x-1)}, \tag{19}$$

and sectoral investment demand

$$x^j_{n,t} = X_{n,t} (\omega^x_{n,j})^{\sigma_x} \left(\frac{P^j_{n,t}}{P^x_{n,t}}\right)^{-\sigma_x} \left(\frac{X_{n,t}}{L_{n,t}}\right)^{(1-\sigma_x)(\epsilon^j_x-1)}. \tag{20}$$

3.5 Production

In each country i, sector j, and period t, a unit mass of monopolistically competitive firms produces differentiated varieties. Firms differ in idiosyncratic productivity ϕ. A firm with productivity ϕ produces

$$q^j_{i,t}(\phi) = A^j_{i,t}\phi \left(K^j_{i,t}(\phi)\right)^{\alpha_j} \left(\widetilde{L}^j_{i,t}(\phi)\right)^{1-\alpha_j}, \tag{21}$$

where $\widetilde{L}_{i,t}^j(\phi) = s_{i,t}^j L_{i,t}^j(\phi)$ is the firm's labor input in efficiency units. The term $A_{i,t}^j$ is a country-sector productivity shifter common to all firms in country i, sector j, and period t. The term ϕ captures firm-level productivity.

Firm productivity is distributed Pareto with common shape parameter θ:

$$G(\phi) = 1 - \left(\frac{\phi_0}{\phi}\right)^\theta, \qquad \phi \geq \phi_0, \qquad \theta > \eta - 1. \tag{22}$$

Because the model has no fixed or entry costs, all firms with draws on the support are active. With CES demand, aggregate sales and prices depend on firms' productivities through the $(\eta-1)$-order productivity average. We define the corresponding representative productivity as

$$\widetilde{\phi} \equiv \left(\int_{\phi_0}^{\infty} \phi^{\eta-1} dG(\phi)\right)^{\frac{1}{\eta-1}} = \left[\frac{\theta}{\theta - (\eta - 1)}\right]^{\frac{1}{\eta-1}} \phi_0. \tag{23}$$

This object is the productivity of a representative variety that delivers the same CES aggregate as the continuum of heterogeneous firms. Thus, $A_{i,t}^j$ captures country-sector productivity, whereas $\widetilde{\phi}$ summarizes the contribution of within-sector firm heterogeneity.

We then define the sector-specific Cobb–Douglas unit-cost constant as

$$\kappa_j \equiv \alpha_j^{-\alpha_j}(1 - \alpha_j)^{-(1-\alpha_j)}. \tag{24}$$

Cost minimization gives the unit cost of producing a variety before trade and financial frictions:

$$u_{i,t}^j(\phi) = \frac{\kappa_j w_{i,t}^{1-\alpha_j} r_{i,t}^{\alpha_j}}{A_{i,t}^j \phi}. \tag{25}$$

Since $w_{i,t}$ is the price of an efficiency unit of labor, the agricultural effective-labor wedge does not enter equation (25). By contrast, the sector-specific factor shares alter the sensitivity of unit costs to wages and rental rates.

Within each sector, varieties are aggregated with elasticity $\eta > 1$. Let

$$\rho \equiv \frac{\eta - 1}{\eta}, \qquad \mu \equiv \frac{1}{\rho} = \frac{\eta}{\eta - 1}.$$

Under monopolistic competition, firms charge the constant markup μ over the marginal cost of serving a market.

3.6 Financial frictions

Financial development affects the economy through an investment friction and an export-finance friction. The investment friction affects the intertemporal allocation of capital, whereas the export-finance friction raises the delivered cost of foreign sales. A residual intertemporal wedge absorbs distortions to the Euler equation that are not captured by the structural investment wedge.

Investment-finance friction and residual Euler wedge. Financial underdevelopment affects capital accumulation by raising the shadow cost of resources used to build future productive capacity. We summarize this mechanism with an investment-finance wedge

$$\psi_{n,t} = \bar{\psi}\left(\frac{1}{\lambda_{n,t}} - 1\right), \qquad \bar{\psi} > 0, \tag{26}$$

where $\lambda_{n,t} \in (0,1]$ denotes financial development. The wedge is zero at the financial frontier and increases as financial development deteriorates.

The structural investment-finance wedge is not intended to account for all country-period variation in investment behavior. We therefore also introduce a residual Euler wedge, denoted by $\omega_{n,t}$. The household's intertemporal optimality condition is

$$\begin{aligned}(1+\omega_{n,t})(1+\psi_{n,t})\frac{P^x_{n,t}}{P^c_{n,t}} \\ = \beta\,\mathbb{E}_t\left[\frac{L_{n,t+1}}{L_{n,t}}\frac{C_{n,t}}{C_{n,t+1}}\frac{P^x_{n,t+1}}{P^c_{n,t+1}}\left(\frac{r_{n,t+1}/P^x_{n,t+1}-(1+\psi_{n,t+1})\Phi_2(K_{n,t+2},K_{n,t+1})}{\Phi_1(K_{n,t+1},K_{n,t})}\right)\right].\end{aligned} \tag{27}$$

Under the deterministic transition paths used in the quantitative exercises, the conditional-expectation operator can be omitted.

Equation (27) highlights two roles for the structural investment wedge. First, $(1+\psi_{n,t})$ raises the current shadow cost of installing additional capital. Second, $(1+\psi_{n,t+1})$ multiplies the continuation term involving Φ_2. The reason is that an increase in $K_{n,t+1}$ changes next period's required investment,

$$X_{n,t+1} = \Phi(K_{n,t+2}, K_{n,t+1}).$$

The corresponding saving in next-period investment expenditure is valued at the distorted next-period investment price $(1+\psi_{n,t+1})P^x_{n,t+1}$.

The residual wedge $\omega_{n,t}$ is a reduced-form shifter of the intertemporal margin. It captures the remaining discrepancy between observed investment dynamics and the Euler equation after accounting for the structural financial-development component $\psi_{n,t}$.[5]

The distinction between the two wedges is important. The wedge $\psi_{n,t}$ is the structural component linked explicitly to financial development through equation (26). By contrast, $\omega_{n,t}$ is not assigned an independent structural interpretation. In the counterfactual exercises, the residual wedge is held fixed at its baseline value, whereas $\psi_{n,t}$ is recomputed from the counterfactual path of financial development. The exercises therefore isolate the effect of changing the financial-development component of the intertemporal distortion while holding fixed the remaining forces needed to rationalize baseline investment behavior.

The investment-finance friction affects sectoral outcomes through the composition of capital formation. Since the investment bundle is intensive in manufacturing, a higher $\psi_{n,t}$ lowers capital accumulation and reduces demand

5. The use of a residual wedge in the intertemporal Euler equation follows a standard quantitative-accounting strategy. Chari, Kehoe, and McGrattan (2007) emphasize that a measured wedge identifies the overall distortion to an equilibrium condition rather than a unique primitive friction. In a closely related structural-transformation framework, García-Santana, Pijoan-Mas, and Villacorta (2021) introduce an Euler-equation wedge to reconcile the model with the observed investment path, building on Chari, Kehoe, and McGrattan (2007) and Cheremukhin et al. (2017). Relatedly, Sposi, Yi, and Zhang (2026) use a country-time intertemporal shifter to capture external forces affecting saving dynamics. In our framework, $\omega_{n,t}$ may summarize omitted forces affecting saving and investment, specification differences, or measurement error.

for the sectoral composites used intensively in investment. Conversely, an improvement in financial development stimulates investment demand and capital deepening.

Export-finance friction. Financial development also shapes the cost of serving foreign markets. For tradable sectors $j \in \mathcal{T}$, the effective bilateral trade wedge is

$$\widetilde{\tau}^{j}_{ni,t} = \begin{cases} 1, & n = i, \\ \tau^{j}_{ni,t}\zeta^{j}_{i,t}, & n \neq i. \end{cases} \tag{28}$$

The term $\tau^{j}_{ni,t}$ captures nonfinancial iceberg trade costs. The term $\zeta^{j}_{i,t}$ captures the exporter-side financial component of the cost of serving foreign markets. We write this component as

$$\zeta^{j}_{i,t} = \mathcal{Z}^{j}\left(\lambda_{i,t}; \boldsymbol{\chi}_{j}\right), \qquad j \in \mathcal{T}, \tag{29}$$

where $\lambda_{i,t}$ measures financial development in exporter i at time t, and $\boldsymbol{\chi}_j$ collects the parameters governing the sector-specific mapping from financial development into export costs. We normalize

$$\mathcal{Z}^{j}\left(1; \boldsymbol{\chi}_{j}\right) = 1, \tag{30}$$

so that the export-finance wedge disappears at the financial frontier. The functional form of $\mathcal{Z}^{j}(\cdot)$ and the estimation of its parameters are described in Section 4.6.1.

The export-finance wedge is exporter-sector-time specific but common across foreign destinations. It captures the financial conditions faced by firms in exporter i and the sensitivity of export costs in sector j to those conditions. By contrast, destination-specific bilateral barriers are captured by $\tau^{j}_{ni,t}$. The wedge applies only to foreign sales, capturing the trade-specific effect of financial frictions discussed in Fact 3, which make export performance particularly sensitive to financial development above and beyond domestic output. We allow the parameters $\boldsymbol{\chi}_j$ to differ across tradable sectors, consistent with the evidence that financial constraints affect export performance unevenly across activities. Domestic sales are not directly distorted by $\zeta^{j}_{i,t}$. Low-skilled services are non-tradable, so no low-skilled-services export-finance wedge enters equilibrium.

3.7 Prices, trade shares, and aggregation

We now aggregate from firm-level varieties to sectoral composites. For a tradable sector $j \in \mathcal{T}$, a variety produced in origin i and sold in destination n must be delivered subject to the bilateral wedge $\widetilde{\tau}^{j}_{ni,t}$, resulting in marginal cost:

$$mc^{j}_{ni,t}(\phi) = \widetilde{\tau}^{j}_{ni,t} u^{j}_{i,t}(\phi).$$

Since firms are monopolistically competitive and face CES demand, they charge a constant markup μ

$$p^{j}_{ni,t}(\phi) = \mu \widetilde{\tau}^{j}_{ni,t} u^{j}_{i,t}(\phi).$$

The sectoral composite in each destination is a CES aggregate of the varieties available in that sector. Aggregating over origin countries and over the productivity distribution gives the sectoral price index for tradable sectors:

$$P^j_{n,t} = \mu\widetilde{\phi}^{-1}\left[\sum_i \left(\widetilde{\tau}^j_{ni,t}\right)^{1-\eta}\left(\frac{\kappa_j w_{i,t}^{1-\alpha_j} r_{i,t}^{\alpha_j}}{A^j_{i,t}}\right)^{1-\eta}\right]^{\frac{1}{1-\eta}}, \qquad j \in \mathcal{T}. \tag{31}$$

Origin countries with lower factor costs, higher country-sector productivity, or lower bilateral wedges receive greater weight in the sectoral price index. For low-skilled services, which are non-tradable, only domestic varieties enter the aggregate price index:

$$P^{ls}_{n,t} = \mu\widetilde{\phi}^{-1}\frac{\kappa_{ls} w_{n,t}^{1-\alpha_{ls}} r_{n,t}^{\alpha_{ls}}}{A^{ls}_{n,t}}. \tag{32}$$

The same CES structure determines bilateral expenditure shares. Let $\pi^j_{ni,t}$ denote the share of destination n's expenditure on sector j sourced from origin i. For tradable sectors,

$$\pi^j_{ni,t} = \frac{\left(\widetilde{\tau}^j_{ni,t}\right)^{1-\eta}\left(\kappa_j w_{i,t}^{1-\alpha_j} r_{i,t}^{\alpha_j}/A^j_{i,t}\right)^{1-\eta}}{\sum_h \left(\widetilde{\tau}^j_{nh,t}\right)^{1-\eta}\left(\kappa_j w_{h,t}^{1-\alpha_j} r_{h,t}^{\alpha_j}/A^j_{h,t}\right)^{1-\eta}}, \qquad j \in \mathcal{T}. \tag{33}$$

Thus, an origin country obtains a larger share of a destination's sectoral expenditure when its production costs are low, its productivity is high, or its effective trade wedge is small. For low-skilled services, expenditure is entirely domestic:

$$\pi^{ls}_{nn,t} = 1, \qquad \pi^{ls}_{ni,t} = 0 \quad \text{for } i \neq n.$$

Sector-specific factor shares change the relevant factor-cost bundle in each sector. In differential form,

$$d\log u^j_{i,t} = (1-\alpha_j)d\log w_{i,t} + \alpha_j d\log r_{i,t} - d\log A^j_{i,t}. \tag{34}$$

Thus, sectors with higher α_j are more sensitive to rental rates, whereas sectors with lower α_j are more sensitive to wages.

Sectoral demand in each destination country stems from household consumption and investment. Sectoral absorption and expenditure are

$$y^j_{n,t} = c^j_{n,t} + x^j_{n,t}, \qquad E^j_{n,t} = P^j_{n,t} y^j_{n,t}. \tag{35}$$

Bilateral expenditure shares allocate this expenditure across origins. Producer revenue in origin i is

$$R^j_{i,t} = \sum_n \pi^j_{ni,t} E^j_{n,t}, \qquad j \in \mathcal{T}, \tag{36}$$

with $R^{ls}_{i,t} = E^{ls}_{i,t}$ for low-skilled services.

Revenues determine sectoral factor demands. Since firms use Cobb–Douglas production and charge a constant markup, payments to capital and effective labor are fixed shares of revenue. Effective-labor demand and capital demand are

$$\widetilde{L}^j_{i,t} = \frac{1-\alpha_j}{\mu w_{i,t}} R^j_{i,t}, \qquad K^j_{i,t} = \frac{\alpha_j}{\mu r_{i,t}} R^j_{i,t}. \tag{37}$$

Using $\widetilde{L}^j_{i,t} = s^j_{i,t} L^j_{i,t}$, sectoral headcount employment is

$$L^j_{i,t} = \frac{1-\alpha_j}{\mu s^j_{i,t} w_{i,t}} R^j_{i,t}. \tag{38}$$

In particular,

$$L^a_{i,t} = \frac{1-\alpha_a}{\mu s^a_{i,t} w_{i,t}} R^a_{i,t}, \qquad L^k_{i,t} = \frac{1-\alpha_k}{\mu w_{i,t}} R^k_{i,t}, \quad k \neq a. \tag{39}$$

For a given agricultural revenue and wage per efficiency unit, a lower $s^a_{i,t}$ raises measured agricultural headcount employment without changing the sector's efficiency-unit labor demand.

3.8 Equilibrium

We define a sequential equilibrium for a given set of countries $\mathcal{N}$, sector sets $\mathcal{J}$ and $\mathcal{T}$, time-invariant parameters

$$\left\{\beta, \delta, \nu, \eta, \theta, \phi_0, \{\alpha_j\}_{j\in\mathcal{J}}, \sigma, \{\epsilon^j\}_{j\in\mathcal{J}}, \{\gamma^j_n\}_{n\in\mathcal{N},j\in\mathcal{J}}, \sigma_x, \{\epsilon^j_x\}_{j\in\mathcal{J}}, \{\omega^x_{n,j}\}_{n\in\mathcal{N},j\in\mathcal{J}}, \bar{\psi}, \{\boldsymbol{\chi}_j\}_{j\in\mathcal{T}}\right\},$$

initial capital stocks $\{K_{n,0}\}_{n\in\mathcal{N}}$, and exogenous paths

$$\left\{\{A^j_{n,t}\}_{n\in\mathcal{N},j\in\mathcal{J},t}, \{\tau^j_{ni,t}\}_{n,i\in\mathcal{N},j\in\mathcal{T},t}, \{\lambda_{n,t}\}_{n\in\mathcal{N},t}, \{L_{n,t}\}_{n\in\mathcal{N},t}, \{s^a_{n,t}\}_{n\in\mathcal{N},t}, \{\omega_{n,t}\}_{n\in\mathcal{N},t}\right\}.$$

The constants μ, $\{\kappa_j\}_{j\in\mathcal{J}}$, and $\widetilde{\phi}$ are implied by equations (24) and (23). The structural investment wedge $\psi_{n,t}$, the export-finance wedge $\zeta^j_{i,t}$, the effective bilateral trade wedge $\widetilde{\tau}^j_{ni,t}$, and the investment rebate $T^I_{n,t}$ are determined by equations (26), (29), (28), and (6). The country-period paths $\{s^a_{n,t}\}$ and $\{\omega_{n,t}\}$ are disciplined as described in Section 4.

Given this, a sequential equilibrium consists of sequences of prices

$$\left\{w_{n,t}, r_{n,t}, P^c_{n,t}, P^x_{n,t}, \{P^j_{n,t}\}_{j\in\mathcal{J}}\right\}_{n\in\mathcal{N},t},$$

allocations

$$\left\{C_{n,t}, X_{n,t}, K_{n,t+1}, \{c^j_{n,t}, x^j_{n,t}, \widetilde{L}^j_{n,t}, L^j_{n,t}, K^j_{n,t}, y^j_{n,t}, E^j_{n,t}\}_{j\in\mathcal{J}}, Y_{n,t}, \Pi_{n,t}, T^I_{n,t}\right\}_{n\in\mathcal{N},t}, \qquad \left\{R^j_{i,t}\right\}_{i\in\mathcal{N},j\in\mathcal{J},t},$$

and bilateral expenditure shares $\{\pi^j_{ni,t}\}_{n,i\in\mathcal{N},j\in\mathcal{T},t}$ such that:

1. Households optimize subject to equations (5) and (8), with the intertemporal allocation satisfying equation (27);
2. Sectoral consumption demands and the average consumption price satisfy equations (10)–(14);
3. The investment-bundle producer minimizes assembly costs and prices the bundle at average cost, so equations (15)– (20) hold;
4. Variety producers minimize costs, hire factors according to equation (37), and charge constant markups over delivered marginal costs;
5. Sectoral composite prices and bilateral expenditure shares satisfy equations (31)–(33), with $\pi^{ls}_{nn,t} = 1$ and $\pi^{ls}_{ni,t} = 0$ for $i \neq n$;

6. Sectoral absorption, expenditure, and origin revenues satisfy equations (35) and (36), with $R^{ls}_{n,t} = E^{ls}_{n,t}$;

7. Factor markets clear within each country: $\sum_{j\in\mathcal{J}} L^j_{n,t} = L_{n,t}$ and $\sum_{j\in\mathcal{J}} K^j_{n,t} = K_{n,t}$.

8. Domestic income, firm profits, and aggregate absorption satisfy

$$Y_{n,t} \equiv \sum_{j\in\mathcal{J}} R^j_{n,t}, \qquad \Pi_{n,t} \equiv Y_{n,t} - w_{n,t}\widetilde{L}_{n,t} - r_{n,t}K_{n,t} = \left(1 - \frac{1}{\mu}\right) Y_{n,t}. \tag{40}$$

Together with the investment rebate in equation (6), aggregate absorption is

$$P^c_{n,t}C_{n,t} + P^x_{n,t}X_{n,t} = Y_{n,t}. \tag{41}$$

4 Calibration and implementation

The calibration proceeds in six steps. First, we assemble the country-year data used to discipline the baseline transition path, including sectoral quantities and prices, bilateral trade shares, aggregate capital and investment, and financial-development measures. Second, we fix a small set of standard external parameters governing discounting, depreciation, markups, and firm heterogeneity. Third, we calibrate production parameters and the agricultural labor-efficiency wedge. Fourth, we recover country-sector productivity paths from domestic expenditure shares, sectoral prices, and factor costs. Fifth, we estimate the non-homothetic demand systems that govern consumption and investment demand across sectors. Finally, we recover total effective bilateral trade wedges, decompose them into nonfinancial trade costs and export-finance wedges, and discipline the investment-finance wedge from the empirical relationship between investment rates and financial underdevelopment.

4.1 Data and sample

The model is calibrated to an annual panel of 44 economies and a rest-of-the-world aggregate from 1970 to 2018. The sample combines countries with long-run sectoral accounts and the input-output and trade data required to construct sectoral expenditure, bilateral trade shares, and relative prices. Appendix A reports the country list and classifications.

Aggregate output, capital, employment and aggregate price levels are taken from Penn World Table 11.0 (Feenstra, Inklaar, and Timmer (2015)). These series provide the country-level endowments and aggregate quantities used in the calibration, as well as exchange rates and aggregate deflators used to express nominal variables in comparable units.

Sectoral employment and value added are assembled from harmonized long-run sectoral sources. For countries covered by the GGDC data, we use the GGDC 10-Sector Database and the GGDC Economic Transformation Database. For countries covered by WIOD, we use the WIOD Socio-Economic Accounts and extend the series backward with EU KLEMS historical releases and forward with EU KLEMS 2023 as well as OECD data where necessary. All sources are mapped into the four model sectors: agriculture, manufacturing, low-skilled services, and high-skilled services. Sectoral prices are constructed from nominal and real value added, rebased to 2005, and anchored across countries using the GGDC Productivity Level Database.

Sectoral final demand is constructed from OECD Input-Output Tables and historical WIOD input-output data. Consumption corresponds to household final consumption expenditure, and investment to gross fixed capital formation. The sectoral composition of consumption and investment is used to discipline the non-homothetic aggregators, while aggregate consumption and investment levels in the baseline are taken from PWT national accounts.

Bilateral trade shares are constructed separately for goods and high-skilled services. Trade in agriculture, manufacturing, and high-skilled services is based on WIOD whenever available. Agriculture and manufacturing trade data are complemented with UN COMTRADE before 1995 and BACI from 1995 to 2018, with product codes mapped into the model sectors. High-skilled-services trade is completed with data from the OECD-WTO BaTIS dataset for 1995–2018. For earlier years, historical services export data are combined with average bilateral export shares from BaTIS to construct bilateral flows. In the baseline calibration, $\lambda_{n,t}$ is measured by the IMF Financial Institutions Index from the IMF Financial Development Database (Svirydzenka 2016). The index lies between zero and one, with higher values corresponding to more developed financial institutions. The observed IMF series covers 1980–2018 in the calibration sample. To obtain a balanced panel from 1970 to 2018, we complete the early part of the series using domestic-credit measures from the World Bank Global Financial Development Database together with GDP per worker and a time component. The rest-of-the-world aggregate is assigned the cross-country median value of $\lambda_{n,t}$ in each year. A private-credit measure from the World Bank Global Financial Development Database is used in robustness exercises.[6]

4.2 External parameters

We set a small number of standard parameters externally. The annual discount factor is $\beta = 0.96$, as in annual quantitative models such as Gourinchas and Jeanne (2006) and García-Santana, Pijoan-Mas, and Villacorta (2021). The elasticity of substitution across varieties within a sector is set to $\eta = 6$, implying the constant markup

$$\mu = \frac{\eta}{\eta - 1} = 1.20.$$

These values lie within ranges commonly used in quantitative macro and trade applications. The annual depreciation rate is $\delta = 0.10$, as in Edmond, Midrigan, and Xu (2015) and Alessandria, Bai, and Woo (2024).

Firm productivity is Pareto distributed with shape parameter $\theta = 6$. This value is broadly consistent with estimates in the related literature, including the lower estimates reported by Tombe (2015) and the higher sectoral estimates in Caliendo and Parro (2015). It also satisfies the restriction $\theta > \eta - 1$ required for the $(\eta - 1)$-order productivity moment to be finite. The lower bound of the productivity distribution is normalized to $\phi_0 = 1$; this normalization fixes the scale of the country-sector productivity shifters recovered below.

6. This measure also has missing observations for some country-years. We complete it in a similar way as the IMF indices. The conversion of private credit to GDP into the model's $\lambda_{n,t} \in (0, 1)$ range is described in Appendix E.1.

4.3 Calibrated parameters

The capital-accumulation technology follows Lucas and Prescott (1971). Its curvature is set to $\nu = 0.79$, which targets a steady-state investment rate of 0.23, close to the observed investment rate in our sample.[7]

The sectoral capital shares α_j are calibrated externally to match observed labor compensation shares. For each sector we measure the labor share as compensation of employees divided by that sector's nominal value added, using the WIOD Socio-Economic Accounts for the 24 model countries covered by WIOD over 1995–2014. We pool these sector-level labor shares across countries and years, take their simple average, and set the sectoral capital share equal to one minus this average. The resulting parameters are time-invariant and common across countries: $\alpha^a = 0.31$, $\alpha^m = 0.46$, $\alpha^{ls} = 0.35$, and $\alpha^{hs} = 0.43$. We discipline the agricultural labor-efficiency wedge using the observed gap between value added per worker outside agriculture and value added per worker in agriculture. Define

$$APG_{i,t}^{\text{data}} \equiv \frac{R_{i,t}^{\text{nonag,data}}/L_{i,t}^{\text{nonag,data}}}{R_{i,t}^{a,\text{data}}/L_{i,t}^{a,\text{data}}}, \qquad R_{i,t}^{\text{nonag,data}} \equiv \sum_{k\neq a} R_{i,t}^{k,\text{data}}. \tag{42}$$

With sector-specific factor intensities, the mapping from the agricultural productivity gap into effective labor per agricultural worker also depends on the composition of non-agricultural value added. Let

$$D_{i,t}^{\text{nonag,data}} \equiv \frac{\sum_{k\neq a}(1-\alpha_k)R_{i,t}^{k,\text{data}}}{\sum_{k\neq a} R_{i,t}^{k,\text{data}}}. \tag{43}$$

The wedge that matches the observed agricultural productivity gap is

$$s_{i,t}^a = \frac{1-\alpha_a}{APG_{i,t}^{\text{data}} D_{i,t}^{\text{nonag,data}}}, \tag{44}$$

where both APG and the non-agricultural composition enter as country-level HP-smoothed series (Hodrick and Prescott (1997)), with smoothing parameter 6.25, the value recommended for annual data by Ravn and Uhlig (2002). To avoid numerically extreme effective-labor values, we clip $s_{i,t}^a \in [0.15, 1]$. For the rest-of-world aggregate, we set $s_{ROW,t}^a = 1$.

4.4 Sectoral productivity

The country-sector productivity sequences $\{A_{i,t}^j\}$ are recovered from sectoral prices and domestic expenditure shares. Domestic sales are not subject to international trade costs or to the export-finance wedge. Hence, the domestic expenditure share isolates the component of sectoral prices that is explained by domestic factor costs, firm heterogeneity, and country-sector productivity. For each sector $j \in \mathcal{J}$,

$$\pi_{ii,t}^j = \left[\frac{\mu\kappa_j \left(w_{i,t}^{\text{data}}\right)^{1-\alpha_j}\left(r_{i,t}^{\text{data}}\right)^{\alpha_j}}{A_{i,t}^j\widetilde{\phi}P_{i,t}^j}\right]^{1-\eta}. \tag{45}$$

7. In steady state, the investment rate is given by:

$$\rho^* = \frac{\bar{\alpha}\delta}{\mu\left(\delta + \frac{1-\beta}{\nu\beta}\right)},$$

where $\bar{\alpha} = 0.418$ is the value-added-share-weighted average of the sectoral capital shares, averaged across the model countries.

The factor prices used in the recovery must reflect both sector-specific factor intensities and the agricultural labor-efficiency wedge. Let

$$\widetilde{L}_{i,t}^{\text{data}} \equiv s_{i,t}^{a} L_{i,t}^{a,\text{data}} + \sum_{k \neq a} L_{i,t}^{k,\text{data}} \tag{46}$$

denote effective labor in the data. Given sectoral nominal value added $\{R_{i,t}^{j,\text{data}}\}$ and aggregate capital $K_{i,t}^{\text{data}}$, factor prices are recovered as

$$w_{i,t}^{\text{data}} = \frac{\sum_{j \in \mathcal{J}} (1-\alpha_j) R_{i,t}^{j,\text{data}}}{\mu \widetilde{L}_{i,t}^{\text{data}}}, \qquad r_{i,t}^{\text{data}} = \frac{\sum_{j \in \mathcal{J}} \alpha_j R_{i,t}^{j,\text{data}}}{\mu K_{i,t}^{\text{data}}}. \tag{47}$$

Solving equation (45) for productivity gives

$$A_{i,t}^{j} = \frac{\mu \kappa_j \left(w_{i,t}^{\text{data}}\right)^{1-\alpha_j} \left(r_{i,t}^{\text{data}}\right)^{\alpha_j}}{P_{i,t}^{j} \widetilde{\phi}} \left(\frac{1}{\pi_{ii,t}^{j}}\right)^{\frac{1}{1-\eta}}, \qquad j \in \mathcal{J}. \tag{48}$$

where the sectoral prices $P_{i,t}^{j}$ are the PPP-adjusted price series constructed from nominal and real value added. For tradable sectors, the domestic shares $\pi_{ii,t}^{j}$ come from the bilateral trade-share matrices, for low-skilled services $\pi_{ii,t}^{ls} = 1$. The recovered paths are smoothed over time to reduce the influence of high-frequency measurement error, using an HP filter with smoothing parameter 6.25.

4.5 Non-homothetic demand parameters

The final-demand calibration disciplines how sectoral expenditure shares respond to relative prices and to the scale of consumption and investment. We estimate separate non-homothetic CES systems for household consumption and gross fixed capital formation using sectoral final-demand shares from OECD Input–Output Tables and historical WIOD input-output data, mapped into the four model sectors. Aggregate consumption and investment expenditures are taken from PWT. Appendix C.1 reports the estimating equations, normalizations, and numerical procedure.

The consumption system is governed by the substitution parameter σ, sectoral scale elasticities $\{\epsilon^{j}\}_{j \in \mathcal{J}}$, and country-specific weights $\{\gamma_n^{j}\}_{j \in \mathcal{J}}$. The investment system has the analogous parameters σ_x, $\{\epsilon_x^{j}\}_{j \in \mathcal{J}}$, and $\{\omega_{n,j}^{x}\}_{j \in \mathcal{J}}$. The common elasticities determine how final-demand shares move with scale and relative prices, while the weights capture persistent country-specific differences in the composition of consumption and investment.

The estimated consumption parameters are

$$\sigma = 0.80, \qquad (\epsilon^{a}, \epsilon^{m}, \epsilon^{ls}, \epsilon^{hs}) = (0.29, 1.00, 1.45, 1.83).$$

Agriculture has a scale elasticity below one, while low-skilled and high-skilled services have scale elasticities above one. The estimated investment parameters are

$$\sigma_x = 0.76, \qquad (\epsilon_x^{a}, \epsilon_x^{m}, \epsilon_x^{ls}, \epsilon_x^{hs}) = (0.24, 0.99, 0.76, 1.48).$$

For each country, the time-invariant weights $\{\gamma_n^{j}\}_{j \in \mathcal{J}}$ and $\{\omega_{n,j}^{x}\}_{j \in \mathcal{J}}$ are calibrated to match initial sectoral final-demand shares and are then held fixed in the baseline and counterfactual exercises. This calibration preserves an important feature of the data: investment demand is strongly manufacturing-intensive. In the initial-year data, manufacturing accounts for 82.5 percent of investment expenditure on average; in the calibrated demand system, manufacturing receives the largest investment weight in every model economy.

4.6 Financial development

Financial development enters the calibration through a country-year index $\lambda_{n,t}$. This index is common to the two financial margins in the model. It enters the investment wedge directly, with the strength of that margin governed by the parameter $\bar{\psi}$. It also enters the export-finance wedge, where its effect varies across sectors according to the estimated parameters χ^j.

4.6.1 Trade costs and export-finance wedges

The trade data identify a total effective bilateral wedge for each tradable sector. For foreign flows $n \neq i$, the trade-share equation implies

$$\tilde{\tau}^j_{ni,t} = \left(\frac{\pi^j_{ni,t}}{\pi^j_{ii,t}}\right)^{\frac{1}{1-\eta}} \frac{P^j_{n,t}}{P^j_{i,t}}, \qquad j \in \{a, m, hs\}.$$

We decompose this total wedge into a nonfinancial iceberg component and an exporter-side finance component:

$$\tilde{\tau}^j_{ni,t} = \tau^j_{ni,t}\zeta^j_{i,t},$$

where $\zeta^j_{i,t}$ is exporter-sector-time specific and is normalized to one at the financial frontier. The export-finance component is estimated from the relationship between recovered total effective trade wedges and financial under-development, measured as $x_{i,t} = -\log(\lambda_{i,t})$.

For the quantitative analysis, we use the parsimonious linear specification. It delivers a monotonic relationship between financial development and export frictions and avoids extrapolating from imprecisely estimated quadratic terms.[8] Let $\ell^j_{ni,t} \equiv \log \tilde{\tau}^j_{ni,t}$. The baseline specification is

$$\ell^j_{ni,t} = \alpha^j_{ni} + \delta^j_{nt} + \chi^j x_{i,t} + \beta^j \log(GDPpw_{i,t}) + \nu^j_{ni,t}, \qquad j \in \{a, m, hs\},$$

where α^j_{ni} are importer-exporter pair fixed effects and δ^j_{nt} are importer-year fixed effects. The GDP-per-worker control is important because financial development may covary with broader exporter-side advantages; the estimates therefore discipline sector-specific mappings from financial underdevelopment to export frictions rather than stand alone as causal regressions.

The estimates imply that financial underdevelopment raises total effective trade wedges in sectors that are more exposed to export-finance frictions. The estimated coefficients are 0.151 in agriculture, 0.210 in manufacturing, and 0.269 in high-skilled services. The implied average finance wedges are 1.14, 1.21, and 1.28, respectively, and the finance component accounts for approximately 7, 12, and 12 percent of the total effective log trade wedge in

8. See Appendix C.2.

the three sectors. Appendix C.2 reports the full estimating equations, fixed effects, decomposition, and alternative functional forms, including the quadratic coefficients.

Given the fitted export-finance wedge,

$$\hat{\zeta}_{i,t}^{j} = \exp\left(\hat{\chi}^{j} x_{i,t}\right) = \lambda_{i,t}^{-\hat{\chi}^{j}},$$

we recover the residual iceberg component and impose the standard restriction $\tau_{ni,t}^{j} \geq 1$ for foreign pairs. The effective trade wedge used in the model is then reconstructed as the product of the recovered nonfinancial trade cost and the estimated export-finance component. This decomposition allows the counterfactuals to vary export-finance frictions and nonfinancial trade costs separately. Bilateral pairs with zero observed expenditure shares are treated as prohibitive-trade-cost observations.

4.6.2 Investment-finance friction

The investment wedge is governed by the same country-year financial development measure $\lambda_{n,t}$ used for the export wedge. In the baseline specification,

$$\psi_{n,t} = \bar{\psi}\left(\frac{1}{\lambda_{n,t}} - 1\right),$$

so that the wedge is zero under full financial development and increases as financial development deteriorates. The scalar $\bar{\psi}$ governs the strength of this intertemporal financial friction.

We calibrate $\bar{\psi}$ to match the empirical sensitivity of investment rates to financial underdevelopment. Let

$$\rho_{n,t}^{data} \equiv \frac{I_{n,t}^{data}}{Y_{n,t}^{data}}$$

denote the observed aggregate investment rate. In the data, we estimate

$$\rho_{n,t}^{data} = a_t + b_1\left(\frac{1}{\lambda_{n,t}} - 1\right) + b_2 \log(GDPpw_{n,t}^{data}) + u_{n,t},$$

where a_t are year fixed effects. The coefficient b_1 is the target moment: it measures the partial relationship between investment rates and financial underdevelopment after absorbing common year effects and controlling for the level of development. The baseline regression is estimated on the balanced 44-country model panel from 1970 to 2018, giving 2,156 country-year observations. The specification is unweighted and includes year fixed effects and log GDP per worker. It gives an estimated $\hat{b}_1 = -0.00836$, with the standard error clustered by country = 0.003299 (p-value = 0.011). The same coefficient remains statistically significant when standard errors are clustered two ways by country and year. Furthermore, Appendix C.3 shows that this relationship is robust to using the raw IMF sample from 1980 onward, replacing the IMF index with a log-normalized private-credit-to-GDP measure from the World Bank GFDD, allowing a quadratic income control, weighting observations by economic size, trimming outliers, lagging financial development, and dropping countries one at a time. Across these checks, the baseline estimate is generally small in absolute value relative to the alternative estimates.

The empirical coefficient is the moment to be matched, while $\bar{\psi}$ is the positive structural parameter that maps financial underdevelopment into the model's investment wedge. For a candidate $\bar{\psi}$, the model is solved forward and delivers an endogenous investment-rate path $\rho_{n,t}^{model}$. We then estimate the analogous year-fixed-effect regression in the model, controlling for model GDP per worker, and update $\bar{\psi}$ until the coefficient on $(1/\lambda_{n,t} - 1)$ matches the empirical target. This procedure gives

$$\bar{\psi} = 0.05453.$$

We then recover the residual Euler wedge $\omega_{n,t}$ country by country and period by period as the value that makes the intertemporal condition (27) hold along the calibrated baseline transition path. The recovery uses the baseline paths of consumption, population, capital, factor returns, as well as the consumption and investment price indices. Conditional on these paths and on the disciplined value of $\bar{\psi}$, equation (27) delivers a country-period residual that rationalizes the observed baseline investment dynamics.

5 Model fit

Having estimated the structural parameters and recovered the exogenous processes, we next assess the model's ability to reproduce the sectoral patterns that are central to the quantitative analysis. We distinguish between moments that directly discipline the calibration and outcomes that are generated by the model in equilibrium. Relative sectoral prices, sectoral final-demand shares, and bilateral trade shares are used in the estimation or recovery of model objects. Their fit provides an internal consistency check on the calibrated framework. Sectoral employment shares, by contrast, are not targeted and therefore provide a more demanding test of the model's ability to reproduce the process of structural transformation. We then examine the recovered investment-finance wedge and its relationship with the residual intertemporal distortion $\omega_{n,t}$.

5.1 Fit of sectoral moments

The model closely reproduces relative sectoral prices. Figure 7 compares the model-implied series with the data for agriculture, high-skilled services, and low-skilled services, each relative to manufacturing. The fit is strong both in levels and in comovement. For example, the average model-implied value of P^a/P^m is 2.97, compared with 3.16 in the data, while the corresponding values for P^{hs}/P^m are 0.59 and 0.61. Across the three relative prices, the pooled, within-country, and within-year model–data correlations are all at least 0.92; most exceed 0.98.

Figure 8 plots sectoral consumption shares against log GDP per worker relative to the United States for the full sample and for the two groups of countries used in the quantitative analysis. The estimated non-homothetic demand system captures the reallocation away from agriculture and toward services along the development path. The fit is also strong across countries. For manufacturing, the average consumption share is 0.39 in the model and 0.36 in the data. The within-year model–data correlation is 0.68, and the pooled correlation is 0.64, while the corresponding pooled correlations for agriculture, low-skilled services, and high-skilled services are 0.92, 0.81, and 0.81, respectively.

Sectoral employment shares provide a more demanding validation. Figure 9 compares the model and the data

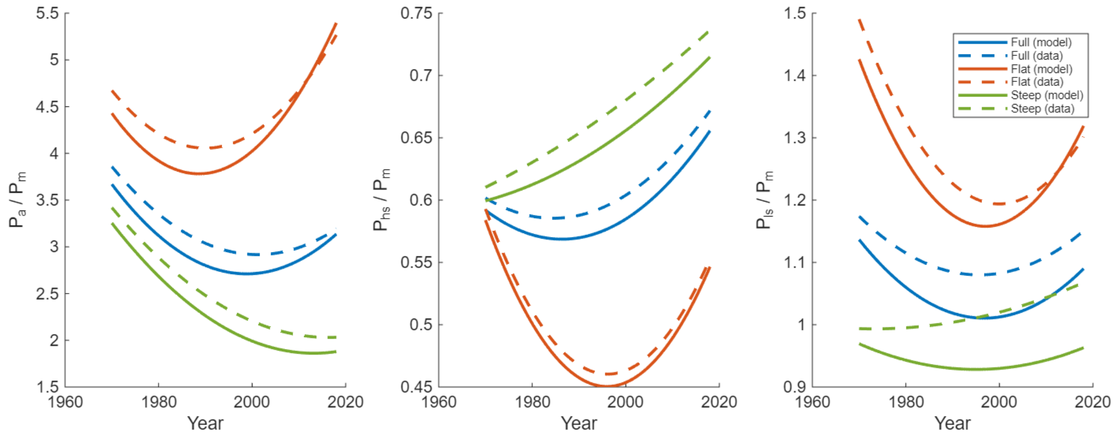

Figure 7: Relative sectoral prices: model and data

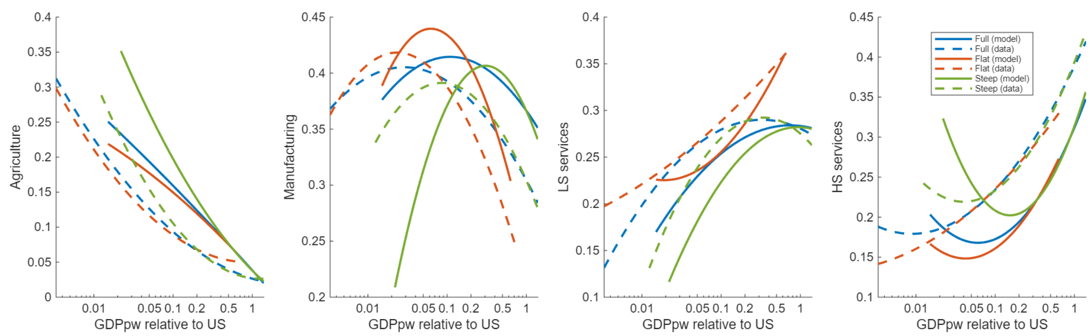

Figure 8: Sectoral consumption shares: model and data

along the development path. Our main outcome of interest is manufacturing employment. The model reproduces its comovement with the data both across countries and over time: the median within-country correlation is 0.78, the within-year correlation is 0.70, and the pooled correlation is 0.71. Thus, countries and periods with relatively high manufacturing employment shares in the data tend to have relatively high shares in the model. That said, our model does overstate the level of manufacturing employment. This discrepancy is quantitatively meaningful, but it is broadly common across the development distribution and therefore leaves the cross-country structure largely intact. The comparison between the two country groups illustrates this point. In the data, the manufacturing employment share is higher among steep-manufacturing economies than among flat-manufacturing economies, with a difference of 0.098 when evaluated at group medians and 0.118 when evaluated at group means. The model reproduces the same ranking, with differences of 0.087 and 0.082, respectively, preserving approximately 90% of the median steep–flat gap.

Finally, we verify the model fit of trade flows using domestic expenditure shares, $\pi^j_{ii,t}$, which summarize the degree of international sourcing in each sector. The calibrated model reproduces both the level and comovement of home shares closely. For manufacturing, the pooled model–data correlation is 0.78, while the median within-country correlation is 0.88. The average manufacturing home share is 0.80 in the model and 0.75 in the data. The corresponding pooled correlations are 0.82 for agriculture and 0.78 for high-skilled services. Average home shares

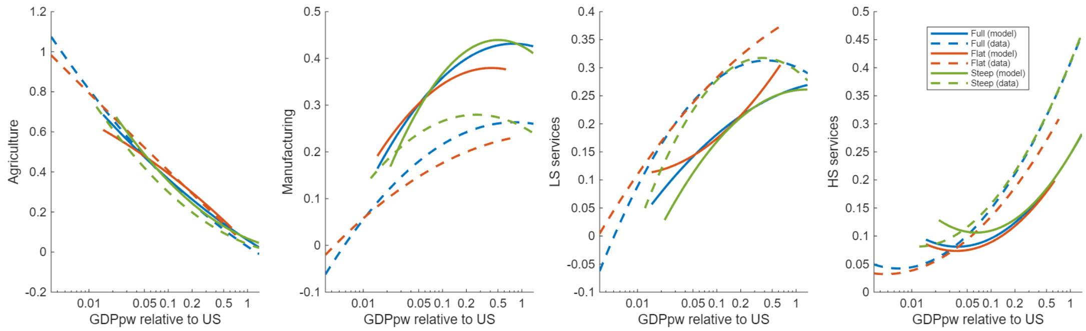

Figure 9: Sectoral employment shares: model and data

are 0.85 and 0.87 in agriculture and 0.95 and 0.94 in high-skilled services for the model and data, respectively.

5.2 Investment-finance wedge and residual intertemporal distortions

We evaluate whether the independently disciplined investment-finance wedge correctly captures the component of the intertemporal distortion that is systematically associated with financial development. As described in Section 4.6.2, the baseline calibration includes a structural investment-finance wedge,

$$\psi_{n,t} = \bar{\psi}\left(\frac{1}{\lambda_{n,t}} - 1\right),$$

and a residual Euler wedge, $\omega_{n,t}$, which absorbs the remaining country-period discrepancy between observed investment dynamics and the intertemporal optimality condition. To evaluate the contribution of the structural financial component, we compare two residual Euler wedges. Both are recovered along the observed investment path and the associated data-consistent equilibrium-price sequence. The baseline residual, $\omega_{n,t}^{\text{base}}$, is the adjustment required by the Euler equation after allowing $\psi_{n,t}$ to operate. The no-financial-wedge residual, $\omega_{n,t}^{\text{nfw}}$ is the adjustment required by the same equation when the structural financial component is removed from both the contemporaneous investment-price term and the continuation term: $\psi_{n,t} = \psi_{n,t+1} = 0$. Importantly, the association between $\psi_{n,t}$ and $\omega_{n,t}^{\text{nfw}}$ is not mechanical. The structural wedge is constructed from observed financial-development data independently of the Euler-equation recovery, whereas $\omega_{n,t}^{\text{nfw}}$ is the wedge required to match investment in a model without the structural investment wedge $\psi_{n,t}$.

The financial wedge is positively correlated with the residual distortion required by the model without the investment-finance channel, especially in the cross-sectional dimension that the financial-development mechanism intends to capture. The average within-year cross-country correlation is 0.32; when averaged over time, the cross-country correlation rises to 0.66, corresponding to an R^2 of 0.43.[9] Figure 10 illustrates this relationship. The cross-country R^2 is only descriptive, but it shows that the financial-development measure is systematically related to a substantial share of the cross-country variation in the intertemporal distortion required in a model without the investment-finance channel. The fit is particularly strong among the flat-manufacturing economies emphasized in the quantitative exercises. Introducing $\psi_{n,t}$ reduces the mean absolute Euler residual by 17%.

9. In a univariate regression of the average no-financial-wedge residual on the average financial wedge.

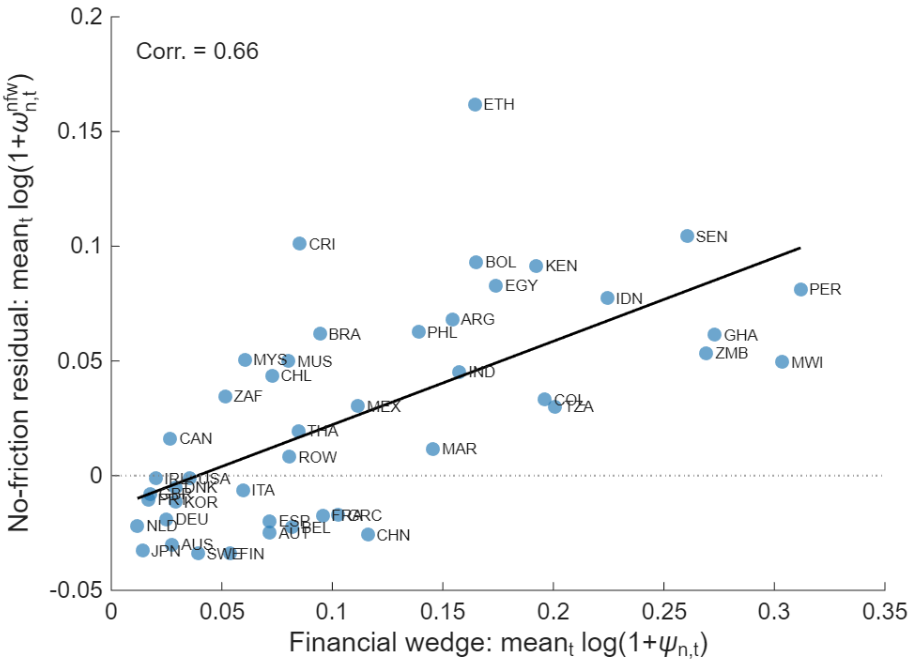

Figure 10: Financial-development wedge and no-financial-wedge Euler residual: country averages

The difference between the pooled and cross-country correlations reflects the distinct frequencies at which the two wedges operate. The structural investment-finance wedge is persistent and largely cross-sectional: 64% of its variance is between countries, and its within-country autoregressive coefficient is approximately 0.93. By contrast, 71% of the variance of $\omega_{n,t}^{\text{nfw}}$ is within countries, and its autoregressive coefficient is approximately 0.24. After the structural financial component is introduced, this discrepancy becomes even more pronounced: 80% of the variance of $\omega_{n,t}^{\text{base}}$ is within country.

This pattern is consistent with the intended roles of the two wedges in the model. The financial-development measure is designed to capture persistent differences across countries and gradual changes over time, not the short-run annual variation contained in the Euler-equation residual. These movements are precisely those the residual wedge is designed to absorb.

Taken together, the model-fit exercises support the use of the calibrated framework for the counterfactual analysis. The model reproduces the relative sectoral prices, consumption patterns, and trade structure used to discipline its static blocks, while also capturing the relative evolution of manufacturing employment across countries and over time. The investment-finance diagnostic shows that the independently disciplined financial wedge aligns with the persistent cross-country component of the intertemporal distortion required by the model. In the next section, we exploit this structure by varying the financial-development path, recomputing $\psi_{n,t}$, and holding the recovered residual $\omega_{n,t}^{\text{base}}$ fixed. This isolates the quantitative role of financial development in shaping investment, trade, and the manufacturing trajectory, as well as the consequences for real output and consumption per worker.

6 Quantitative exercises

The quantitative exercises explore both the manufacturing and output implications of financial underdevelopment. We find that a moderate improvement in financial development raises manufacturing employment, output per worker, and consumption per worker in flat-manufacturing economies. Around two thirds of the manufacturing response is driven by the domestic investment-demand margin, whereby lower investment costs increase demand for manufacturing-intensive capital goods. At the same time, the impact of improved financial development is substantially enhanced when paired with international openness: when the benchmark reduction in financial frictions is combined with lower nonfinancial trade costs, the manufacturing response becomes much larger. Finance changes not only the scale of development, but also the sectoral comparative advantage that openness amplifies.

The main reporting group is the baseline flat-manufacturing group: the economies in the comparison sample whose observed manufacturing-employment paths do not satisfy the steep-path screens described in Appendix A. Unless stated otherwise, table entries report annual weighted-average differences from the calibrated baseline for this group. Furthermore, to summarize the annual transition paths, we average values over three contiguous periods: early, 1970–1985; middle, 1986–2001; and late, 2002–2018. When the steep-manufacturing column is shown, it reports the corresponding general-equilibrium response of untreated steep-manufacturing economies.[10] Output and consumption per worker are percentage changes in levels relative to baseline; output is measured in units of the final-consumption good, Y/P^c.

The benchmark counterfactual gives flat-manufacturing economies a moderate improvement in financial development. In each year, these economies close one-half of the gap between their observed financial-development level and the year-specific financial frontier among model economies:

$$\lambda_{i,t}^{cf} = \lambda_{i,t} + \frac{1}{2}\left(\max_j \lambda_{j,t} - \lambda_{i,t}\right), \tag{49}$$

where $\lambda_{i,t}$ denotes financial development, the maximum is taken over the model economies in year t, and the change is applied to the baseline flat-manufacturing economies. This brings flat-manufacturing economies very close to the average steep financial development path but preserves the heterogeneity between them.[11] In the full experiment, this new financial-development path affects both margins: it lowers the investment wedge and reduces the finance-induced component of export costs. The channel decomposition exercises use the same financial-development path but hold one margin at its baseline value.[12] All tables provide values relative to the model baseline, leaving recovered productivity paths, preferences, labor, initial capital, nonfinancial trade costs (unless otherwise specified), and residual transition wedges unchanged.

Results are organized around five questions. First, Table 4 shows the impact of improving financial development

10. The exception is the counterfactual that lowers nonfinancial trade costs, where the reduction is universal.

11. The baseline counterfactual brings the average lambda among flat economies to 0.57 and the median to 0.56. In contrast, the mean among the steep economies, which are untreated and thus equivalent in the baseline and counterfactual, is 0.56 while the median is 0.58.

12. Because the model is nonlinear, these channel decomposition exercises are not fully additive but provide a reasonable approximation of the role of each channel in the aggregate response.

on manufacturing employment and aggregate outcomes, as well as the contributions of the investment-demand and export-finance margins. Second, Table 5 focuses on the full sectoral composition of flat-manufacturing economies. Third, Table 6 studies the interaction between financial development and lower nonfinancial trade costs. Fourth, Table 7 translates these transition effects into the peak manufacturing gap that motivates the paper. Finally, Table 8 quantifies the impact of simultaneously removing trade exposure. Appendix E reports the full counterfactual design and additional robustness exercises.

6.1 Financial development changes scale and shape

The benchmark counterfactual first establishes the positive result: financial development changes the sectoral path of flat-manufacturing economies. Table 4 additionally reports two historical financial-path experiments, and the two channel decomposition exercises. In the full experiment, manufacturing employment rises by 2.71 percentage points in the early period, 2.01 percentage points in the middle period, and 1.82 percentage points in the late period. These gains persist across the transition, so the improved financial development expands the manufacturing window rather than only shifting employment at a particular date.

The same counterfactual also has large real aggregate consequences. Output per worker rises by 17.23, 16.44, and 13.25 percent across the three periods, while consumption per worker rises by 7.60, 12.49, and 10.41 percent. These gains underscore the importance of sectoral results: financial underdevelopment is associated not only with a different allocation of labor, but also with lower real output and consumption along the transition.

The alternative-measure row shows that the main result is not specific to the IMF Financial Institutions Index. When financial development is measured using private credit to GDP, the same one-half frontier improvement raises manufacturing employment by 3.44, 2.60, and 2.85 percentage points across the three periods. Output per worker rises by 19.55, 18.75, and 17.40 percent, while consumption per worker rises by 8.50, 14.67, and 12.12 percent. The private-credit calibration therefore strengthens the paper's central message that financial underdevelopment constrains both the manufacturing trajectory and the real resources associated with it.

The historical-path rows show that the benchmark response is not specific to the frontier rule. These exercises assign treated economies either Korea's observed financial-development path or the average path of steep-manufacturing economies, empirically relevant trajectories associated with more pronounced manufacturing humps.[13] All other parameters are held at baseline values. The resulting effects are similar to the benchmark. Under the Korea path, manufacturing employment rises by 2.96, 2.16, and 2.25 percentage points, while output per worker rises by 18.51, 17.72, and 15.35 percent. Under the steep-economy path, manufacturing employment rises by 2.42, 1.98, and 1.96 percentage points, and output per worker rises by 15.46, 15.40, and 13.49 percent.

The channel decomposition exercises show that the manufacturing and scale effects are concentrated in different

13. Korea is used as the main country-specific historical path because it is an observed steep-manufacturing economy in the baseline sample and provides a concrete high-manufacturing trajectory. Appendix E.5 reports additional country-specific paths for Malaysia (MYS), Mauritius (MUS), and Chile (CHL), together with other financial-development dynamics.

Table 4: Financial development and the two margins

Exercise	Flat mfg. emp. pp	Steep mfg. emp. pp	Flat Y/L %	Flat C/L %	Flat inv. rate pp	Flat exports/ output pp
Benchmark financial-development improvement	2.71	-0.00	17.23	7.60	5.86	2.85
	2.01	-0.06	16.44	12.49	2.30	2.21
	1.82	-0.05	13.25	10.41	1.36	2.29
Investment-demand margin only	2.36	-0.01	15.07	5.79	5.69	-0.15
	1.28	-0.02	13.50	9.77	2.18	-0.22
	1.05	-0.03	9.71	7.11	1.15	-0.23
Export-finance margin only	0.31	0.01	1.73	1.65	0.03	3.01
	0.65	-0.03	2.52	2.42	0.05	2.45
	0.70	-0.02	3.22	3.10	0.17	2.52
Private-credit-to-GDP financial-development measure	3.44	-0.00	19.55	8.50	6.15	3.54
	2.60	-0.06	18.75	14.67	2.94	2.78
	2.85	-0.06	17.40	12.12	2.59	3.39
Korea financial path	2.96	-0.00	18.51	8.01	6.33	3.32
	2.16	-0.06	17.72	13.55	2.37	2.42
	2.25	-0.07	15.35	11.77	1.72	3.10
Steep-economy financial path	2.42	-0.01	15.46	6.88	5.21	2.28
	1.98	-0.05	15.40	11.44	2.28	2.05
	1.96	-0.06	13.49	10.36	1.50	2.33

Notes: Entries are annual weighted-average differences from the baseline. Stacked entries report early, middle, and late effects for 1970–1985, 1986–2001, and 2002–2018. Except for the steep-manufacturing column, entries refer to the baseline flat-manufacturing economies. The steep-manufacturing column reports the corresponding response of untreated steep-manufacturing economies. Output is nominal output Y expressed in units of the final-consumption good, Y/P^c. Output and consumption are percentage changes in levels relative to baseline. Share and rate variables are percentage-point differences. The private-credit-to-GDP row uses the alternative calibration in which financial development is measured by private credit to GDP, and reports differences relative to the corresponding private-credit-to-GDP baseline.

margins. The investment-demand margin delivers most of the manufacturing response: manufacturing employment rises by 2.36, 1.28, and 1.05 percentage points across the three periods, compared with 2.71, 2.01, and 1.82 percentage points in the full experiment. It also generates almost all of the increase in the investment rate. The export-finance margin has a different profile. It raises manufacturing employment more modestly, but increases exports over output by 3.01, 2.45, and 2.52 percentage points and raises consumption per worker by 1.65, 2.42, and 3.10 percent. Financial development therefore changes sectoral allocation mainly through domestic investment demand, while export finance operates primarily by raising exports and world-market participation while generating smaller but positive real gains.

The next question is how the manufacturing response reshapes the broader employment allocation in flat-manufacturing economies. Financial development reverses part of the employment shift into low-skilled services that characterizes flat-manufacturing paths. In the full experiment, manufacturing's share of non-agricultural employment rises by 2.36 percentage points in the early period, 0.98 percentage points in the middle period, and 0.63 percentage points in the late period. Low-skilled services move in the opposite direction, falling by 1.48, 0.69,

Table 5: Sectoral reallocation in flat-manufacturing economies

Exercise	Agriculture emp. pp	Mfg. emp. pp	Mfg. share of non-ag. emp. pp	Low-skilled services share of non-ag. emp. pp	High-skilled services share of non-ag. emp. pp
Benchmark financial-development improvement	-2.27	2.71	2.36	-1.48	-0.88
	-2.50	2.01	0.98	-0.69	-0.29
	-2.50	1.82	0.63	-0.51	-0.11
Investment-demand margin only	-1.79	2.36	2.21	-1.40	-0.81
	-1.30	1.28	0.87	-0.54	-0.33
	-1.18	1.05	0.56	-0.35	-0.21
Export-finance margin only	-0.41	0.31	0.15	-0.06	-0.09
	-1.11	0.65	0.09	-0.14	0.05
	-1.24	0.70	0.04	-0.15	0.11

Notes: Entries are annual weighted-average percentage-point differences from the baseline for the baseline flat-manufacturing economies. Stacked entries report early, middle, and late effects for 1970–1985, 1986–2001, and 2002–2018.

and 0.51 percentage points as a share of non-agricultural employment.

6.2 Finance determines what openness amplifies

Pairing financial improvements with lower trade costs for all economies recasts globalization as an amplifier of finance-shaped sectoral change. A common view is that global competition narrows the manufacturing window for developing economies (Rodrik 2016). We instead ask what happens when openness operates on an economy whose financial constraints have changed: the effects of lower trade costs are not invariant to the domestic frictions on which they operate (Bai, Jin, and Lu 2024). Financial development strengthens comparative advantage in externally finance-dependent sectors and expands domestic demand for manufacturing-intensive investment goods. Lower nonfinancial trade costs then amplify this new sectoral configuration. In the trade-cost exercises, nonfinancial iceberg trade costs in agriculture, manufacturing, and high-skilled services move one-half of the way toward their frictionless values for all international pairs. The trade-cost-only exercise leaves financial development at baseline, while the combined exercise applies the same trade-cost reduction and lets the finance-induced export-cost component follow the benchmark financial-development improvement. Table 6 shows the transition effects of the trade-cost-only and combined exercises; Table 7 then reports the implication for the peak manufacturing gap. Additional trade-cost exercises are reported in Appendix E.7.

Lower nonfinancial trade costs alone raise manufacturing employment in flat-manufacturing economies by 2.00, 6.22, and 6.15 percentage points. Thus, openness is itself pro-manufacturing in this environment. But the response is larger when trade-cost reductions operate on an economy whose financial development has already strengthened effective comparative advantage in finance-dependent tradables and raised demand for manufacturing-intensive investment goods. Combining lower nonfinancial trade costs with the benchmark financial improvement raises manufacturing employment by 6.47, 9.80, and 8.49 percentage points. These gains exceed the sum of the separate

Table 6: Lower trade costs and financial development

Exercise	Flat mfg. emp. pp	Steep mfg. emp. pp	Flat Y/L %	Flat C/L %	Flat exports/ output pp
Benchmark financial-development improvement	2.71	-0.00	17.23	7.60	2.85
	2.01	-0.06	16.44	12.49	2.21
	1.82	-0.05	13.25	10.41	2.29
Lower nonfinancial trade costs only	2.00	1.88	8.04	7.63	10.98
	6.22	5.86	19.33	18.07	12.92
	6.15	7.55	26.12	24.59	18.61
Benchmark financial development and lower nonfinancial trade costs	6.47	1.81	33.74	21.66	18.30
	9.80	5.69	46.32	39.58	18.28
	8.49	7.46	48.22	42.61	23.01

Notes: Entries are annual weighted-average differences from the baseline. Stacked entries report early, middle, and late effects for 1970–1985, 1986–2001, and 2002–2018. Except for the steep-manufacturing column, entries refer to the baseline flat-manufacturing economies; the steep-manufacturing column reports untreated steep-manufacturing economies. Output is nominal output Y expressed in units of the final-consumption good, Y/P^c. Output and consumption are percentage changes in levels relative to baseline. Share and rate variables are percentage-point differences. In the trade-cost-only and combined rows, nonfinancial iceberg trade costs in agriculture, manufacturing, and high-skilled services move one-half of the way toward their frictionless values for all international pairs. The trade-cost-only row leaves financial development at baseline, while the combined row also applies the benchmark financial-development experiment.

finance-only and trade-only effects by 1.76, 1.57, and 0.52 percentage points, respectively. The interaction is therefore not just additive: financial development changes the sectoral incentives that openness magnifies.

The finance–trade interaction also generates the largest gains in real output and consumption in the section. Output per worker rises by 33.74, 46.32, and 48.22 percent, while consumption per worker rises by 21.66, 39.58, and 42.61 percent. Exports over output increase by 18.30, 18.28, and 23.01 percentage points. Finance not only affects the manufacturing response to openness, it also changes the real gains associated with that sectoral path.

Table 7 translates these transition responses into the paper's central empirical object: the flat–steep gap in peak manufacturing employment. The empirical gap is computed from the harmonized sectoral employment data used in Section 2, drawing on GGDC, ETD, WIOD, EU KLEMS, and OECD sources. For each country, the observed peak is the maximum manufacturing employment share in the data; the empirical gap is the difference between the average peak of steep-manufacturing economies and the average peak of flat-manufacturing economies, equal to 11.26 percentage points.[14] The benchmark experiment, which moves flat-manufacturing economies halfway to the

14. The empirical denominator is computed on a restricted sample: countries whose observed manufacturing-employment peak occurs within 1973–2015 and whose agricultural employment share at that peak is no higher than 65 percent. The peak-year restriction avoids treating sample endpoints as genuine peaks, since an endpoint maximum may place the true peak outside the observed window. The agricultural-employment restriction excludes economies that remain highly agricultural at their observed manufacturing maximum, where structural transformation is still beginning and the observed maximum is less informative about the eventual manufacturing window. The restricted flat-manufacturing sample is ZMB, COL, BOL, IDN, PER, THA, BRA, and GRC; the restricted steep-manufacturing sample is MEX, CRI, CAN, CHL, IRL, ZAF, FRA, CHN, JPN, MYS, FIN, ESP, KOR, PRT, and MUS. Counterfactual peak gains in Table 7 are computed over the full 1970–2018

Table 7: Counterfactual peak manufacturing and the empirical peak gap

Exercise	Flat peak gain pp	Steep peak gain pp	Net peak gain pp	Share of 11.26 pp gap %
Benchmark financial-development improvement	3.17	-0.02	3.19	28.3
Investment-demand margin only	1.92	-0.02	1.94	17.2
Export-finance margin only	0.93	-0.00	0.93	8.2
Private-credit-to-GDP financial-development measure	4.57	-0.03	4.60	40.8
Korea financial path	3.77	-0.03	3.79	33.7
Steep-economy financial path	3.23	-0.03	3.26	28.9
Benchmark financial development and lower nonfinancial trade costs	10.82	2.54	8.28	73.5

Notes: Counterfactual peak gains are averages of country-level peak gains for all countries in the baseline flat- and steep-manufacturing groups. For each country, the gain is the counterfactual peak manufacturing-employment share over 1970–2018 minus its baseline peak over the same period. The net peak gain is the average flat-country gain minus the average steep-country gain. The last column divides the unrounded net gain by the empirical flat–steep peak gap of 11.26 percentage points. The private-credit-to-GDP row uses the alternative calibration in which financial development is measured by private credit to GDP, and reports peak gains relative to the corresponding private-credit-to-GDP baseline.

year-specific financial frontier, closes 28.3 percent of this gap.

The private-credit-to-GDP calibration points in the same direction, but with a larger peak effect. Under this alternative measure of financial development, the net peak gain is 4.60 percentage points, closing over two fifths of the empirical flat–steep peak gap. Thus, the baseline result is not just robust to the financial-development measure: using private credit to GDP implies that finance accounts for an even greater share of the missing manufacturing window.

The channel decomposition shows that the investment-demand margin closes 17.2 percent of the gap, while the export-finance margin closes 8.2 percent. The Korea and steep-economy path exercises deliver similar gap closure, at 33.7 and 28.9 percent. The most striking result is the finance–trade combination: when the same financial-development improvement is paired with lower nonfinancial trade costs, the net peak gain rises to 8.28 percentage points, closing almost three quarters of the empirical gap. Lower trade frictions therefore become strongly pro-manufacturing once financial development has shifted comparative advantage and strengthened domestic investment demand.

6.3 Autarky as a diagnostic

Finally, the autarky exercise approaches this question from a complementary angle: removing trade exposure entirely. It shows that autarky does not create a large or sustained manufacturing window. If global competition were the main reason flat-manufacturing economies miss that window, shutting down international trade should

model period for the baseline flat- and steep-manufacturing groups; Appendix E.2 reports peak results for the same restricted empirical sample.

generate a strong manufacturing response.

Table 8 shows instead that autarky raises manufacturing employment only slightly in the early period, by 0.27 percentage points, and then lowers it by 1.37 and 1.14 percentage points in the middle and late periods. Autarky also lowers output and consumption per worker in every period. Appendix E.7 reaches the same conclusion from the opposite direction: lowering only nonfinancial trade costs raises manufacturing employment. The issue is therefore not openness itself, but the sectoral incentives that openness acts on.

Relative to the baseline closed economy, the subsequent improvement in financial development within autarky raises manufacturing employment by 2.23, 1.00, and 0.67 percentage points across the three periods, as well as output and consumption. However, this increase in both manufacturing shares and real outcomes is smaller than the improvement in the baseline counterfactual or the investment-only counterfactual.[15] This reinforces the result that the gains from financial development are stronger in the open economy.

Table 8: Autarky and the domestic investment-demand margin

Exercise	**Mfg. emp. pp**	**Real** Y/L **%**	**Real** C/L **%**	**Investment rate pp**
Autarky only, relative to open-economy baseline	0.27	-1.65	-1.59	0.07
	-1.37	-4.92	-4.57	-0.99
	-1.14	-7.60	-7.35	-0.06
Benchmark financial-development improvement within autarky	2.23	14.82	5.64	5.89
	1.00	13.18	9.53	3.39
	0.67	9.46	6.94	1.82

Notes: Entries are annual weighted-average differences for baseline flat-manufacturing economies. Stacked entries report early, middle, and late effects for 1970–1985, 1986–2001, and 2002–2018. Autarky shuts down international trade. The first row reports the autarky-only economy relative to the open-economy baseline. The second row subtracts the autarky-only economy from the autarky economy with the benchmark financial-development improvement. Output is nominal output Y expressed in units of the final-consumption good, Y/P^c. Output and consumption are percentage changes in levels relative to the relevant comparison economy. Share and rate variables are percentage-point differences.

The counterfactual exercises deliver several core conclusions. First, financial development changes the sectoral trajectory of flat-manufacturing economies, shifting employment toward manufacturing rather than low-skilled services. It also raises output and consumption per worker, especially when paired with lower nonfinancial trade costs. The channel decomposition exercises identify domestic investment demand as the main source of the manufacturing window. Finally, the trade exercises show that lower nonfinancial trade costs become strongly pro-manufacturing once finance changes comparative advantage and domestic demand; the autarky diagnostics support a similar claim, showing that the gains from financial development are weaker in the closed economy. Appendix E reports additional robustness exercises, including additional exercises with private-credit-to-GDP as the proxy for financial development, country-group classification checks, restricted-sample peak calculations, alternative financial-development paths, universal financial convergence, aggregation checks, additional trade-cost and autarky diagnostics, and

15. Since the export channel is absent from this setup, by definition, the investment-only counterfactual is the appropriate comparison.

country-at-a-time counterfactuals.

7 Concluding remarks

This paper shows that cross-country differences in financial development are a quantitatively important driver of heterogeneous structural transformation paths, with sizable consequences for output and consumption. The mechanism operates through two margins. Financial underdevelopment weakens competitiveness in sectors that rely more heavily on external finance, limiting their expansion in world markets. It also raises the effective cost of investment, reducing demand for manufacturing-intensive capital goods. Together, these margins mean that finance changes both the scale and the sectoral trajectory of development.

The quantitative results show that the impact of financial underdevelopment is economically large. In the benchmark counterfactual, flat-manufacturing economies move one-half of the way to the year-specific financial frontier. Manufacturing employment rises along the transition path, and the resulting peak gain closes 28.3 percent of the empirical flat–steep peak gap. The same counterfactual raises output per worker by about 13 to 17 percent across periods and consumption per worker by around 8 to 12 percent. The channel decomposition identifies domestic investment demand as the source of around two thirds of the manufacturing-window response. The export-finance margin plays a different role, expanding exports and world-market participation by reducing finance-induced disadvantages in externally finance-dependent sectors.

The trade exercises sharpen the paper's position on globalization. The issue is not openness by itself, but the sectoral incentives that openness acts on. When financial development is paired with lower nonfinancial trade costs, the manufacturing-employment peak rises sharply in flat-manufacturing economies, closing almost three quarters of the empirical flat–steep peak gap. Finance therefore shapes what globalization amplifies: lower nonfinancial trade frictions are strongly pro-manufacturing when financial development has strengthened comparative advantage in externally finance-dependent sectors and raised demand for manufacturing-intensive investment goods. Autarky diagnostics reinforce the claim that the gains from financial development are larger in the open economy.

These findings point to an important policy implication: financial development is not merely a byproduct of economic growth, but a determinant of the sectoral path through which development takes place. Countries with underdeveloped financial systems face a double disadvantage—weaker export competitiveness in finance-dependent sectors and a higher cost of investment—that together steer the economy away from manufacturing and toward low-skilled services. Policies aimed at deepening financial markets may therefore affect structural transformation in ways that go well beyond their direct impact on credit availability, changing not only the scale of development but also the sectors through which it occurs.

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A Country classification

A.1 Baseline classification

We define the flat treatment group using observed manufacturing-employment dynamics. The baseline flat group contains economies in the targeted comparison sample that do not satisfy any of two steep-path screens: a peak manufacturing-employment share of at least 27.5 percent or a 2018 manufacturing-employment share of at least 25 percent.

Table 9: Country classification for the baseline comparison

Group	**Countries**	**Count**
Flat-manufacturing	BOL, BRA, COL, ETH, GHA, GRC, IDN, KEN, MAR, MWI, PER, PHL, SEN, THA, TZA, ZMB	16
Steep-manufacturing	ARG, AUS, AUT, BEL, CAN, CHL, CHN, CRI, DEU, DNK, EGY, ESP, FIN, FRA, GBR, IND, IRL, ITA, JPN, KOR, MEX, MUS, MYS, NLD, PRT, SWE, USA, ZAF	28

Notes: The flat-manufacturing row is the treatment and reporting group used in the baseline counterfactual exercises. The steep row is the non-flat comparison group used in the baseline-sample peak-gap calculation; ROW is kept separate.

Table 10: Country classification for the broader empirical sample

Group	**Countries**	**Count**
Flat-manufacturing	BFA, BGD, BOL, BRA, BWA, CMR, COL, CYP, ECU, ETH, GHA, GRC, IDN, KEN, KHM, LAO, LSO, LVA, MAR, MMR, MOZ, MWI, NAM, NGA, NPL, PAK, PER, PHL, RWA, SEN, THA, TZA, UGA, ZMB	34
Steep-manufacturing	ARG, AUS, AUT, BEL, BGR, CAN, CHL, CHN, CRI, CZE, DEU, DNK, EGY, ESP, EST, FIN, FRA, GBR, HKG, HUN, IND, IRL, ISR, ITA, JPN, KOR, LKA, LTU, LUX, MEX, MLT, MUS, MYS, NLD, POL, PRT, ROU, RUS, SGP, SVK, SVN, SWE, TUN, TUR, TWN, USA, VEN, VNM, ZAF	49

Notes: The table reports the broader empirical classification used in Section 2. The two rows sum to 83 countries. Taiwan is included in the classification because its sectoral employment path is observed, but it has no non-missing IMF Financial Institutions Index observations and is therefore excluded from the financial-development moments and regressions.

The resulting baseline flat group contains 16 economies in Table 9, which defines the treatment and reporting groups used in the counterfactual tables. Table 10 reports the broader empirical classification used to organize the empirical analysis in Section 2, applying the same steep-path screens to the larger empirical sample.

A.2 Robustness of the classification and the empirical peak gap

This subsection assesses the sensitivity of the flat-versus-steep classification described above, and of the corresponding empirical peak-manufacturing gap of 11.26 percentage points reported in Section 6, to alternative classification rules, sample definitions, and inference assumptions. Across all the checks below, the empirical peak gap remains positive, economically meaningful, and statistically distinguishable from a random partition; the flat group is stable under any reasonable perturbation of the two steep-path screens; and no single retained country shifts the gap by more than one percentage point. Robustness exercises that involve re-running the main counterfactual experiments under alternative classifications are reported in Appendix E.3.

A.2.1 Sample restrictions for the empirical peak comparison

The empirical comparison uses countries that meet two restrictions on the country-level manufacturing-employment series. First, the observed peak must fall within 1973–2015, so that the measured peak is not mechanically determined by the beginning or end of the sample. Second, the agricultural-employment share in the year of the manufacturing peak must be at most 65 percent. The second restriction ensures that the recorded peak reflects a mature manufacturing trajectory rather than an early phase of industrialization: in economies where agriculture still dominates employment at the year of the highest observed manufacturing share, that share is typically rising and the recorded value is not informative about the country's long-run manufacturing peak. Eight flat-manufacturing economies satisfy both restrictions—Bolivia, Brazil, Colombia, Greece, Indonesia, Peru, Thailand, and Zambia, with an average peak share of 22.5 percent—together with fifteen steep-manufacturing economies—Canada, Chile, China, Costa Rica, Spain, Finland, France, Ireland, Japan, Korea, Mexico, Mauritius, Malaysia, Portugal, and South Africa, with an average peak share of 33.7 percent. The implied empirical peak gap is 11.26 percentage points.

A.2.2 Threshold sensitivity

The baseline classification declares a country steep if either its observed manufacturing-employment peak share is at least 27.5 percent or its 2018 manufacturing-employment share is at least 25 percent, and flat otherwise. Both cutoffs are convenient choices and can be varied without overturning the empirical peak gap. Figure 11 reports the empirical peak gap on a grid of alternative thresholds, with the peak threshold ranging over $\{25.0, 26.5, 27.5, 29.0, 30.0, 31.5\}$ percent and the 2018-share threshold ranging over $\{22.5, 24.0, 25.0, 26.0, 27.5\}$ percent. Each cell reapplies the two-screen rule with the corresponding pair of thresholds to the 44 baseline economies, partitions them into flat and steep groups, and recomputes the empirical peak gap on the countries that satisfy the sample restrictions of Section A.2.1. Across the entire grid the gap ranges from 9.0 to 11.5 percentage points and remains positive and economically meaningful in every cell. The gap is more sensitive to the peak-share threshold than to the 2018-share threshold, because a small number of borderline economies shift between groups when the peak threshold is moved by a few percentage points, whereas relatively few economies are classified steep by the

2018-share condition alone.

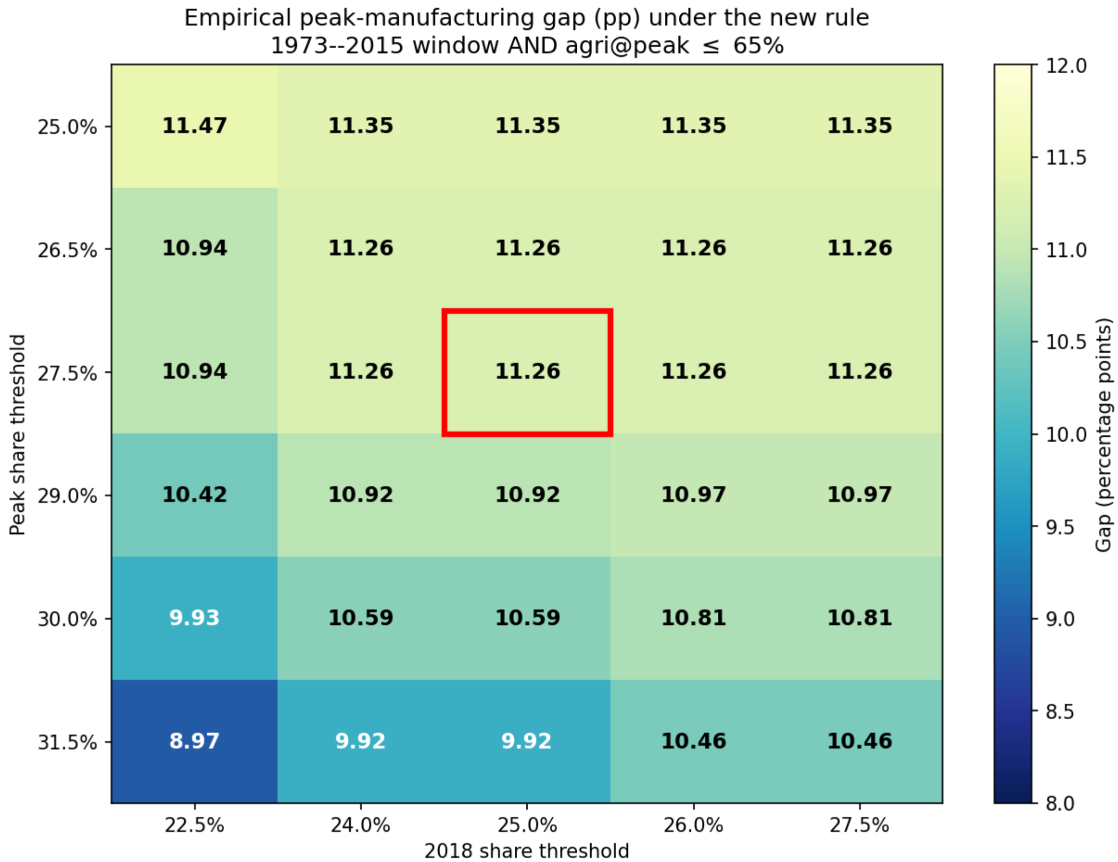

Figure 11: Empirical peak-manufacturing gap (steep group average minus flat group average peak share, percentage points) across alternative thresholds for the two steep-path screens. The baseline classification corresponds to the cell highlighted in red (peak threshold 27.5 percent, 2018-share threshold 25 percent).

A.2.3 Single-screen classifications

The baseline classification combines the peak threshold and the 2018-share threshold with an inclusive "or" rule. Dropping either screen leaves a single-screen classification. Under the peak-only screen (steep if and only if the peak manufacturing-employment share is at least 27.5 percent), Egypt is the only economy that switches group, moving from steep to flat. Because Egypt's observed peak occurs in 2018, outside the 1973–2015 window used for the empirical gap calculation, this reassignment leaves the empirical peak gap unchanged at 11.26 percentage points. Under the 2018-share-only screen (steep if and only if the 2018 share is at least 25 percent), twenty-one economies are reclassified from steep to flat, leaving a steep group of seven and a flat group of thirty-seven; the empirical peak gap falls to 7.2 percentage points. This variant is degenerate because many of the reclassified economies—for example, Belgium, France, Germany, Italy, and the United Kingdom—attained manufacturing-employment shares well above 27.5 percent earlier in the sample, so the 2018-only screen mechanically reclassifies countries that the historical evidence clearly identifies as steep. The peak-only screen therefore captures essentially the same information as the baseline rule, while the 2018-only screen does not.

A.2.4 Leave-one-out

To check that the empirical peak gap is not driven by a small number of influential countries, we recompute the gap after dropping each of the twenty-three economies that contribute to the empirical comparison. The smallest leave-one-out gap is 10.46 percentage points, obtained by dropping Zambia (a low-peak flat economy), and the largest is 11.78 percentage points, obtained by dropping Greece (a high-peak flat economy). No single country moves the gap by more than 0.80 percentage points from the headline value, and the full leave-one-out range is contained within ±1 percentage point of the headline.

A.2.5 Alternative peak windows

The baseline calculation restricts attention to countries whose observed manufacturing-employment peak falls within 1973–2015. Table 11 reports the empirical peak gap under several alternative windows. Using the full 1970–2018 sample raises the gap to 13.1 percentage points, because the wider window admits additional steep-group economies whose peaks fall outside the headline restriction. Tightening the window to 1975–2010 reduces the sample to four flat and eight steep economies and yields a gap of 10.4 percentage points; the 1980–2015 and 1990–2018 windows give 10.9 and 12.2 percentage points, respectively. Across all the windows considered the empirical peak gap lies between 10.4 and 13.1 percentage points.

Table 11: Empirical peak-manufacturing gap under alternative peak-window restrictions

Peak window	n_{flat}	n_{steep}	Flat avg. peak (%)	Steep avg. peak (%)	Gap (pp)
1970–2018 (full)	13	28	21.6	34.8	13.1
1973–2015 (baseline)	8	15	22.5	33.7	11.3
1975–2010	4	8	24.1	34.5	10.4
1980–2015	6	8	23.3	34.3	10.9
1990–2018	9	7	21.1	33.3	12.2

Notes: Each row restricts attention to economies in the baseline 44-country sample whose observed manufacturing-employment peak falls within the listed window and whose agricultural-employment share in the peak year is at most 65 percent. “Gap” is the difference between the average peak share in the steep group and the average peak share in the flat group, in percentage points.

A.2.6 Statistical inference

Two statistical exercises complement the comparisons above. First, a permutation test reassigns the 44 baseline economies randomly into a 16-country flat group and a 28-country steep group, applies the sample restrictions of Section A.2.1, and recomputes the gap for each random partition. Across 10,000 random permutations the mean gap is essentially zero with a standard deviation of 2.9 percentage points, and no permuted gap reaches the observed value of 11.3 percentage points. The implied two-sided p-value is below 10^{-4}. Second, a non-parametric block bootstrap resamples with replacement the country-level peak shares within each retained group. Across 10,000 bootstrap draws the mean gap is 11.3 percentage points and the 95 percent bootstrap confidence interval is $[8.71, 14.03]$ percentage points, comfortably excluding zero.

A.2.7 Region-stratified gap

Table 12 reports the empirical peak gap within each broad geographic region in the baseline 44-country sample. The gap is largest within sub-Saharan Africa (20.9 percentage points across one flat and two steep economies) and smallest within Latin America (6.6 percentage points across four flat and three steep economies). Within Western OECD economies the gap is 7.6 percentage points, but with only Greece on the flat side this comparison is shaped largely by Greece's position within the steep distribution. South Asia and East Asia contain no flat economies in the baseline sample, and the Middle East and North Africa region contributes no economy that satisfies the sample restrictions, so the within-region gap is not informative in those cases. The headline gap is therefore not an artifact of regional composition: it survives within each region for which the within-region comparison is meaningful, and the within-region magnitudes are economically large.

Table 12: Empirical peak-manufacturing gap by region

Region	n_{flat}	n_{steep}	Gap (pp)
Latin America and the Caribbean	4	3	6.6
Western OECD	1	6	7.6
Southeast Asia	2	1	11.8
Sub-Saharan Africa	1	2	20.9
Middle East and North Africa	0	0	n.a.
East Asia	0	3	n.a.
South Asia	0	0	n.a.

Notes: The empirical peak gap is computed using the sample restrictions of Section A.2.1. "n.a." indicates that the region contains either no flat or no steep economy that satisfies those restrictions, so the within-region gap is not informative.

A.2.8 Summary

Taken together, the seven exercises above show that the baseline classification and the corresponding empirical peak gap of 11.3 percentage points are not an artifact of the particular cutoffs, sample window, or set of countries used in the headline calculation. The gap survives ± 2.5-percentage-point variation in either steep-path threshold, leave-one-out exclusion of every contributing country, alternative peak windows, the post-1990 reclassification, and within-region comparisons in every region for which the within-region calculation is meaningful. The associated permutation p-value is below 10^{-4}, the bootstrap confidence interval excludes zero, and no single country shifts the gap by more than one percentage point. Robustness exercises that propagate alternative classifications through the full counterfactual model are reported in Appendix E.3.

B Additional empirical evidence

This appendix reports supporting evidence for Fact 2 in Section 2. The main text uses the completed IMF Financial Institutions Index, allows for curvature through the index and its square root, and reports the ten-year pre-peak exercise. The tables below show that the same qualitative patterns are not specific to that presentation.

Table 13 replaces the square-root terms in the main employment-share specification with quadratic terms. Table 14 uses the broader IMF Financial Development Index instead of the Financial Institutions Index. Table 15 uses log private credit to GDP. Table 16 repeats the baseline analysis after excluding China, Japan, and South Korea, where major industrial policies may affect the relationship between financial development and sectoral employment shares. Finally, Table 17 controls for the level of openness to trade while Table 18 controls for domestic expenditure shares.

Tables 19 and 20 report the pre-peak exercise at five- and fifteen-year horizons. Across these checks, financial development remains systematically related to sectoral allocation, and financial development measured before the manufacturing peak remains positively associated with the eventual peak.

Table 13: Sectoral employment shares and the IMF Financial Institutions Index: quadratic specification

	Panel A				Panel B			
	Agric.	Manuf.	LS serv.	HS serv.	Agric.	Manuf.	LS serv.	HS serv.
ln(GDPpw)	-0.08***	0.03*	0.01	0.03**	-0.53***	0.55***	0.28***	-0.30***
	(0.018)	(0.013)	(0.009)	(0.009)	(0.091)	(0.094)	(0.055)	(0.057)
$\ln(\text{GDPpw})^2$					0.02***	-0.03***	-0.01***	0.02***
					(0.005)	(0.005)	(0.003)	(0.003)
Fin Dev	-0.42***	0.26**	0.24***	-0.08	-0.34***	0.17*	0.19***	-0.02
	(0.088)	(0.085)	(0.048)	(0.066)	(0.088)	(0.073)	(0.048)	(0.053)
Fin Dev^2	0.49***	-0.39***	-0.29***	0.19**	0.34***	-0.22***	-0.20***	0.09.
	(0.077)	(0.078)	(0.047)	(0.064)	(0.071)	(0.061)	(0.044)	(0.051)
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.98	0.83	0.93	0.97	0.98	0.87	0.94	0.97
Observations	3,261	3,261	3,261	3,261	3,261	3,261	3,261	3,261

Notes: Fin Dev is the completed IMF Financial Institutions Index. Standard errors clustered at the country level are reported in parentheses. All specifications include country and year fixed effects. Significance codes are ***: 0.001, **: 0.01, *: 0.05, .: 0.1.

Table 14: Sectoral employment shares and the IMF Financial Development Index

	Panel A				Panel B			
	Agric.	Manuf.	LS serv.	HS serv.	Agric.	Manuf.	LS serv.	HS serv.
ln(GDPpw)	-0.09***	0.04***	0.02*	0.02**	0.70***	-0.87***	-0.43***	0.60***
	(0.018)	(0.012)	(0.010)	(0.009)	(0.195)	(0.176)	(0.114)	(0.122)
ln(GDPpw)$^{1/2}$					-4.79***	5.57***	2.73***	-3.50***
					(1.160)	(1.060)	(0.679)	(0.717)
Fin Dev	0.58***	-0.49***	-0.38***	0.29**	0.40***	-0.28**	-0.28***	0.15*
	(0.116)	(0.114)	(0.070)	(0.088)	(0.109)	(0.093)	(0.067)	(0.075)
Fin Dev$^{1/2}$	-0.57***	0.37*	0.37***	-0.17	-0.43**	0.20.	0.29**	-0.07
	(0.153)	(0.142)	(0.093)	(0.107)	(0.149)	(0.119)	(0.091)	(0.090)
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.98	0.84	0.93	0.97	0.98	0.87	0.94	0.97
Observations	3,261	3,261	3,261	3,261	3,261	3,261	3,261	3,261

Notes: Fin Dev is the completed IMF Financial Development Index. Standard errors clustered at the country level are reported in parentheses. All specifications include country and year fixed effects. Significance codes are ***: 0.001, **: 0.01, *: 0.05, .: 0.1.

Table 15: Sectoral employment shares and private credit to GDP

	Panel A				Panel B			
	Agric.	Manuf.	LS serv.	HS serv.	Agric.	Manuf.	LS serv.	HS serv.
ln(GDPpw)	-0.08***	0.03*	0.02	0.03**	1.04***	-1.20***	-0.63***	0.80***
	(0.020)	(0.015)	(0.011)	(0.010)	(0.206)	(0.197)	(0.116)	(0.125)
ln(GDPpw)$^{1/2}$					-6.79***	7.53***	3.96***	-4.70***
					(1.220)	(1.190)	(0.684)	(0.742)
Fin Dev	0.02	-0.07*	-0.03.	0.07***	-0.03	-0.01	-0.003	0.04**
	(0.029)	(0.027)	(0.015)	(0.017)	(0.024)	(0.021)	(0.012)	(0.013)
Fin Dev$^{1/2}$	-0.11	0.24**	0.12*	-0.25***	0.06	0.06	0.02	-0.14***
	(0.082)	(0.077)	(0.046)	(0.054)	(0.068)	(0.056)	(0.035)	(0.036)
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.97	0.80	0.92	0.96	0.98	0.86	0.93	0.97
Observations	3,265	3,265	3,265	3,265	3,265	3,265	3,265	3,265

Notes: Fin Dev is log completed private credit to GDP; the underlying private-credit series is measured in percent of GDP before taking logs. Standard errors clustered at the country level are reported in parentheses. All specifications include country and year fixed effects. Significance codes are ***: 0.001, **: 0.01, *: 0.05, .: 0.1.

Table 16: Sectoral employment shares and the IMF Financial Institutions Index: subsample without China, Japan and South Korea

	Panel A				Panel B			
	Agric.	Manuf.	LS serv.	HS serv.	Agric.	Manuf.	LS serv.	HS serv.
ln(GDPpw)	-0.053**	0.020	0.004	0.029**	0.919***	-1.090***	-0.520***	0.694***
	(0.016)	(0.015)	(0.009)	(0.009)	(0.191)	(0.230)	(0.129)	(0.128)
$\ln(\text{GDPpw})^{1/2}$					-5.960***	6.830***	3.210***	-4.080***
					(1.170)	(1.390)	(0.772)	(0.759)
Fin Dev	0.886***	-0.768***	-0.509***	0.391***	0.596***	-0.436***	-0.352***	0.192*
	(0.126)	(0.126)	(0.082)	(0.086)	(0.121)	(0.101)	(0.080)	(0.077)
$\text{Fin Dev}^{1/2}$	-1.100***	0.847***	0.616***	-0.368**	-0.798***	0.506***	0.456***	-0.164.
	(0.163)	(0.164)	(0.103)	(0.110)	(0.158)	(0.129)	(0.098)	(0.093)
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.978	0.834	0.928	0.969	0.981	0.870	0.936	0.974
Observations	3,119	3,119	3,119	3,119	3,119	3,119	3,119	3,119

Notes: Fin Dev is the completed IMF Financial Institutions Index. Standard errors clustered at the country level are reported in parentheses. All specifications include country and year fixed effects. Significance codes are ***: 0.001, **: 0.01, *: 0.05, .: 0.1.

Table 17: Sectoral employment shares and the IMF Financial Institutions Index: controlling for openness

	Panel A				Panel B			
	Agric.	Manuf.	LS serv.	HS serv.	Agric.	Manuf.	LS serv.	HS serv.
ln(GDPpw)	-0.066***	0.024.	0.010	0.032**	0.791***	-1.000***	-0.518***	0.730***
	(0.019)	(0.013)	(0.010)	(0.010)	(0.217)	(0.197)	(0.125)	(0.125)
$\ln(\text{GDPpw})^{1/2}$					-5.260***	6.300***	3.240***	-4.280***
					(1.290)	(1.200)	(0.746)	(0.740)
Fin Dev	0.823***	-0.745***	-0.511***	0.434***	0.558***	-0.428***	-0.348***	0.218**
	(0.130)	(0.121)	(0.080)	(0.091)	(0.123)	(0.101)	(0.079)	(0.076)
$\text{Fin Dev}^{1/2}$	-1.010***	0.827***	0.620***	-0.433***	-0.735***	0.493***	0.448***	-0.207*
	(0.172)	(0.155)	(0.100)	(0.117)	(0.162)	(0.128)	(0.097)	(0.094)
Openness	0.014	-0.053	-0.004	0.044	0.013	-0.052	-0.004	0.043
	(0.032)	(0.071)	(0.014)	(0.043)	(0.025)	(0.060)	(0.016)	(0.036)
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.976	0.835	0.925	0.967	0.979	0.867	0.933	0.973
Observations	3,204	3,204	3,204	3,204	3,204	3,204	3,204	3,204

Notes: Fin Dev is the completed IMF Financial Institutions Index. Standard errors clustered at the country level are reported in parentheses. All specifications include country and year fixed effects. Significance codes are ***: 0.001, **: 0.01, *: 0.05, .: 0.1.

Table 18: Sectoral employment shares and the IMF Financial Institutions Index: controlling for domestic absorption

	Panel A			Panel B		
	Agric.	Manuf.	HS serv.	Agric.	Manuf.	HS serv.
ln(GDPpw)	-0.067***	0.028.	0.022*	0.790***	-1.040***	0.656***
	(0.019)	(0.014)	(0.010)	(0.230)	(0.185)	(0.144)
$\ln(\text{GDPpw})^{1/2}$				-5.240***	6.500***	-3.860***
				(1.350)	(1.110)	(0.848)
Fin Dev	0.854***	-0.778***	0.346**	0.576***	-0.429***	0.162*
	(0.134)	(0.127)	(0.104)	(0.124)	(0.100)	(0.079)
$\text{Fin Dev}^{1/2}$	-1.040***	0.856***	-0.358**	-0.752***	0.491***	-0.169.
	(0.177)	(0.164)	(0.135)	(0.163)	(0.128)	(0.101)
π_{nn}	-0.084*	0.081	-0.032	-0.028	0.091	0.008
	(0.040)	(0.074)	(0.038)	(0.042)	(0.059)	(0.040)
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.977	0.838	0.969	0.980	0.876	0.974
Observations	3,216	3,216	3,000	3,216	3,216	3,000

Notes: Fin Dev is the completed IMF Financial Institutions Index. Standard errors clustered at the country level are reported in parentheses. All specifications include country and year fixed effects. Significance codes are ***: 0.001, **: 0.01, *: 0.05, .: 0.1.

Table 19: Financial development before the manufacturing peak: horizon $q = 5$

	Panel A: Linear specification			Panel B: Quadratic specification		
	Priv. Cred. / GDP	IMF FD	IMF institutions	Priv. Cred. / GDP	IMF FD	IMF institutions
FD	0.010*	0.060**	0.040*	0.009	0.059**	0.037.
	(0.005)	(0.018)	(0.019)	(0.006)	(0.017)	(0.019)
y_{init}	-0.0007	-0.003	-0.0005	0.095	0.132	0.132
	(0.006)	(0.006)	(0.006)	(0.096)	(0.082)	(0.080)
y^2_{init}				-0.005	-0.007.	-0.007.
				(0.005)	(0.004)	(0.004)
m_{init}	0.895***	0.928***	0.914***	0.899***	0.926***	0.913***
	(0.061)	(0.052)	(0.050)	(0.062)	(0.051)	(0.049)
Constant	0.029	0.067	0.044	-0.418	-0.568	-0.575
	(0.054)	(0.058)	(0.057)	(0.458)	(0.400)	(0.391)
Observations	52	52	52	52	52	52
Adjusted R^2	0.925	0.925	0.922	0.924	0.926	0.923

Notes: Heteroskedasticity-robust standard errors are reported in parentheses. The dependent variable is the peak manufacturing employment share, $m_i^{peak} = \max_t m_{i,t}$. Financial development and controls are measured $q = 5$ years before the peak, at $t_i^{peak} - 5$. Columns use log private credit to GDP, the IMF Financial Development Index, and the IMF Financial Institutions Index; private credit is measured in percent of GDP before taking logs. In Panel A, the estimated specification is
$m_i^{peak} = \alpha + \beta FD_{i,t_i^{peak}-5} + \gamma_1 y_{\text{init}} + \gamma_2 m_{\text{init}} + \varepsilon_i$. In Panel B, the specification additionally includes y^2_{init}. Significance codes are ***: 0.001, **: 0.01, *: 0.05, .: 0.1.

Table 20: Financial development before the manufacturing peak: horizon $q = 15$

	Panel A: Linear specification			Panel B: Quadratic specification		
	Priv. Cred. / GDP	IMF FD	IMF institutions	Priv. Cred. / GDP	IMF FD	IMF institutions
FD	0.013.	0.097.	0.093	0.011.	0.098.	0.097
	(0.007)	(0.055)	(0.061)	(0.006)	(0.056)	(0.058)
y_{init}	-0.011	-0.014.	-0.014.	0.099	0.145	0.153
	(0.009)	(0.008)	(0.008)	(0.110)	(0.115)	(0.116)
y^2_{init}				-0.006	-0.009	-0.009
				(0.006)	(0.006)	(0.006)
m_{init}	0.925***	0.960***	0.975***	0.917***	0.932***	0.944***
	(0.148)	(0.140)	(0.124)	(0.150)	(0.150)	(0.130)
Constant	0.140.	0.182**	0.178*	-0.360	-0.541	-0.586
	(0.072)	(0.065)	(0.067)	(0.510)	(0.535)	(0.537)
Observations	37	37	37	37	37	37
Adjusted R^2	0.790	0.786	0.787	0.787	0.787	0.788

Notes: Heteroskedasticity-robust standard errors are reported in parentheses. The dependent variable is the peak manufacturing employment share, $m_i^{peak} = \max_t m_{i,t}$. Financial development and controls are measured $q = 15$ years before the peak, at $t_i^{peak} - 15$. Columns use log private credit to GDP, the IMF Financial Development Index, and the IMF Financial Institutions Index; private credit is measured in percent of GDP before taking logs. In Panel A, the estimated specification is $m_i^{peak} = \alpha + \beta FD_{i,t_i^{peak}-15} + \gamma_1 y_{\text{init}} + \gamma_2 m_{\text{init}} + \varepsilon_i$. In Panel B, the specification additionally includes y^2_{init}. Significance codes are ***: 0.001, **: 0.01, *: 0.05, .: 0.1.

C Calibration details

C.1 Non-homothetic demand estimation

This appendix describes the estimation of the non-homothetic demand parameters used in the consumption and investment aggregators. Consumption shares measure the allocation of household final-consumption expenditure across agriculture, manufacturing, low-skilled services, and high-skilled services. Investment shares measure the corresponding allocation of gross fixed capital formation. The sectoral shares are constructed from OECD Input–Output Tables and historical WIOD input-output data, mapped into the four model sectors. Aggregate consumption and investment expenditures are taken from PWT.

Let $s^{c,j}_{n,t}$ denote sector j's expenditure share in final consumption and $s^{x,j}_{n,t}$ its expenditure share in investment. Taking the log ratio relative to manufacturing nets out the common price index of the bundle and re-expresses the scale term through the elasticity differences $\epsilon^j - \epsilon^m$. First-differencing the resulting log ratio then removes the time-invariant relative demand weights γ^j_n/γ^m_n, leaving an estimating equation that depends only on relative prices, aggregate expenditure per worker, and the structural elasticities. For consumption, the estimating equation is

$$\begin{aligned}\Delta \log\left(\frac{s^{c,j}_{n,t}}{s^{c,m}_{n,t}}\right) &= (1-\sigma)\Delta\log\left(\frac{P^j_{n,t}}{P^m_{n,t}}\right) \\ &\quad + (1-\sigma)(\epsilon^j - \epsilon^m)\Delta\log\left(\frac{C_{n,t}}{L_{n,t}}\right) + v^{c,j}_{n,t}, \qquad j \neq m. \end{aligned} \tag{50}$$

The investment equation is analogous:

$$\begin{aligned}\Delta \log\left(\frac{s^{x,j}_{n,t}}{s^{x,m}_{n,t}}\right) &= (1-\sigma_x)\Delta\log\left(\frac{P^j_{n,t}}{P^m_{n,t}}\right) \\ &\quad + (1-\sigma_x)(\epsilon^j_x - \epsilon^m_x)\Delta\log\left(\frac{X_{n,t}}{L_{n,t}}\right) + v^{x,j}_{n,t}, \qquad j \neq m. \end{aligned} \tag{51}$$

The two systems are estimated separately. The model-consistent regressors $\Delta\log(C_{n,t}/L_{n,t})$ and $\Delta\log(X_{n,t}/L_{n,t})$ are not directly observed. The data contain nominal final expenditures, sectoral final-demand shares, sectoral prices, and employment, while the real aggregate indices $C_{n,t}$ and $X_{n,t}$ and their associated price indices are model objects that depend on the elasticities through the non-homothetic aggregators. The elasticities and the aggregate index growth must therefore be determined jointly.

The numerical procedure iterates between two steps. Given current elasticities, the first step recovers, for every country-year, the per-worker real index growth that is consistent with the non-homothetic aggregator, observed nominal expenditure growth, sectoral price growth, and lagged sectoral shares. Holding the recovered index growth fixed, the second step updates the elasticities by least squares on the relative-share equation, using equal observation weights. The two steps are iterated to a fixed point, so that the estimated elasticities and the recovered aggregate index are mutually consistent. Prior to estimation, sectoral shares, sectoral prices, aggregate expenditure, and employment are smoothed over time to attenuate high-frequency measurement error using an HP filter with smoothing parameter 6.25; the smoothing of sectoral shares is share-preserving, so the four shares continue to sum to one within each country-year.

Within each demand system, the scale elasticities are identified only up to a normalization of the aggregate index. For consumption, we set $\epsilon^m = 1$. For investment, the normalization affects the returns to scale of the bundle technology. We therefore normalize the sample-average expenditure-share-weighted cost elasticity to one:

$$\frac{1}{|\mathcal{S}|} \sum_{(n,t)\in\mathcal{S}} \sum_{j\in\mathcal{J}} s_{n,t}^{x,j} \epsilon_x^j = 1, \tag{52}$$

where $\mathcal{S}$ denotes the investment estimation sample.

The estimated consumption parameters are

$$\sigma = 0.80, \qquad (\epsilon^a, \epsilon^m, \epsilon^{ls}, \epsilon^{hs}) = (0.29, 1.00, 1.45, 1.83),$$

and the estimated investment parameters are

$$\sigma_x = 0.76, \qquad (\epsilon_x^a, \epsilon_x^m, \epsilon_x^{ls}, \epsilon_x^{hs}) = (0.24, 0.99, 0.76, 1.48).$$

Finally, for each country we calibrate the time-invariant weights $\{\gamma_n^j\}_{j\in\mathcal{J}}$ and $\{\omega_{n,j}^x\}_{j\in\mathcal{J}}$ to match initial sectoral expenditure shares in consumption and investment. These weights capture persistent cross-country differences in final-demand composition that are not explained by relative prices or by the common elasticities. Once calibrated, they remain fixed throughout the baseline and counterfactual exercises. The calibrated investment weights preserve the manufacturing intensity of investment demand: in the initial-year data, manufacturing accounts for 82.5 percent of investment expenditure on average, and manufacturing receives the largest calibrated investment weight in every model economy.

C.2 Export-finance wedge calibration

This subsection describes the construction of the export-finance wedge used in Section 4.6.1. For each tradable sector $j \in \mathcal{T} = \{a, m, hs\}$, the model's trade-share equation identifies a total effective bilateral trade wedge. For foreign flows, $n \neq i$,

$$\frac{\pi_{ni,t}^j}{\pi_{ii,t}^j} = \left(\tilde{\tau}_{ni,t}^j\right)^{1-\eta} \left(\frac{P_{i,t}^j}{P_{n,t}^j}\right)^{1-\eta}, \tag{53}$$

where $\pi_{ii,t}^j$ is exporter i's domestic expenditure share and $P_{i,t}^j$ and $P_{n,t}^j$ are sectoral prices. Solving for the total effective wedge gives

$$\tilde{\tau}_{ni,t}^j = \left(\frac{\pi_{ni,t}^j}{\pi_{ii,t}^j}\right)^{\frac{1}{1-\eta}} \frac{P_{n,t}^j}{P_{i,t}^j}, \qquad n \neq i. \tag{54}$$

This wedge combines standard iceberg trade costs and an exporter-side finance wedge:

$$\tilde{\tau}_{ni,t}^j = \tau_{ni,t}^j \zeta_{i,t}^j. \tag{55}$$

Let

$$\ell_{ni,t}^j \equiv \log \tilde{\tau}_{ni,t}^j$$

denote the recovered total effective log trade wedge. We measure financial underdevelopment as

$$x_{i,t} \equiv -\log(\lambda_{i,t}).$$

A higher value of $x_{i,t}$ corresponds to weaker financial development. Since $x_{i,t} = 0$ when $\lambda_{i,t} = 1$, the implied export-finance wedge is normalized to one at the financial frontier.

We consider two sector-specific functional forms:

$$F_j(x_{i,t}) = \begin{cases} \chi_j x_{i,t}, & \text{linear,} \\ \chi_{1j} x_{i,t} + \chi_{2j} x_{i,t}^2, & \text{quadratic.} \end{cases}$$

The corresponding multiplicative export-finance wedge is

$$\zeta_{i,t}^j = \exp\left(F_j(x_{i,t})\right). \tag{56}$$

This formulation allows the sensitivity of export frictions to financial development to differ across sectors and lets the data determine the shape of this relationship directly.

The baseline strategy estimates the relationship between financial underdevelopment and total effective trade wedges separately for each sector:

$$\ell_{ni,t}^j = \alpha_{ni}^j + \delta_{nt}^j + F_j(x_{i,t}) + \rho_j \log\left(\text{GDPpw}_{i,t}\right) + \nu_{ni,t}^j, \qquad j \in \{a, m, hs\}. \tag{57}$$

Here, α_{ni}^j are sector-specific importer-exporter pair fixed effects and δ_{nt}^j are sector-specific importer-year fixed effects. Pair fixed effects absorb time-invariant bilateral trade barriers, while importer-year fixed effects absorb time-varying destination-side conditions within each sector. In all reported specifications, log GDP per worker is included as a control.

This specification has two main advantages. First, it allows the relationship between financial development and export frictions to differ flexibly across sectors. Second, it directly delivers the absolute sector-specific mappings

$$\log \zeta_{i,t}^j = F_j(x_{i,t}), \qquad j \in \{a, m, hs\},$$

required to construct the export-finance wedges used in the quantitative model.

A potential concern is that financial development may be correlated with broader exporter-side advantages, such as logistics capacity, infrastructure, institutional quality, or other dimensions of economic development that also reduce trade costs. To mitigate this concern, we control for log GDP per worker. This control allows trade wedges to vary with the exporter's overall level of development, rather than attributing all development-related differences in export performance to financial frictions. The estimated coefficients should therefore be interpreted as sector-specific conditional associations between financial underdevelopment and trade wedges, after accounting for bilateral fixed factors, importer-year conditions, and the exporter's level of development. The GDP-per-worker control reduces the scope for omitted-variable bias, although it does not eliminate the possibility that other time-varying exporter-side factors remain correlated with financial development.

Table 21 reports the estimated coefficients for the linear and quadratic specifications.[16] In the linear specifi-

16. Because of data quality and availability, we restrict the estimation sample to years from 1980 onward in all sectors. Even if the years and countries considered are the same in all sectors, the number of observations need not be identical across the sector-specific regressions; for example, a bilateral pair can have a positive flow in manufacturing in a given year but not necessarily in agriculture or high-skilled services.

cation, financial underdevelopment is positively and statistically significantly associated with total effective trade wedges in manufacturing and high-skilled services. The estimated coefficient is also positive in agriculture, although its p-value of 0.102 lies slightly above the conventional 10% threshold. The average finance wedge is $\zeta^a = 1.14$ in agriculture, $\zeta^m = 1.21$ in manufacturing, and $\zeta^{hs} = 1.28$ in high-skilled services. The finance component accounts for approximately 7, 12, and 12 percent of the total effective log trade wedge in agriculture, manufacturing, and high-skilled services, respectively.

The quadratic specification provides limited evidence of curvature. In manufacturing and in high-skilled services, the linear term is positive and statistically significant, but the quadratic term is imprecisely estimated. In agriculture, neither coefficient is precisely estimated. The implied average finance wedges are somewhat larger in manufacturing and high-skilled services than under the linear specification, but the additional flexibility is not supported by precisely estimated quadratic terms.

Table 21: Sector-specific export-finance wedge estimates

Sector	Estimate	S.E.	p-value	Mean ζ	Median ζ	Ratio of means	R^2	Adj. R^2	Obs.
Panel A: Linear financial-development specification									
Agriculture	0.151	(0.092)	0.102	1.136	1.105	0.073	0.839	0.829	62,652
Manufacturing	0.210	(0.069)	0.002	1.208	1.165	0.116	0.946	0.943	70,490
HS services	0.269	(0.085)	0.001	1.277	1.215	0.118	0.959	0.957	70,718
Panel B: Quadratic financial-development specification									
Agriculture	$\chi_1 = -0.195$	(0.248)	0.431	0.994	0.966	−0.005	0.840	0.830	62,652
	$\chi_2 = 0.148$	(0.099)	0.135						
Manufacturing	$\chi_1 = 0.359$	(0.218)	0.100	1.284	1.256	0.153	0.946	0.944	70,490
	$\chi_2 = -0.062$	(0.083)	0.452						
HS services	$\chi_1 = 0.367$	(0.182)	0.044	1.330	1.277	0.138	0.959	0.957	70,718
	$\chi_2 = -0.041$	(0.055)	0.449						

Notes: The table reports estimated coefficients from sector-specific specifications of the export-finance wedge. All specifications define financial underdevelopment as $x_{i,t} = -\log(\lambda_{i,t})$. Standard errors are reported in parentheses. GDP per worker controls are included in the underlying regressions but omitted from the coefficient columns. Mean ζ, median ζ, and the ratio of means are computed from the implied decomposition. The ratio of means is defined as the finance log-wedge contribution divided by the total effective log trade wedge. The reported R^2, adjusted R^2, and number of observations correspond to the underlying sector-specific regressions.

For the quantitative analysis, we use the parsimonious linear specification. This specification delivers a monotonic relationship between financial development and export frictions, is straightforward to interpret, and avoids extrapolating from imprecisely estimated quadratic terms. Using the sector-specific estimates, we construct the fitted export-finance wedge as

$$\hat{\zeta}^j_{i,t} = \exp\left(\hat{\chi}_j \left[-\log(\lambda_{i,t})\right]\right) = \lambda_{i,t}^{-\hat{\chi}_j}. \tag{58}$$

We first recover the residual iceberg component before imposing the standard iceberg restriction[17]:

$$\hat{\tau}_{ni,t}^{j,\mathrm{raw}} = \frac{\tilde{\tau}_{ni,t}^{j}}{\hat{\zeta}_{i,t}^{j}}, \qquad n \neq i. \tag{59}$$

For foreign pairs, we impose the restriction

$$\tau_{ni,t}^{j} \geq 1.$$

Accordingly, the residual iceberg component used in the quantitative model is

$$\hat{\tau}_{ni,t}^{j} = \max\left\{1, \hat{\tau}_{ni,t}^{j,\mathrm{raw}}\right\}. \tag{60}$$

The effective wedge used as an input into the quantitative model is then reconstructed as

$$\tilde{\tau}_{ni,t}^{j} = \hat{\tau}_{ni,t}^{j}\hat{\zeta}_{i,t}^{j}. \tag{61}$$

Bilateral pairs with zero observed expenditure shares are treated as prohibitive-trade-cost observations.

C.3 Investment-rate slope and investment-wedge calibration

This subsection reports the regression evidence used to discipline the investment wedge in Section 4. The dependent variable is the aggregate investment rate,

$$\rho_{n,t}^{data} = \frac{I_{n,t}^{data}}{Y_{n,t}^{data}}.$$

Each row estimates the relationship between $\rho_{n,t}^{data}$ and financial underdevelopment, measured as $1/\lambda_{n,t} - 1$ unless otherwise stated, while controlling for log GDP per worker and year fixed effects. The completed IMF Financial Institutions Index used here is the same financial-development input used in the quantitative model. The baseline sample is the balanced model panel from 1970 to 2018, consisting of the 44 model economies and the rest-of-world aggregate. As in the quantitative calibration, the rest-of-world aggregate is assigned the cross-country median value of $\lambda_{n,t}$ in each year.

The baseline investment wedge is

$$\psi_{n,t} = \bar{\psi}\left(\frac{1}{\lambda_{n,t}} - 1\right),$$

with $\bar{\psi} = 0.05453$ in the baseline calibration. The wedge enters the Euler equation on both sides:

$$(1+\omega_{n,t})(1+\psi_{n,t})\frac{P_{n,t}^{x}}{P_{n,t}^{c}} = \beta\frac{L_{n,t+1}}{L_{n,t}}\frac{C_{n,t}}{C_{n,t+1}}\frac{P_{n,t+1}^{x}}{P_{n,t+1}^{c}}\frac{r_{n,t+1}/P_{n,t+1}^{x} - (1+\psi_{n,t+1})\Phi_2(K_{n,t+2},K_{n,t+1})}{\Phi_1(K_{n,t+1},K_{n,t})}.$$

Thus current financial underdevelopment raises the effective marginal price of investment, while next-period financial underdevelopment also affects the adjustment-cost term associated with the choice of $K_{n,t+1}$. The residual Euler wedge $\omega_{n,t}$ is computed from this same equation. The parameter $\bar{\psi}$ is disciplined by the investment-rate slope reported in Table 22. The table first reports the baseline calibration regression and then varies the sample, financial-development measure, functional form, weighting scheme, outlier treatment, timing, and investment-rate construction.

17. This affects 6.7% of bilateral trade observations, in developed countries with high trade shares.

Table 22: Investment rates and financial underdevelopment

Specification	Clustering	Coefficient	Std. error	Obs.
Baseline, 1970–2018	Year	−0.0084***	0.0009	2,205
Baseline, 1970–2018	Country	−0.0084**	0.0033	2,205
Baseline, 1970–2018	Country–year	−0.0084**	0.0033	2,205
Raw IMF period, 1980–2018	Year	−0.0115***	0.0011	1,751
Raw IMF period, 1980–2018	Country–year	−0.0115**	0.0044	1,751
Private credit-to-GDP, normalized	Year	−0.0167***	0.0030	2,033
Private credit-to-GDP, normalized	Country–year	−0.0167***	0.0041	2,033
Quadratic GDP control	Year	−0.0084***	0.0009	2,205
Quadratic GDP control	Country–year	−0.0084**	0.0032	2,205
GDP-weighted	Year	−0.0207***	0.0022	2,205
GDP-weighted	Country–year	−0.0207*	0.0108	2,205
Financial development lagged 1 year	Year	−0.0077***	0.0008	2,160
Financial development lagged 5 years	Year	−0.0058***	0.0008	1,980
Financial development lagged 10 years	Year	−0.0030***	0.0006	1,755
IMF index on private-credit sample	Year	−0.0076***	0.0009	2,033
Alternative transform: $-\log\lambda$	Year	−0.0325***	0.0043	2,205
Standardized financial underdevelopment	Year	−0.0196***	0.0021	2,205
Employment-weighted	Year	−0.0260***	0.0018	2,205
Population-weighted	Year	−0.0233***	0.0014	2,205
Winsorized 1/99	Year	−0.0092***	0.0010	2,205
Trimmed 1/99	Year	−0.0079***	0.0014	2,119
Sample period, 1970–1990	Year	−0.0074***	0.0008	945
Sample period, 1991–2018	Year	−0.0113***	0.0018	1,260
Quantitative period, 1970–1985	Year	−0.0067***	0.0008	720
Quantitative period, 1986–2001	Year	−0.0133***	0.0013	720
Quantitative period, 2002–2018	Year	−0.0034*	0.0019	765
Alternative investment total: PWTalt	Year	−0.0322***	0.0056	2,156
Alternative investment total: case-managed	Year	−0.0076***	0.0007	2,205

Notes: The coefficient is on $1/\lambda_{n,t} - 1$ unless otherwise stated. All specifications control for log GDP per worker and include year fixed effects. The baseline sample is the 45-unit model panel from 1970 to 2018, consisting of 44 economies and the rest-of-world aggregate. The rest-of-world aggregate is assigned the cross-country median value of $\lambda_{n,t}$ in each year, as in the quantitative calibration. The raw-IMF row restricts attention to 1980–2018, the period covered by the observed IMF Financial Institutions Index. World Bank GFDD DI12 is private credit by deposit money banks and other financial institutions as a share of GDP; it is transformed into an alternative $\lambda_{n,t}$ by taking logs and min–max normalizing the logged series over the regression sample. The inverse specification uses the strictly positive support of this normalized measure. Country clustering clusters by model unit; country–year clustering denotes two-way clustering by model unit and year. Weighted specifications use analytic weights. The alternative PWTalt investment-total row has 2,156 observations because the rest-of-world investment total is missing in that alternative file. The baseline coefficient is −0.008356; the country-clustered standard error is 0.003299, and the two-way country–year standard error is 0.003300. Significance codes are ***: 0.01, **: 0.05, *: 0.1.

The baseline coefficient is the target moment used to calibrate the strength of the investment wedge. It is negative and statistically significant when standard errors are clustered by country and when they are clustered

Table 23: Leave-one-unit-out investment-rate slope

Statistic	Coefficient	Std. error	p-value
Minimum	−0.010198	0.000747	6.68×10^{-15}
25th percentile	−0.008580	0.000854	5.76×10^{-13}
Median	−0.008387	0.000879	1.22×10^{-12}
Mean	−0.008363	0.000882	1.41×10^{-11}
75th percentile	−0.008194	0.000890	2.99×10^{-12}
Maximum / least negative	−0.006468	0.001147	2.63×10^{-10}

Notes: Each statistic summarizes 45 regressions that drop one model unit at a time from the baseline sample. The columns report the corresponding distributional statistic across leave-one-out estimates, standard errors, and p-values. One of these units is the rest-of-world aggregate. Standard errors are clustered by year. All regressions control for log GDP per worker and include year fixed effects.

two ways by country and year. The remaining rows show that the negative investment-rate slope is not specific to the baseline sample or measurement choices. The estimate remains negative across the displayed alternatives, and most alternatives imply larger absolute slopes than the baseline calibration target.

Table 23 reports a leave-one-unit-out check for the baseline specification. Dropping one model unit at a time leaves the coefficient tightly centered around the baseline estimate, and all 45 resulting estimates remain negative and statistically significant.

Together, these estimates provide the empirical discipline for $\bar{\psi}$. The baseline investment-rate slope in Table 22 is the calibration target, while the remaining specifications show that the negative relationship between investment rates and financial underdevelopment is stable across alternative samples, measures, functional forms, weighting schemes, and unit exclusions.

D Solution Algorithm

This appendix describes the computation of the deterministic transition path. The economy is solved given initial capital stocks, the exogenous paths for productivity, labor, financial development, trade costs, the agricultural effective-labor wedge, and the calibrated preference and technology parameters. The dynamic unknown is the path of nominal investment rates,

$$\rho^x_{n,t} \equiv \frac{P^x_{n,t} X_{n,t}}{Y_{n,t}}, \qquad t = 1, \dots, T.$$

The data period is 1970–2018. To close the transition, the model appends a 25-year terminal tail, so the simulated horizon is $T^* = T + 25$. In the tail, productivity, labor, trade costs, financial development, the agricultural effective-labor wedge, and the residual Euler wedge are held at their final data-period values. Investment rates converge geometrically from their last data-period value to a long-run value of 0.228, with the terminal gap reduced to two percent by the end of the tail. The convergence criterion is evaluated over the data years.

For a given experiment, the financial and trade wedges are constructed before solving the transition. The investment wedge is

$$\psi_{n,t} = \bar{\psi} \left(\frac{1}{\lambda_{n,t}} - 1 \right),$$

with $\bar{\psi}$ calibrated as described in Section 4. The export-finance wedge $\zeta^j_{i,t}$ and the nonfinancial trade-cost component $\tau^j_{ni,t}$ are constructed as described in Section 4.6.1. Thus the effective bilateral trade wedge in tradable sectors is $\tilde{\tau}^j_{ni,t} = \tau^j_{ni,t} \zeta^j_{i,t}$, while low-skilled services are non-tradable. In channel decompositions, the same counterfactual path for $\lambda_{n,t}$ is used, but one financial margin is held at its baseline value. In trade-cost counterfactuals, the nonfinancial component $\tau^j_{ni,t}$ is changed separately from the export-finance component.

The algorithm has two nested parts. The inner problem computes the within-period equilibrium for a given capital stock and investment rate. Because the agricultural effective-labor wedge makes aggregate effective labor depend on agricultural employment, the inner problem treats agricultural headcount labor as a within-period co-iterate together with factor prices. The outer problem updates the investment-rate path until the intertemporal Euler equations hold along the transition.

1. Guess an $N \times T$ matrix of investment rates $\{\rho^x_{n,t}\}$. Extend this path over the terminal tail using the rule described above.
2. Given $\{\rho^x_{n,t}\}$, compute the transition path forward from the initial capital stocks. For each period t:
   (a) Take the capital stocks $\{K_{n,t}\}$ as predetermined and initialize within-period iterates for wages, rental rates, and agricultural headcount labor $L^a_{n,t}$, with wages normalized to fix the numeraire.
   (b) Given wages and rental rates, compute sectoral unit costs. For tradable sectors, combine unit costs with the effective bilateral trade wedges to obtain sectoral price indices and bilateral expenditure shares. For low-skilled services, impose domestic sourcing.
   (c) Given prices and the current agricultural-labor iterate, form aggregate effective labor

$$\widetilde{L}_{n,t} = L_{n,t} - (1 - s^a_{n,t}) L^a_{n,t}.$$

Total income is then computed from the factor-income identity, $Y_{n,t} = \mu(w_{n,t}\widetilde{L}_{n,t} + r_{n,t}K_{n,t})$, and expenditures are $E^x_{n,t} = \rho^x_{n,t}Y_{n,t}$ and $E^c_{n,t} = Y_{n,t} - E^x_{n,t}$.

(d) Solve the non-homothetic consumption and investment systems for $C_{n,t}$, $X_{n,t}$, their price indices, and sectoral final-demand quantities.

(e) Combine sectoral final demand with bilateral expenditure shares to obtain producer revenues by country and sector. Use the production first-order conditions to compute sectoral labor and capital demand, taking into account the agricultural effective-labor wedge. The implied agricultural labor demand updates the $L^a_{n,t}$ co-iterate used to construct $\widetilde{L}_{n,t}$. With sector-specific capital shares, rental rates are updated within the same fixed point using the capital-income identity $r_{n,t}K_{n,t} = \mu^{-1}\sum_j \alpha_j R^j_{n,t}$.

(f) Check labor and capital market clearing and the consistency of the agricultural-labor co-iterate. If the within-period fixed point has not been reached, update wages, rental rates, and agricultural labor and return to step (b). If markets clear, proceed to capital accumulation.

(g) Update capital stocks using the investment technology in equation (8).

3. After the full forward path has been computed, evaluate the Euler condition in equation (27) for every country and data-period year. If the Euler conditions hold, the transition path is solved. Otherwise, update the investment-rate path and return to step 2.

The calibrated baseline is computed in two passes. First, $\bar{\psi}$ is disciplined by solving the transition for candidate values of the investment-wedge parameter and matching the model-implied investment-rate slope with respect to $1/\lambda_{n,t} - 1$ to the corresponding empirical slope. Second, given the calibrated $\bar{\psi}$, the baseline is solved with the observed investment-rate path imposed over 1970–2018, and the country-year residual Euler wedge $\omega_{n,t}$ is recovered from the Euler equation. This residual wedge captures the component of baseline investment dynamics not explained by the financial-development wedge. It is held fixed in all reported counterfactuals, together with the calibrated preference and technology parameters, recovered productivity paths, the agricultural effective-labor wedge, baseline nonfinancial trade costs unless the exercise explicitly changes them, and the baseline initial capital stocks.

E Additional counterfactuals and robustness

This appendix reports additional counterfactual exercises that support the interpretation in Section 6. The exercises show that the main scale-and-sectoral-trajectory result is not specific to the financial-development measure, the empirical peak sample, the baseline flat-country classification, the size or target of the financial-development improvement, the timing of the financial path, or the aggregation rule. They also expand the trade-cost and autarky diagnostics that underlie the interpretation of the finance–trade interaction.

Unless stated otherwise, entries are annual weighted-average differences from the calibrated baseline for the relevant reporting group. Manufacturing-employment shares, investment rates, export ratios, and world-output shares are reported in percentage points. Output and consumption per worker are percentage changes in levels. The three stacked entries in each cell correspond to the early, middle, and late periods: 1970–1985, 1986–2001, and 2002–2018.

The benchmark financial-development counterfactual moves each baseline flat-manufacturing economy one-half of the way to the year-specific financial frontier among model economies,

$$\lambda_{i,t}^{cf} = \lambda_{i,t} + \frac{1}{2}\left(\max_{j} \lambda_{j,t} - \lambda_{i,t}\right), \tag{62}$$

where the maximum is taken over model economies in year t. Channel experiments use the same counterfactual $\lambda_{i,t}^{cf}$ but allow it to affect only the investment wedge or only the finance-induced export-cost component. Nonfinancial trade-cost exercises operate on the pure iceberg component of trade costs. When a sector j is included in a trade-cost exercise, the counterfactual pure trade cost is

$$\tau_{ni,t}^{j,cf} = \tau_{ni,t}^{j} - \kappa\left(\tau_{ni,t}^{j} - 1\right), \tag{63}$$

with $\kappa \in \{1/3, 1/2\}$ depending on the exercise. In combined finance–trade exercises, $\lambda_{i,t}^{cf}$ changes the financial margins while equation (63) lowers the nonfinancial trade-cost component. Recovered productivity paths, preferences, labor, initial capital, and residual transition wedges remain fixed. The appendix is organized around five sets of robustness and diagnostic exercises. Subsection E.1 replaces the baseline financial-development measure with private credit to GDP. Subsection E.2 reports peak-gap results on the restricted empirical sample used to construct the main denominator. Subsections E.3–E.6 examine robustness to country classification, the scale and target of financial convergence, historical financial paths, timing, and aggregation. Subsection E.7 reports additional nonfinancial trade-cost exercises and finance–trade interactions. Subsections E.8 and E.9 provide diagnostics based on autarky and country-at-a-time treatment.

E.1 Private-credit-to-GDP financial-development measure

The first robustness exercise replaces the baseline IMF Financial Institutions Index with private credit to GDP as the measure of financial development. The baseline economy is recalibrated under this alternative measure, and the same one-half movement toward the year-specific financial frontier is applied to the baseline flat-manufacturing economies. To map private credit to GDP into the model's $\lambda_{n,t} \in (0, 1)$ range, we pool all country-year observations of the completed series, winsorize each value at the 5th and 95th percentiles of the pooled distribution ($P_5 = 6.43\%$, $P_{95} = 146.78\%$), and linearly rescale the clipped values to the empirical range of the IMF Financial Institutions Index in the calibration sample, [0.054, 0.978]. This preserves the cross-country and time-series variation of private credit to GDP while keeping the input to the model's $1/\lambda_{n,t}$ wedge functions in the same numerical regime as the baseline calibration. Table 24 reports the full frontier counterfactual, the channel decomposition exercises, and two historical-path alternatives.

Table 24: Private credit to GDP: financial-development paths and margins

Exercise	**Mfg. emp. pp**	**Real** Y/L **%**	**Real** C/L **%**	**Inv. rate pp**	**Exports/ output pp**	**Net peak gain pp**
One-half frontier, both margins	3.44	19.55	8.50	6.15	3.54	4.60
	2.60	18.75	14.67	2.94	2.78	
	2.85	17.40	12.12	2.59	3.39	
Investment-demand margin only	2.97	16.84	6.24	5.96	-0.16	2.41
	1.81	15.47	11.55	2.84	-0.22	
	1.71	12.52	7.83	2.21	-0.37	
Export-finance margin only	0.41	2.17	2.07	-0.01	3.68	1.31
	0.66	2.71	2.73	-0.09	2.99	
	0.98	4.24	3.97	0.24	3.73	
Korea financial path	2.62	15.02	6.86	4.44	1.96	4.41
	1.68	12.55	10.56	1.83	1.31	
	2.94	15.11	9.35	2.95	3.76	
Steep-economy financial path	2.76	15.81	7.14	4.72	2.19	4.59
	2.09	14.53	11.54	2.42	1.86	
	3.00	16.38	10.52	2.94	3.48	

Notes: Entries are annual weighted-average differences from the private-credit-to-GDP baseline for baseline flat-manufacturing economies. Stacked entries report early, middle, and late effects for 1970–1985, 1986–2001, and 2002–2018. The frontier row moves treated economies one-half of the way to the year-specific financial frontier under the private-credit-to-GDP measure. The historical-path rows assign treated economies Korea's private-credit-to-GDP path or the average path of baseline steep-manufacturing economies. The net peak gain is the average flat-country peak gain minus the average steep-country peak gain, with country-level peaks computed over 1970–2018.

The alternative financial-development measure strengthens the main result. With both financial margins active, manufacturing employment rises by 3.44, 2.60, and 2.85 percentage points across the three periods. Output per worker rises by 19.55, 18.75, and 17.40 percent, while consumption per worker rises by 8.50, 14.67, and 12.12 percent. The net peak gain is 4.60 percentage points, equal to 40.8 percent of the empirical flat–steep peak gap used in the main text. The channel decomposition mirrors the baseline measure: the investment-demand margin accounts for most of the manufacturing and aggregate response, while the export-finance margin mainly raises exports over output and generates smaller but positive gains in output and consumption. The historical-path rows point in the same direction. Korea's financial path closes 39.2 percent of the empirical peak gap, while the average steep-economy path closes 40.8 percent.

Table 25 repeats the autarky diagnostic under the private-credit-to-GDP calibration. The exercise evaluates whether the investment-demand margin remains quantitatively important under autarky.

Table 25: Private credit to GDP: autarky and financial development

Exercise	**Mfg. emp. pp**	**Real Y/L %**	**Real C/L %**	**Inv. rate pp**	**Flat peak gain pp**
Autarky only, relative to open-economy baseline	0.25	-1.70	-1.64	0.24	-0.94
	-1.45	-5.10	-4.62	-1.20	
	-1.16	-7.77	-7.51	-0.37	
Financial-development improvement within autarky	2.85	16.66	6.13	7.31	1.90
	1.49	15.21	11.23	4.99	
	1.21	12.53	7.82	2.35	

Notes: Entries are annual weighted-average differences for baseline flat-manufacturing economies under the private-credit-to-GDP calibration. Stacked entries report early, middle, and late effects for 1970–1985, 1986–2001, and 2002–2018. The first row reports autarky relative to the open-economy private-credit-to-GDP baseline. The second row reports the one-half financial-frontier improvement within autarky, relative to the autarky-only economy. Peak gains are average country-level counterfactual peak manufacturing-employment shares over 1970–2018 minus baseline peaks over the same period.

The autarky results mirror the baseline diagnostic. Autarky alone raises manufacturing employment only slightly in the early period and reduces it thereafter; output and consumption per worker fall in every period. By contrast, financial development within autarky raises manufacturing employment, output, and consumption, albeit by less than in the benchmark counterfactual (in absolute and relative terms). The domestic investment-demand margin therefore remains quantitatively important even when international specialization is shut down, but it is nonetheless more economically powerful in the open economy.

E.2 Peak-gap calculation on the restricted empirical sample

The main text computes the empirical flat–steep peak gap on a restricted empirical sample to avoid treating endpoints or still highly agricultural economies as informative manufacturing peaks. Table 26 applies the same country restriction to the model peak-gain calculation. The benchmark financial-development improvement closes 32.3 percent of the empirical peak gap in this restricted comparison. The finance–trade combination remains much larger, closing 61.9 percent of the same empirical gap.

Table 26: Counterfactual peak manufacturing in the restricted empirical sample

Exercise	Flat peak gain pp	Steep peak gain pp	Net peak gain pp	Share of 11.26 pp gap %
Benchmark financial-development improvement	3.59	-0.06	3.64	32.3
Investment-demand margin only	1.84	-0.02	1.86	16.6
Export-finance margin only	1.26	-0.03	1.29	11.5
Korea financial path	4.20	-0.07	4.27	37.9
Steep-economy financial path	3.49	-0.06	3.55	31.5
Benchmark financial development and lower non-financial trade costs	10.93	3.96	6.97	61.9
Benchmark finance plus trade, investment-demand margin only	9.54	3.92	5.61	49.8

Notes: The restricted flat sample is ZMB, COL, BOL, IDN, PER, THA, BRA, and GRC; the restricted steep sample is MEX, CRI, CAN, CHL, IRL, ZAF, FRA, CHN, JPN, MYS, FIN, ESP, KOR, PRT, and MUS. The empirical denominator is 11.26 percentage points. It is computed from countries whose observed manufacturing-employment peak occurs within 1973–2015 and whose agricultural employment share at that peak is no higher than 65 percent. Counterfactual peak gains are country-level counterfactual peaks over the full 1970–2018 model period minus baseline peaks over the same period.

The restricted-sample calculation delivers the same qualitative message as the main peak comparison. Financial development alone closes a substantial share of the empirical gap, and the finance–trade experiment is much larger. Because the restricted sample applies the same country screen to the empirical denominator and the model peak calculation, this comparison checks that the peak-gap result is not driven by countries outside the empirical support used to define the motivating gap.

E.3 Country-group classification

Table 27 changes the treated flat-manufacturing group and recomputes the one-half financial-frontier counterfactual with both financial margins active. The result is not driven by a single borderline classification. Adding EGY or MEX, removing GRC, or using stricter and more lenient flat groups leaves the same qualitative pattern: financial development raises manufacturing employment and aggregate outcomes in every period.

Table 27: Robustness to the flat-manufacturing country group

Reporting group	**N**	**Mfg. emp. pp**	**Real Y/L %**	**Real C/L %**	**Peak gain pp**
Baseline flat group	16	2.71	17.23	7.60	3.17
		2.01	16.44	12.49	
		1.82	13.25	10.41	
EGY added to flat	17	2.71	16.26	7.20	3.17
		2.02	15.92	11.72	
		1.83	13.22	10.53	
MEX added to flat	17	2.53	15.76	6.91	3.05
		1.99	15.85	11.83	
		1.76	12.97	10.22	
GRC removed from flat	15	2.71	17.41	7.78	3.12
		2.04	16.60	12.58	
		1.83	13.28	10.47	
Strict flat group	11	2.00	11.39	4.03	3.68
		2.45	13.04	8.48	
		2.37	11.85	9.02	
Lenient flat group	18	2.54	15.10	6.74	3.05
		1.99	15.22	11.10	
		1.78	12.89	10.22	

Notes: Each row reports the one-half financial-frontier counterfactual for the listed treated and reporting group. The strict group drops GRC, BRA, COL, IDN, and PHL from the baseline flat group. The lenient group adds EGY and MEX. Peak gains are average country-level counterfactual peak manufacturing-employment shares over 1970–2018 minus baseline peaks over the same period for the listed group.

The magnitudes vary across classifications, as expected, but the sign pattern is stable. In every reporting group, the one-half financial-frontier counterfactual raises manufacturing employment, output per worker, and consumption per worker in all three periods. The peak gain ranges from 3.05 percentage points in the lenient group to 3.68 percentage points in the strict group, so the main result does not depend on any single borderline economy.

E.4 Alternative scales and targets of financial convergence

Table 28 varies the size of the movement toward the year-specific financial frontier. The response rises with the size of the financial-development improvement, but the channel decomposition is stable across the size of the financial-development improvement. Moving from one-third to full convergence increases the level of the response, but it does not change the assignment of roles across margins. The investment-demand margin remains the main source of the manufacturing-employment gain, while the export-finance margin is concentrated in exports and consumption.

Table 29 reports additional target definitions. These exercises move financial development toward $\lambda = 1$ rather than toward the contemporaneous model frontier, or set $\lambda = 1$ directly. They are best interpreted as upper-bound

Table 28: Alternative sizes of frontier financial convergence

Exercise	Mfg. emp. pp	Real Y/L %	Real C/L %	Exports/ output pp
One-third frontier, both margins	2.24	14.52	6.58	2.04
	1.57	13.43	10.36	1.54
	1.39	10.41	8.28	1.58
One-third frontier, investment only	1.98	12.97	5.26	-0.13
	1.04	11.34	8.42	-0.18
	0.84	7.93	5.95	-0.19
One-third frontier, export only	0.23	1.26	1.20	2.17
	0.46	1.76	1.74	1.74
	0.50	2.26	2.15	1.77
One-half frontier, both margins	2.71	17.23	7.60	2.85
	2.01	16.44	12.49	2.21
	1.82	13.25	10.41	2.29
One-half frontier, investment only	2.36	15.07	5.79	-0.15
	1.28	13.50	9.77	-0.22
	1.05	9.71	7.11	-0.23
One-half frontier, export only	0.31	1.73	1.65	3.01
	0.65	2.52	2.42	2.45
	0.70	3.22	3.10	2.52
Two-thirds frontier, both margins	2.93	18.48	8.18	3.59
	2.28	18.06	13.69	2.84
	2.07	14.80	11.71	2.96
Two-thirds frontier, investment only	2.61	16.43	6.07	-0.16
	1.45	15.03	10.67	-0.24
	1.19	10.93	7.91	-0.26
Two-thirds frontier, export only	0.38	2.15	2.05	3.75
	0.80	3.16	3.05	3.10
	0.87	4.05	3.89	3.20
Full frontier, both margins	3.55	21.94	9.35	4.86
	2.90	22.38	16.62	3.94
	2.66	18.82	14.79	4.14
Full frontier, investment only	2.98	18.29	6.39	-0.18
	1.70	17.22	11.87	-0.27
	1.38	12.69	9.07	-0.29
Full frontier, export only	0.50	2.91	2.76	5.04
	1.09	4.39	4.16	4.25
	1.17	5.65	5.45	4.43

Notes: Entries are annual weighted-average differences from baseline for baseline flat-manufacturing economies. Frontier rows move treated economies a stated fraction of the way to the year-specific financial frontier. The one-half frontier row is the benchmark used in the main text.

diagnostics rather than alternatives to the benchmark, because the main exercise is deliberately moderate.

Table 29: Alternative financial-development targets

Exercise	**Mfg. emp. pp**	**Real Y/L %**	**Real C/L %**	**Exports/ output pp**
One-third to $\lambda = 1$, both margins	2.56	16.47	7.36	2.59
	1.69	14.89	11.54	1.69
	1.88	12.25	8.40	1.77
One-third to $\lambda = 1$, investment only	2.22	14.38	5.69	-0.15
	1.09	12.36	9.31	-0.20
	0.87	8.38	6.34	-0.20
One-third to $\lambda = 1$, export only	0.27	1.58	1.50	2.74
	0.51	2.02	1.96	1.90
	0.53	2.46	2.37	1.91
Two-thirds to $\lambda = 1$, both margins	3.29	20.69	9.05	4.45
	2.45	19.90	15.13	3.08
	2.20	15.97	12.65	3.17
Two-thirds to $\lambda = 1$, investment only	2.91	18.04	6.46	-0.18
	1.49	16.12	11.64	-0.26
	1.21	11.37	8.30	-0.27
Two-thirds to $\lambda = 1$, export only	0.44	2.64	2.50	4.62
	0.86	3.52	3.42	3.37
	0.92	4.35	4.19	3.43
Ceiling $\lambda = 1$, both margins	3.80	23.62	10.23	5.97
	3.00	23.46	17.65	4.26
	2.75	19.53	15.39	4.43
Ceiling $\lambda = 1$, investment only	3.17	19.31	6.65	-0.19
	1.70	17.75	12.47	-0.28
	1.40	12.86	9.19	-0.30
Ceiling $\lambda = 1$, export only	0.58	3.56	3.36	6.15
	1.13	4.74	4.61	4.60
	1.22	5.94	5.72	4.74

Notes: Entries are annual weighted-average differences from baseline for baseline flat-manufacturing economies. The ceiling rows set financial development to $\lambda = 1$ for treated economies. Rows labeled "to $\lambda = 1$" move treated economies the stated fraction of the way from their observed financial-development level to $\lambda = 1$.

The target variants are intentionally more aggressive than the benchmark. They show that the benchmark is not selected because it is the only target capable of producing a manufacturing response. Moving toward $\lambda = 1$ or imposing $\lambda = 1$ directly generates larger effects, but the same two-margin interpretation remains: financial development raises the scale of activity and redirects the sectoral path toward manufacturing.

E.5 Historical financial paths and timing

Historical financial paths provide a second way to discipline the size of the financial-development improvement. Instead of using the frontier rule, Table 30 assigns flat-manufacturing economies the observed path of Korea, the average path of steep-manufacturing economies, or the observed paths of Malaysia, Chile, and Mauritius. These exercises again produce manufacturing gains together with output and consumption gains. The Korea and steep-economy path decompositions preserve the same division of labor between the investment-demand and export-finance margins.

Table 30: Historical financial-development paths

Exercise	Mfg. emp. pp	Real Y/L %	Real C/L %	Exports/ output pp	Flat peak gain pp
Korea path, both margins	2.96	18.51	8.01	3.32	3.77
	2.16	17.72	13.55	2.42	
	2.25	15.35	11.77	3.10	
Korea path, investment only	2.53	15.96	5.90	-0.16	2.19
	1.32	14.26	10.42	-0.23	
	1.23	10.73	7.48	-0.24	
Korea path, export only	0.38	2.01	1.91	3.47	1.27
	0.71	2.74	2.75	2.66	
	0.94	4.09	3.86	3.32	
Steep-economy path, both margins	2.42	15.46	6.88	2.28	3.23
	1.98	15.40	11.44	2.05	
	1.96	13.49	10.36	2.33	
Steep-economy path, investment only	2.09	13.67	5.36	-0.14	1.90
	1.27	12.68	8.93	-0.20	
	1.10	9.77	6.94	-0.21	
Steep-economy path, export only	0.29	1.43	1.38	2.40	1.01
	0.65	2.32	2.23	2.25	
	0.79	3.38	3.22	2.51	
Malaysia path, both margins	1.99	12.71	5.64	1.61	2.96
	1.79	13.29	9.75	1.75	
	1.84	12.34	9.33	2.10	
Chile path, both margins	1.78	10.62	4.23	1.43	2.74
	1.50	12.29	9.37	1.30	
	1.66	10.92	8.19	1.71	
Mauritius path, both margins	2.13	14.02	6.42	1.73	2.50
	1.00	10.96	9.38	0.64	
	1.11	7.88	6.12	0.67	

Notes: Entries are annual weighted-average differences from baseline for baseline flat-manufacturing economies. In each row, treated economies receive the listed financial-development path while all other baseline objects remain fixed. The steep-economy path is the average financial-development path of baseline steep-manufacturing economies. Peak gains are computed over 1970–2018.

The historical paths provide a useful discipline on the benchmark frontier rule. Korea's path and the average steep-economy path both raise manufacturing employment and output, and their channel decompositions again distinguish the domestic manufacturing-window effect from the external participation effect. The Malaysia, Chile, and Mauritius paths are smaller in some periods, but they preserve the same direction of response.

Table 31 changes the timing of the financial-development path. Delaying the improvement shifts the response toward later periods. Freezing financial development at 1970 levels instead moves in the opposite direction, lowering output and consumption and reducing manufacturing employment in the middle and late periods.

Table 31: Timing of the financial-development path

Exercise	**Mfg. emp. pp**	**Real Y/L %**	**Real C/L %**	**Exports/ output pp**
Benchmark starts in 1970	2.71	17.23	7.60	2.85
	2.01	16.44	12.49	2.21
	1.82	13.25	10.41	2.29
Financial improvement starts in 1980	0.85	2.38	-0.58	1.00
	2.15	11.37	6.43	2.33
	1.82	12.05	9.06	2.33
Financial improvement starts in 1990	-0.03	-0.09	0.02	0.00
	1.71	4.71	0.66	1.90
	1.83	10.52	7.24	2.39
Financial development frozen at 1970 levels	-0.83	-2.95	-0.10	-0.58
	-2.31	-14.22	-8.05	-1.40
	-2.74	-18.49	-12.01	-2.82

Notes: Entries are annual weighted-average differences from baseline for baseline flat-manufacturing economies. Phase-in rows leave financial development at its baseline value before the listed year and apply the one-half frontier improvement from that year onward. The freeze row holds treated economies at their 1970 financial-development levels throughout the transition.

The timing exercises show that the effects depend on when the financial constraint is relaxed, not only on its average level. Starting the improvement later delays the manufacturing response, while freezing financial development at its 1970 level pushes the economy in the opposite direction. This supports the interpretation of financial development as an evolving constraint along the transition path.

E.6 General-equilibrium responses and aggregation

The main counterfactuals treat flat-manufacturing economies and leave steep-manufacturing economies untreated. Table 32 instead gives all non-ROW economies the one-half frontier improvement. The flat-manufacturing response remains positive, and steep-manufacturing economies also expand manufacturing when they are directly treated. This confirms that the small steep-column responses in the main tables are general-equilibrium spillovers from flat-country treatment rather than an absence of financial-development effects in steep economies.

Table 32: Universal financial convergence

Exercise	Flat mfg. emp. pp	Steep mfg. emp. pp	Flat Y/L %	Steep Y/L %	Flat C/L %
Universal one-half frontier, both margins	2.59	2.06	17.61	7.44	7.91
	1.80	1.83	16.66	10.32	12.73
	1.41	1.07	13.46	8.29	10.67
Universal one-half frontier, investment only	2.34	1.78	15.06	6.26	5.78
	1.21	1.35	13.46	8.83	9.73
	0.93	0.67	9.59	6.66	7.04
Universal one-half frontier, export only	0.18	0.27	2.03	1.08	1.92
	0.52	0.47	2.75	1.35	2.68
	0.42	0.40	3.51	1.53	3.39

Notes: Entries are annual weighted-average differences from baseline. Universal rows move all non-ROW economies one-half of the way to the year-specific financial frontier. Flat and steep columns report the corresponding baseline flat- and steep-manufacturing groups.

Universal financial convergence is a more demanding general-equilibrium exercise because flat-manufacturing economies improve financially at the same time as their competitors. The flat-manufacturing response remains positive under this stronger comparison. The investment-demand margin again accounts for most of the manufacturing-employment gain, while the export-finance margin raises output, consumption, and market participation.

Table 33 compares weighted aggregation with simple country averages. The manufacturing-employment effects are similar under both schemes, so the main results are not driven by a small number of large economies.

Table 33: Aggregation checks

Exercise	Weighted mfg. emp. pp	Simple mfg. emp. pp	Weighted Y/L %	Simple Y/L %
Benchmark financial-development improvement	2.71	2.51	17.23	13.75
	2.01	2.57	16.44	16.12
	1.82	2.24	13.25	14.17
Investment-demand margin only	2.36	2.19	15.07	11.65
	1.28	1.88	13.50	13.16
	1.05	1.42	9.71	10.44
Export-finance margin only	0.31	0.30	1.73	1.79
	0.65	0.59	2.52	2.55
	0.70	0.71	3.22	3.35

Notes: Weighted aggregation uses group-level totals. Simple aggregation averages country-level effects across baseline flat-manufacturing economies. Entries are differences from baseline.

The aggregation check addresses whether the benchmark is driven by a small number of large economies. The simple-average manufacturing effects are close to the weighted effects and remain positive for the full counterfactual and for the investment-demand margin. The scale effects differ somewhat across aggregation rules, but the sectoral conclusion does not.

E.7 Trade-cost reductions and the finance–trade interaction

Table 34 reports reductions in nonfinancial trade costs without changing financial development. Broad reductions in trade costs raise manufacturing employment in flat-manufacturing economies, and sector-specific reductions show why the sign of openness is not mechanical. Lower manufacturing trade costs are pro-manufacturing; lower high-skilled-services trade costs pull employment away from manufacturing; lower agriculture trade costs initially reduce manufacturing but raise it later. The main point of the paper is therefore not that openness has no manufacturing effect. It is that financial development changes the sectoral incentives that openness amplifies.

Table 34: Nonfinancial trade-cost reductions without financial development

Exercise	**Mfg. emp. pp**	**Real Y/L %**	**Real C/L %**	**Exports/ output pp**	**Mfg. share of exports pp**
All tradables, one-third reduction	0.64	3.26	3.11	5.34	0.05
	2.97	8.75	8.13	6.51	-1.59
	3.11	12.71	11.95	10.07	-2.58
All tradables, one-half reduction	2.00	8.04	7.63	10.98	-0.30
	6.22	19.33	18.07	12.92	-2.76
	6.15	26.12	24.59	18.61	-3.44
Agriculture only, one-half reduction	-2.20	-1.18	-0.93	1.75	-29.01
	0.43	2.96	2.57	1.93	-20.80
	0.86	5.64	5.02	3.38	-19.42
Manufacturing only, one-half reduction	1.95	5.47	5.07	8.80	13.58
	2.96	9.30	8.89	10.24	8.89
	3.40	13.23	12.73	14.36	10.66
High-skilled services only, one-half reduction	-0.57	0.49	0.50	1.19	-26.69
	-0.66	0.94	0.93	1.30	-26.95
	-0.79	1.63	1.60	1.76	-19.60

Notes: Entries are annual weighted-average differences from baseline for baseline flat-manufacturing economies. Broad rows reduce pure iceberg trade costs in agriculture, manufacturing, and high-skilled services. Sector-specific rows reduce pure iceberg trade costs only in the listed sector. Trade costs move the stated fraction of the way toward one.

These trade-only exercises clarify why the paper does not treat globalization as a single force with a fixed sectoral sign. Lower manufacturing trade costs are directly pro-manufacturing, while lower high-skilled-services trade costs pull employment away from manufacturing. Broad trade-cost reductions raise manufacturing employment in these exercises.

Table 35 reports the interaction directly. Combining the benchmark financial-development improvement with the one-half reduction in nonfinancial trade costs raises manufacturing employment by 6.47, 9.80, and 8.49 percentage points across the three periods, much more than financial development alone. The investment-margin-only combined row is also large, which is consistent with the paper's interpretation that openness amplifies the manufacturing path created by stronger finance-based comparative advantage and domestic investment demand. The one-third exercises show the same pattern at a smaller scale.

Table 35: Financial development and lower nonfinancial trade costs

Exercise	**Mfg. emp. pp**	**Real** Y/L **%**	**Real** C/L **%**	**Exports/ output pp**
Financial development only	2.71	17.23	7.60	2.85
	2.01	16.44	12.49	2.21
	1.82	13.25	10.41	2.29
All-tradables trade-cost reduction only	2.00	8.04	7.63	10.98
	6.22	19.33	18.07	12.92
	6.15	26.12	24.59	18.61
Financial development and trade costs,	6.47	33.74	21.66	18.30
both margins	9.80	46.32	39.58	18.28
	8.49	48.22	42.61	23.01
Financial development and trade costs,	4.63	25.03	14.29	10.52
investment margin only	7.95	35.86	29.80	12.28
	7.46	38.03	33.00	17.97
One-third finance and one-third trade	3.58	20.84	12.04	9.24
costs, both margins	5.45	26.38	22.12	9.38
	5.29	27.13	23.64	12.69
One-third finance and one-third trade	2.75	17.01	8.76	5.08
costs, investment margin only	4.30	21.51	17.41	6.16
	4.62	22.98	18.03	9.77
One-third finance and one-third trade	1.43	6.48	6.15	9.48
costs, export margin only	4.11	13.19	12.44	9.75
	4.20	17.79	16.81	13.06

Notes: Entries are annual weighted-average differences from baseline for baseline flat-manufacturing economies. The one-half combined rows use the benchmark one-half financial-frontier improvement and reduce pure iceberg trade costs in agriculture, manufacturing, and high-skilled services one-half of the way toward one. The one-third combined rows use one-third changes in both financial development and pure iceberg trade costs.

The finance–trade rows make the interaction explicit. The combined one-half exercise raises manufacturing employment by 6.47, 9.80, and 8.49 percentage points, compared with 2.71, 2.01, and 1.82 percentage points under financial development alone. Lower nonfinancial trade costs therefore amplify the sectoral path created by stronger finance-based comparative advantage and domestic investment demand.

E.8 Autarky diagnostics

Autarky provides a diagnostic on the domestic investment-demand margin. Relative to the open-economy baseline, autarky raises manufacturing employment only in the early period and lowers it in the middle and late periods. Financial development within autarky, by contrast, raises manufacturing employment in every period relative to the closed economy baseline but by less than the benchmark counterfactual. The investment-demand margin therefore does not rely on international specialization: lower investment costs raise demand for manufacturing-intensive capital goods even when trade is shut down.

Table 36: Autarky and financial development

Exercise	Mfg. emp. pp	Real Y/L %	Real C/L %	Investment rate pp
Autarky only, relative to open-economy baseline	0.27	-1.65	-1.59	0.07
	-1.37	-4.92	-4.57	-0.99
	-1.14	-7.60	-7.35	-0.06
One-third frontier within autarky	1.87	12.76	5.13	4.96
	0.81	11.04	8.20	2.85
	0.54	7.76	5.80	1.43
One-half frontier within autarky	2.23	14.82	5.64	5.89
	1.00	13.18	9.53	3.39
	0.67	9.46	6.94	1.82
Korea financial path within autarky	2.40	15.69	5.75	6.44
	1.03	13.91	10.16	3.41
	0.83	10.45	7.30	2.02
Steep-economy financial path within autarky	2.00	13.53	5.25	5.51
	1.01	12.44	8.78	3.40
	0.74	9.60	6.80	1.79

Notes: The first row compares autarky to the open-economy baseline. All other rows compare the listed financial-development counterfactual within autarky to the autarky-only economy. Entries are annual weighted-average differences for baseline flat-manufacturing economies.

E.9 Country-at-a-time financial-development exercises

The final diagnostic treats one flat-manufacturing economy at a time. These exercises are not additive, because each row solves a separate general-equilibrium counterfactual. They show that the group result combines heterogeneous country-level incidence: several economies display large manufacturing gains, while others mainly experience aggregate gains with smaller peak responses.

Table 37 reports manufacturing employment separately for the early, middle, and late periods for the single treated country, while output and consumption are reported for the late period only. The table is focused on country-level incidence without repeating every aggregate outcome for every country.

Table 37: Country-at-a-time financial-development counterfactuals

Country	Mfg. emp. early pp	Mfg. emp. middle pp	Mfg. emp. late pp	Peak gain pp	Late real Y/L %	Late real C/L %
BOL	2.46	2.80	0.92	3.54	11.21	10.83
BRA	1.19	0.28	-0.01	0.22	2.44	2.43
COL	3.31	2.62	1.17	2.58	10.46	9.51
ETH	0.41	1.35	2.60	1.87	15.92	9.81
GHA	2.56	3.85	4.24	5.40	20.02	9.85
GRC	2.84	0.08	0.00	3.86	2.89	2.95
IDN	5.86	2.81	2.42	1.00	14.86	11.67
KEN	1.07	1.91	1.47	0.04	14.55	11.38
MAR	3.53	2.85	1.98	2.79	10.55	7.96
MWI	2.17	4.54	3.78	2.15	29.59	21.73
PER	8.49	5.14	1.86	9.73	18.97	18.43
PHL	1.25	2.36	2.94	3.11	15.39	12.55
SEN	1.21	1.86	3.14	1.95	26.69	19.15
THA	1.40	1.88	1.31	0.88	6.16	5.21
TZA	1.09	2.04	3.72	5.21	21.32	12.21
ZMB	2.95	5.59	5.91	7.22	33.92	21.97

Notes: Each row is a separate country-at-a-time counterfactual in which the listed economy alone moves one-half of the way to the year-specific financial frontier, with both financial margins active. Entries report the effect for the treated economy itself, not for the flat-manufacturing group. Early, middle, and late are annual averages over 1970–1985, 1986–2001, and 2002–2018. Peak gains are computed as the treated economy's counterfactual peak manufacturing-employment share minus its baseline peak manufacturing-employment share over 1970–2018. Output and consumption are percentage changes in levels relative to baseline.

The appendix results support the interpretation in Section 6. The benchmark financial-development response is robust to the restricted peak sample, to alternative flat-manufacturing classifications, to alternative financial paths, and to aggregation. The trade-cost exercises show that nonfinancial openness has sectoral effects on its own, but the finance–trade interaction is much larger because financial development changes comparative advantage and domestic investment demand. The autarky exercises isolate the domestic side of the mechanism: the manufacturing response does not require trade exposure, although openness strongly amplifies it once financial constraints are relaxed.