

Annex 1. Data and Methodology

Annex 1.1. Growth Accounting

Growth accounting follows a standard Solow-Swan decomposition,

$$Y(t) = K(t)^\alpha (A(t)L(t))^{1-\alpha} ,$$

with $Y(t)$ equaling total production/GDP, $K(t)$ capital, $L(t)$ labor, $A(t)$ total factor productivity—the residual of the decomposition—and α the capital share. We approximate growth rates by taking log differences.

Data are based on Penn World Tables 10.01 (PWT), extended after 2019 with alternative data as follows:

- $Y(t)$: based on *World Economic Outlook* real GDP data.
- $K(t)$: based on the perpetual inventory method, with the depreciation ratio based on PWT data for 2019, and IMF *World Economic Outlook* real gross fixed capital formation to extrapolate investment data.
- $L(t)$: based on IMF *World Economic Outlook* total employment data, with missing countries based on ILO model estimated employment data.
- α : based on 1 minus the PWT country-specific labor share, keeping the 2019 value fixed going forward.

The Asia-Pacific economies included in the sample are: Australia, Bangladesh, Bhutan, Brunei Darussalam, Cambodia, China, Fiji, Hong Kong SAR, India, Indonesia, Japan, Korea, Malaysia, Maldives, Mongolia, Nepal, New Zealand, Philippines, Singapore, Taiwan Province of China, Thailand, and Vietnam.

Annex 1.2. Measurement of Misallocation of Capital

Capital misallocation is measured using the dispersion of marginal revenue productivity of capital (MRPK). This assumes that under perfect capital allocation, capital should be allocated such that the MRPK is equalized across firms. MRPK is derived at the firm level using the following formula

$$MRPK_{isct} = \alpha_{sc} \frac{VA_{isct}}{K_{isct}} ,$$

where VA_{isct} is the value added, K_{isct} is the capital stock, and α_{sc} is the capital share; i identifies firms, s the sector, c the country, and t the year. Firm-level value added and capital stock are derived using data from Orbis. Value added is derived as operating revenue net of material costs and capital stock is derived as the value of fixed assets.

For each sector-country-year triplet, we derive the within-sector standard deviation of $\ln(MRPK_{isct})$ and take the weighted average of this sectoral dispersion of MRPK across sectors for each country-year pair using the total value added of sectors as weights.¹ For each year, we use the cross-country median to plot the dispersion of MRPK in Figure 3.4.

¹ Since we are taking the standard deviation within a sector, the sectoral capital share becomes negligible since the following holds

$$\text{Var}(\ln(MRPK_{isct})) = \text{Var}\left(\ln(\alpha_{sc}) + \ln\left(\frac{VA_{isct}}{K_{isct}}\right)\right) = \text{Var}\left(\ln\left(\frac{VA_{isct}}{K_{isct}}\right)\right) .$$

Annex 1.3. Impact of Financing Constraints

Following Rajan and Zingales (1998), the hypothesis is that firms in industries that are more dependent on external finance will have higher growth rates in countries that have more developed financial systems.

Following Li (2020), the specification tests this for firm growth, defined as the percentage change in firm's total assets, employing the Arellano and Bond (1991) GMM methodology for dynamic panels with lagged dependent variables:

$$g_{isct} = \alpha + \rho_1 g_{isct-1} + \rho_2 g_{isct-2} + \delta(EFD_s \cdot FDI_{ct}) + \beta X_{it} + \gamma Z_{st} + \theta_t + \varepsilon_{isct} ,$$

EFD is the desired external finance dependence of sector s computed, following Rajan and Zingales (1998), for US firms for the period 2000-2019, FDI is the financial development index from the Financial Development Index Database of the IMF, X is a vector of firm-level controls (includes logarithm of total assets and quartiles of firm age), Z is a vector of time varying sector attributes (includes sector level profits and its square transformation), and θ_t denotes year fixed effect. We also include FDI and its square as controls. All balance sheet variables are sourced from Capital IQ and hence the sample is restricted to listed firms. For capital expenditure of firms, the specification is a panel estimation:

$$K_{isct} = \alpha + \delta(EFD_s \cdot FDI_{ct}) + \beta X_{it} + \gamma Z_{st} + \vartheta_c + \sigma_s + \theta_t + \varepsilon_{isct} ,$$

where ϑ_c denotes country fixed effects and σ_s denotes sector fixed effects. We also include FDI and its square as controls. Annual firm-level data, from 2000 to 2021, come from Capital IQ covering 17 Asia and Pacific economies (Australia, Bangladesh, China, Hong Kong SAR, Indonesia, India, Japan, Korea, Sri Lanka, Macao SAR, Malaysia, New Zealand, Philippines, Singapore, Thailand, Taiwan Province of China, and Vietnam).

Annex 1.4. Financing Constraints and Misallocation of Capital

We follow Gopinath and others (2017) and test how firm size (proxied by net worth) matters for how much was invested in capital after the global financial crisis by running the following regression

$$\Delta y_{isc} = \beta \cdot \ln(NA_{isc,2005-07}) + \gamma \cdot \ln(K_{isc,2005-07}) + \delta \cdot \ln(TFPQ_{isc,2005-07}) + FE_{sc} + \varepsilon_{isc} ,$$

where for firm i in sector s and country c , Δy_{isc} is the change in period averages between 2005-2007 and 2013-19 in log capital, log MRPK, or leverage. MRPK is derived as in Annex 1.2 and leverage is derived as the ratio of total liabilities to total assets. $NA_{isc,2005-07}$ is the average net worth in 2005-2007 where net worth is derived as the difference between total assets (current and non-current assets) and total liabilities (current and non-current liabilities). $TFPQ_{isc,2005-07}$ is the average physical productivity in 2005-2007. TFPQ is derived following Hsieh and Klenow (2009). We control for sector-country pair fixed effects, so that we exploit the within-sector cross-firm variation of size. We also remove from the sample the top 1 percent and bottom 1 percent of firms with regards to capital growth for each sector-country pair to control for outliers. The sample includes Australia, China, India, Indonesia, Japan, Korea, Malaysia, New Zealand, Philippines, Thailand, and Vietnam.

Annex 1.5. Importance of Scale versus Mix of Financing

Firms need to issue debt and raise equity to finance the acquisition of physical capital, labor input, and other inputs of production. Rather than imposing a specific theory for why debt and equity are not perfectly substitutable and for how the total amount of financing is distributed into its various applications, we postulate, following Whited and Zhao (2021), a direct mapping from financial liabilities into real value added that captures these unmodeled elements in reduced form. The distribution of finance into capital, labor, and innovation is subsumed in a finance-based measure of productivity which we label as Total Finance Benefit (TFB). Formally,

$$F_{si} = Z_{si} \left[\alpha_s D_{si}^{\frac{\gamma_s-1}{\gamma_s}} + (1 - \alpha_s) E_{si}^{\frac{\gamma_s-1}{\gamma_s}} \right]^{\frac{\gamma_s}{\gamma_s-1}},$$

where s refers to the sector, i denotes the firm, Z_{si} denotes the TFB, backed out from the data based on the methodology in Whited and Zhao (2021), γ_s is the industry-specific elasticity of substitution between debt D and equity E (estimated from the data), and α_s is the industry-specific weight of debt in real value added. This weight is estimated as the undistorted share of debt cost relative to the total cost of debt and equity, with each component adjusted according to the elasticity of substitution. The real value added is denoted by F_{si} . Empirically, we use a firm's sales as the proxy for value added and follow Kmenta (1967) to estimate the elasticity of substitution between debt and equity from the CES production function at the country-sector level.

Wedges, idiosyncratic to the firms, distort the aggregate scale of the firm and the relative price between debt and equity. These are the debt wedge τ_{Dsi} and the equity wedge τ_{Esi} . Every period, firms choose debt and equity taking their prices as given. Therefore,

$$\alpha_s \frac{(\sigma - 1)}{\sigma} \frac{P_{si} F_{si}}{\alpha_s D_{si} + (1 - \alpha_s) D_{si}^{\frac{1}{\gamma_s}} E_{si}^{\frac{\gamma_s-1}{\gamma_s}}} = r (1 + \tau_{Dsi}),$$

$$\alpha_s \frac{(\sigma - 1)}{\sigma} \frac{P_{si} F_{si}}{\alpha_s E_{si} + (1 - \alpha_s) E_{si}^{\frac{1}{\gamma_s}} D_{si}^{\frac{\gamma_s-1}{\gamma_s}}} = \lambda (1 + \tau_{Esi}),$$

where r and λ denote the undistorted cost of debt and equity respectively. σ is the elasticity of substitution for the real benefit of finance between firms in an industry and is set to 1.77. The values of these parameters are set based on Whited and Zhao (2021). Under no distortions, these marginal returns are equalized across firms. Therefore, any dispersion in marginal returns constitutes evidence of misallocation of financial liabilities. Solving a benevolent social planner's problem of maximizing aggregate real value added subject to a given aggregate amount of debt and equity in the industry yields the following solution to the optimal debt and equity allocations under no distortions:

$$\hat{D}_{si} = \frac{(Z_{si}^{\sigma-1})}{(\sum_i^M Z_{si}^{\sigma-1})} D_s,$$

$$\hat{E}_{si} = \frac{(Z_{si}^{\sigma-1})}{(\sum_i^M Z_{si}^{\sigma-1})} E_s,$$

where $\hat{D}_{si}$ and $\hat{E}_{si}$ stand for the aggregate debt and equity holdings allocated to industry s . Given the definitions of efficient debt and equity holdings, the efficient real value added at the firm level is given by the following equation:

$$\hat{F}_{si} = Z_{si} \left[\alpha_s \hat{D}_{si}^{\frac{\gamma_s-1}{\gamma_s}} + (1 - \alpha_s) \hat{E}_{si}^{\frac{\gamma_s-1}{\gamma_s}} \right]^{\frac{\gamma_s}{\gamma_s-1}}.$$

Aggregate gains from resolving financial misallocation can then be derived as the ratio between the aggregate real value added in the undistorted economy and the one observed in the data.

We decompose the contribution of the level of financial liabilities versus the composition (that is, the debt-to-equity ratio) in explaining the overall degree of financial misallocation by comparing our baseline estimates—

derived under sector-specific elasticities of substitution between debt and equity—to those obtained under an alternative scenario that assumes perfect substitutability. Under perfect substitution, the composition of liabilities is irrelevant for real value added; thus, the productivity gains in this scenario reflect only the benefits from reallocating the total amount of finance across firms. The difference between the gains under the baseline and under perfect substitution quantifies the contribution of debt-to-equity ratios in accounting for the aggregate effects of financial misallocation.

The analysis covers the period 2010 to 2022, using data from Orbis for the following Asia-Pacific economies: Australia, China, India, Indonesia, Japan, Korea, Malaysia, Philippines, and Vietnam.

Annex 1.6. Interest rates and Evergreening

To analyze the relationship between interest rates and evergreening, we use the following specification:

$$\text{zombie share}_{sct} = \beta_1(EFD_s \times \text{interest rate}_{ct-1}) + FE + \varepsilon_{stc} ,$$

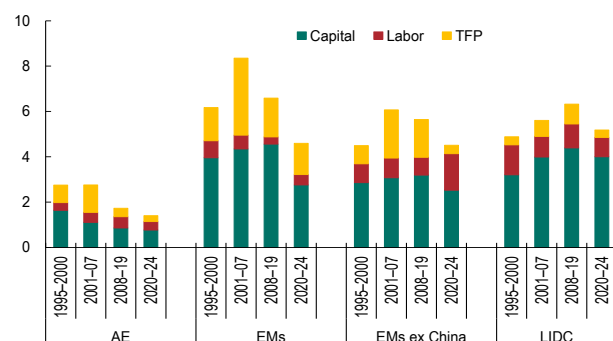
where $\text{zombie share}_{sct}$ is the share of total assets in zombie firms in sector s in country c in year t , EFD_s is the average of the median firm's external finance dependence in sector s in the US for the period 2000-19. $\text{interest rate}_{ct-1}$ refers to the nominal short-term policy rate in country c in year $t - 1$. FE is a set of fixed effects including year, country, sector, year×sector, and year×country fixed effects.

Annual firm-level data come from Capital IQ spanning the period 1996 to 2024 (see Annex 1.3 for country coverage). The data on policy rates are from Bloomberg, BIS, and CEIC. As a robustness check, we also introduce inflation in the specification, based on data from the July 2025 *World Economic Outlook*.

Annex 2. Additional Charts

Annex Figure 2.1. Real GDP Growth and Its Sources, Asia-Pacific, 1995–2024

(Percent)

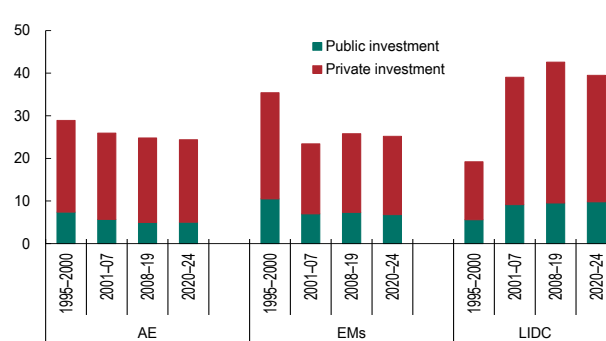


Sources: International Labour Organization; Penn World Tables 10.01; United Nations, World Population Prospects; IMF *World Economic Outlook*; and IMF staff calculations.

Note: Includes 22 economies, weighted by nominal GDP in purchasing-power-parity dollars. AE = advanced economy; EM = emerging market; LIDC = low-income developing country; TFP = total factor productivity.

Annex Figure 2.2. Public versus Private Investment, Asia-Pacific

(Percent of GDP)

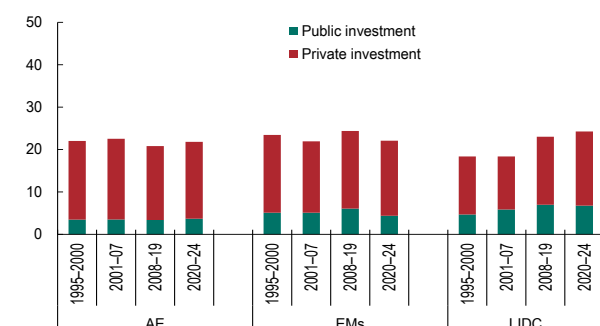


Sources: IMF *World Economic Outlook*; and IMF staff calculations.

Note: Data for 13 economies, excluding China. AE = advanced economy; EMs = emerging market; LIDC = low-income developing country.

Annex Figure 2.3. Public vs Private Investment, RoW

(Percent of GDP)

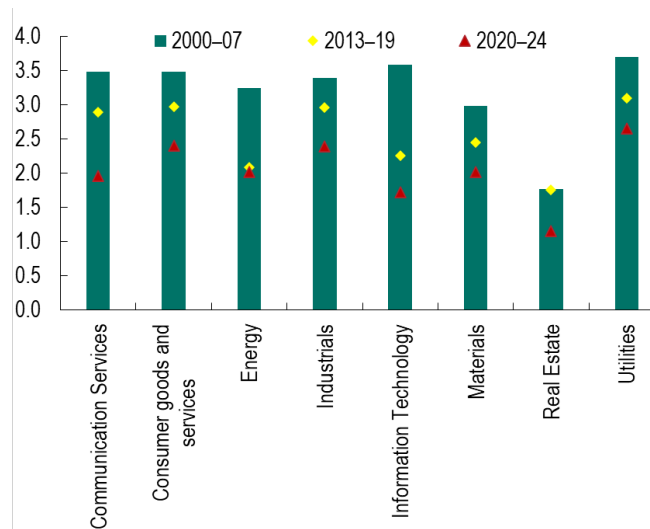


Sources: IMF *World Economic Outlook*; and IMF staff calculations

Note: AE = advanced economy; EMs = emerging market; LIDC = low-income developing country. RoW = rest of the world. Data for 191 economies.

Annex Figure 2.4. Return on Assets by Sector, Asia-Pacific, 2000–24

(Percent, average for each period)

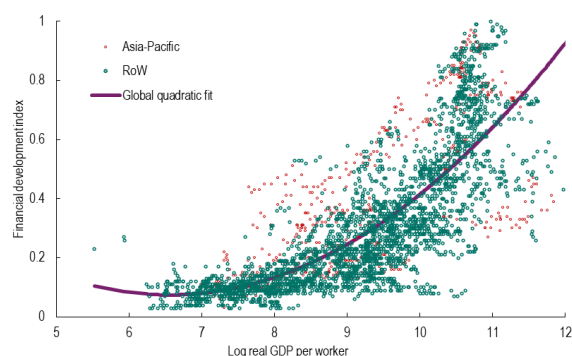


Sources: Capital IQ; and IMF staff calculations.

Note: Return on assets (ROA) is defined as net income divided by average total assets.

Annex Figure 2.5. Financial Development Index

(Index, normalized between 0 and 1, observations are pooled over 2000–21)

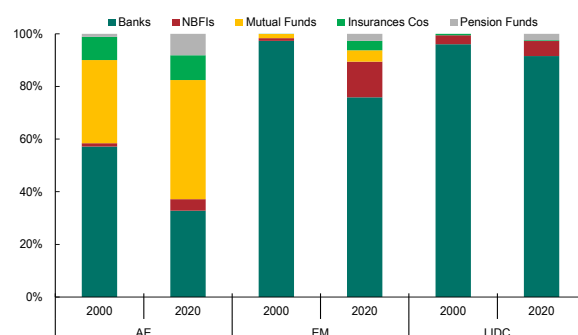


Sources: Financial Development Index (FDI) Database, Penn World Tables 10.01; and IMF staff calculations.

Note: For details of FDI, see Sahay and others (2015). RoW = rest of the world.

Annex Figure 2.6. Structure of Financial Sector in Asia-Pacific by Income Level, 2000–20

(Percent of financial sector assets)

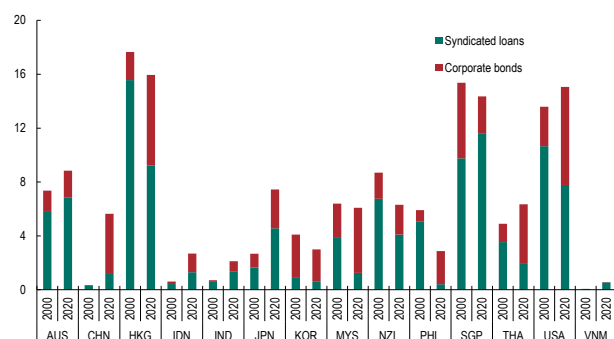


Sources: Global Financial Development Database; and IMF staff calculations.

Note: AE = advanced economy; EM = emerging market; LIDC = low-income developing country; NBFIs = non-bank financial institutions.

Annex Figure 2.7. Nonbank Debt Financing, 2000–20

(Issuance volume as percent of GDP)

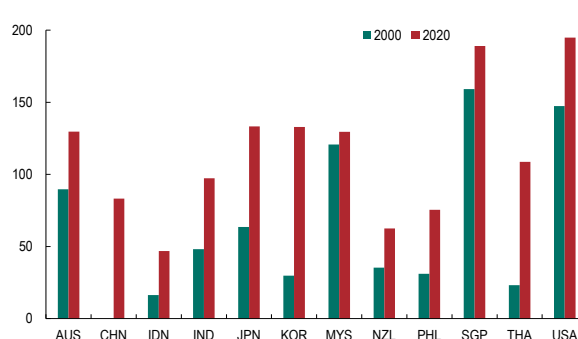


Sources: Global Financial Development Database; and IMF staff calculations.

Note: Data labels in the figure use International Organization for Standardization (ISO) country codes.

Annex Figure 2.8. Stock Market Depth, 2000–20

(Market capitalization as percent of GDP)

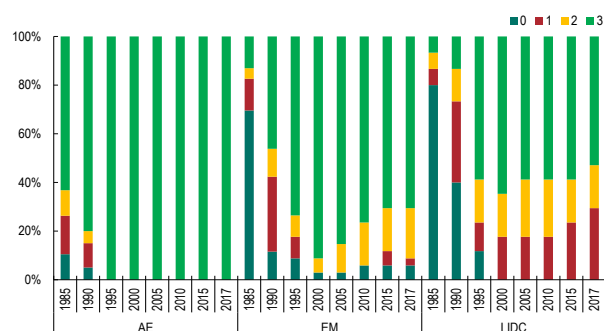


Sources: Global Financial Development Database; and IMF staff calculations.

Note: Hong Kong SAR is excluded as it is an outlier. Data labels in the figure use International Organization for Standardization (ISO) country codes.

Annex Figure 2.9. Interest Rate Controls, RoW, 1985–2017

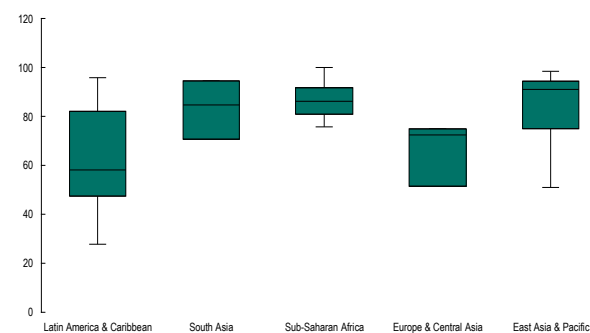
(In percent, countries with a level out of all countries)



Sources: Jafarov, Maino, and Pani (2019); and IMF staff calculations.

Note: Smaller values indicate greater interest rate controls, with 3 representing a situation where banks are essentially free to set their own interest rates, subject at most to nonbinding consumer protection limits forbidding usury. AE = advanced economy; EM = emerging market; LIDC = low-income developing country. RoW = rest of the world.

Annex Figure 2.10. Loans Requiring Collateral (Percent of all loans)

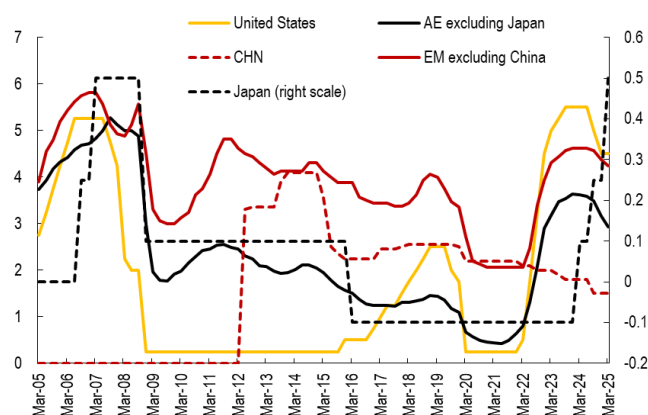


Source: World Bank Enterprise Surveys.

Note: To maximize the Asia-Pacific economies in the sample the data span 2013 to 2019, given the different timing of surveys for different countries.

Annex Figure 2.11. Policy Rate Path

(In percent)



Source: Bloomberg Finance L.P. and IMF staff calculations.

Note: Asia AE includes Australia, Hong Kong SAR, Korea, New Zealand, and Taiwan Province of China. EM Asia includes India, Malaysia, Philippines and Thailand.

Annex 3. Additional Tables

Annex Table 3.1. Financing Constraints and Firm Growth

Dependent variable: Firm growth (change in Log assets)

	(1)	(2)	(3)	(4)	(5)	(6)
	Global	AP	Small	Large	Young	Old
EFD × FDI	-0.0335	0.136***	0.257***	0.0208	0.277***	0.0177
Number of Observations	284,063	185,305	51,869	133,436	72,058	113,247

Sources: Capital IQ, July 2025 *World Economic Outlook*, Financial Development Index Database; and IMF staff calculations.

Note: Estimates from the specification in Annex 1.3. Significance at the 1/5/10% level denoted by ***/**/* . Global refers to sample with all economies and AP refers to sample with Asia-Pacific economies. Small refers to sample with firms with assets less than or equal to median, whereas Large refers to sample with firms with assets greater than median. Young refers to sample with firm age less than or equal to median, whereas Old refers to sample with firm age greater than median.

Annex Table 3.2. Financing Constraints and Capital Expenditure

Dependent variable: Capital expenditure (Log capital expenditure)

	(1)	(2)	(3)	(4)	(5)	(6)
	Global	AP	Small	Large	Young	Old
EFD × FDI	0.259***	0.365***	0.604***	0.147***	0.571***	0.214***
Number of Observations	271,171	165,527	47,899	117,628	77,553	87,974
Fixed Effects	Country, Sector, Year	Country, Sector, Year	Country, Sector, Year	Country, Sector, Year	Country, Sector, Year	Country, Sector, Year

Sources: Capital IQ, July 2025 *World Economic Outlook*, Financial Development Index Database; and IMF staff calculations.

Note: Estimates from regressions in Annex 1.3. Significance at the 1/5/10% level denoted by ***/**/* . Global refers to sample with all economies and AP refers to sample with Asia-Pacific economies. Small refers to sample with firms with assets less than or equal to median, whereas large refers to sample with firms with assets greater than median. Young refers to sample with firm age less than or equal to median, whereas Large refers to sample with firm age greater than median.

Annex Table 3.3. Growth in capital, change in MRPK and change in leverage and firm size.

	Dependent variable: Capital Growth	Dependent variable: MRPK change	Dependent variable: Leverage change
	(1)	(2)	(3)
Log Net Worth	1.980***	-0.444**	0.056***
Log Capital	-4.499***	1.563***	-0.033***
Log Productivity	1.835***	-4.636***	-0.024***
Fixed Effects	Sector X Country	Sector X Country	Sector X Country
Number of observations	46,687	46,687	46,687

Sources: Orbis and IMF staff calculations.

Note: Significance at the 1/5/10% level denoted by ***/**/*.

Annex Table 3.4. Zombie Firm's Rise and Financing Costs

Dependent variable: Zombie firms' share in assets

	(1)	(2)	(3)	(4)
EFD × Policy rate	-0.04**	-0.04**	-0.04**	-0.03*
Inflation				-0.2
Fixed effects	Country, Year, Sector	Country X Year, Sector	Sector X Year, Country	Sector X Year, Country
Number of observations	26,243	26,233	26,026	24,595

Sources: Bloomberg, Bank for International Settlements, Capital IQ, CEIC, July 2025 *World Economic Outlook*; and IMF staff calculations.

Note: Estimates from regressions in Annex 1.6. Significance at the 1/5/10% level denoted by ***/**/*; standard errors are clustered by sector-year and country-year.