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Does debt maturity influence productivity?

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Abstract

Using firm-level data for seven European and Asian countries over a span of 20 years, this study investigates whether debt maturity influences productivity. Long-term debt is associated with lower productivity for small and medium-sized enterprises (SMEs), whereas larger firms succeed in using long-term financing for productivity improvement. Conversely, short-term debt is also associated with higher productivity. These results can be explained by (i) the moral hazard effects of long-term debt stemming from the less intense monitoring of firm performance and fewer liquidation fears, and (ii) the disciplinary effects of short-term debt to improve short-term performance, such as facilitating access to more productive technologies. As the financial market develops, the positive disciplinary effects of short-term debt on productivity weaken, whereas the negative moral hazard effects of long-term debt dissipate.

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1. Introduction

Does debt maturity affect productivity? The existing literature focuses on how it influences output (Jaramillo and Schiantarelli 1997) and firm growth (Léon 2020) but not productivity. For example, Léon (2020) finds that long-term debt does not stimulate the growth of small and young firms, while short-term debt spurs firm growth. The main explanation for this finding was the differential impact of short- and long-term credit provision on small and young firms' access to credit; young and small firms are able to take advantage of an increase in short-term loans, which allows them to switch from informal finance to bank loans.

The relationship between the maturity of debt and productivity has not been studied in the existing literature because the effects are ex ante unclear. On the one hand, a long maturity of debt could avoid the liquidity risk of firms, which allows them to focus on productivity-enhancing activities. On the other hand, long maturity causes moral hazard for firms due to less intense monitoring by creditors. Thus, the effects of debt maturity on productivity are likely to differ across countries depending on the degree of development of financial institutions and the market in each country. Therefore, this study conducts a cross-country empirical investigation to determine the relationship between the productivity effects of debt maturity and financial development.

Theoretically, the optimal financing strategy is to match the maturity of assets and liabilities (Hart and Moore 1995). The implication is that companies use long-term debt to purchase fixed assets and equipment, and short-term debt to finance working capital. In the absence of long-term finance, owing to liquidation fears, companies tend to favor investment in technologies with immediate payoffs. Diamond (1991) demonstrated that companies face liquidity or roll-over risk when they finance long-term investment with short-term debt, as creditors may refuse to roll over their credits. Jensen's (1986) agency theory predicts that short-term debt may discipline managers by imposing frequent renegotiations.

The effects of debt maturity on productivity could differ between large companies and small- and medium-sized enterprises (SMEs). This is because SMEs tend to face credit constraints for long-term financing due to insufficient eligible collaterals.[1] Therefore, this study also investigates how the effects of long- and short-term debt on productivity differ between SMEs and large companies.

Additionally, the effects of the asset side of corporate balance sheets on firm productivity are examined by answering the following question: Does the intangibility of assets influence productivity? Most existing literature analyzes the effects of the levels of intangible assets or intangible investments, but few studies[2] have focused on the intangibility of assets, that is, the share of intangible assets in total assets. There are two reasons why asset intangibility is a superior

[1] This research is also related to firm bankruptcy and default, since SMEs default and go bankrupt when they cannot repay their debts (Altman 1968; Altman *et al*. 1977). In fact, Altman *et al*. (2022) used the ratio of short-term financial debt to total financial debt as one of the financial leverage indicators in the Omega Score model to predict SME default.

[2] Demmou *et al*. (2020) and Demmou and Franco (2021) investigated the effects of cross-term of asset intangibility and financial constraint on productivity growth, but they did not examine the ceteris paribus effect of asset intangibility on productivity. Nakatani (2021, 2023) determine the effects of asset intangibility on productivity growth, but not on productivity level.

variable to the level of intangible investments or assets. First, since intangible "investments" do not necessarily result in intangible "assets" that produce value added, "intangible investment" (e.g., intangible investment, Chappell and Jaffe (2018) and Yang *et al.* (2018), intangible investment per employee, Di Ubaldo and Siedschlag (2021)) is a less preferable explanatory variable as a productivity driver compared to "intangible assets." Second, given the huge differences in the size of balance sheets (i.e., the size of total assets) across firms, it may be prudent to examine the effects of intangibility of assets (rather than the level of intangible assets per employee as in Corrado *et al*. (2021)) on productivity. Furthermore, the impacts of asset intangibility may differ between the manufacturing and service industries,[3] and they could also differ across countries, depending on the presence of product market regulations.

This study analyzes firm-level total factor productivity (TFP) dynamics from the viewpoint of corporate balance sheets (both on the liability and asset sides) to answer the above main questions. How institutional arrangements such as the degree of financial development and product market regulations influence the impacts of debt maturity and asset intangibility on productivity are also investigated. This study adopts firm-level data compiled in the Orbis database from 1995 until 2015 to analyze productivity dynamics across seven advanced and developing countries to understand universal firm-level productivity enhancers in an era of digitalization.

2. Data

This study utilized the Orbis database compiled by Bureau van Dijk. Bajgar *et al*. (2020) discussed the data issues regarding Orbis. They find that Orbis has a good coverage of larger firms. Thus, this study compares the share of SMEs in Table 1, and if the share is below 90 percent, countries are dropped from the data sample. They also find that Orbis tends to have higher coverage in manufacturing than in services. Therefore, the share of service companies is also presented in Table 1 to understand the industrial composition of the data. NACE (and ISIC) four-digit industry classifications are used to control for industry-specific time-fixed effects, such as changes in industry-specific market regulations. To avoid small sample bias, countries with at least 10,000 observations are included in the analysis. As a result, the following seven countries were included: Hungary, Italy, Japan, Poland, Romania, Spain, and South Korea.

The variables included in the analysis are defined as follows: Short-term debt is the financial debt payable within one year. Long-term debt refers to financial debt with maturities greater than 12 months. Both types of debt are divided by total assets. Asset intangibility is the ratio of intangible to total assets. The high asset intangibility in Italy and Spain is likely to be driven by the inclusion of goodwill in intangible assets. Firm age and size are also included as firm characteristics. Firm size is measured by the natural logarithm of the number of employees. This study also takes a natural logarithm for firm age to capture the nonlinear effects of the lifecycle of firm dynamism.

TFP is estimated using Gandhi *et al*.'s (2020) method. Their method is superior to that of Ackerberg *et al*. (2015) because their dependent variable is the log of revenue minus materials

[3] Battisti *et al*. (2015) analyzed only European manufacturing during the short period of 2003-2009, while the data in the current study cover not only European but also Asian countries for all industries, including service industry, for a much longer period.

expenditure, which is referred to as a restricted profit production function that has problems since it is justified as a local approximation, and the variation in production data is not small. Gandhi *et al*. (2020) uses labor input as the cost of employees, and capital input is tangible fixed assets. In the Orbis database, tangible fixed assets are all those assets such as buildings and machinery. Actual amounts of depreciation reported in the data are used to calculate capital. The key assumptions of Gandhi *et al*.'s (2020) method are as follows: (1) The production function is concave and differentiable for all inputs. (2) The Hicks neutral stochastic technology shock involves the Markovian process. (3) The intermediate input demand is strictly monotonic for a single instance of unobservability. (4) The firms are price takers for the intermediate input and output markets (5) The predetermined inputs conditional on the lagged input and output values can be independently varied. Note that this study does not include intangible fixed assets in the estimation of TFP because intangible assets are treated as one of the determinants of TFP dynamics in regression equation (1). In other words, if intangible assets are included as capital inputs in the estimation of TFP, then the relationship between intangible assets and TFP would be decided in the estimation of TFP, which is inconsistent with the empirical strategy used in this study. This study estimated TFP in the NACE 2-digit sector (Srhoj *et al*. 2021). Histograms of TFP levels across the sampled countries are presented in Figures 1-7. Generally, the TFP distributions are skewed toward higher levels in advanced countries compared to developing countries.

A major issue to consider when constructing firm-level data is the need for data cleaning. Data in the Orbis database were cleaned as follows. First, observations involving apparent reporting mistakes were dropped. For example, firms with negative values for (total, tangible, or intangible) assets, sales, or the number of employees in any year were dropped. Observations for which the cost of materials or cost of employees are missing or have nonpositive values were also eliminated. Firms that lack the NACE codes were also dropped because industry-specific time-fixed effects cannot be created. Observations with a negative firm age or negative liability were also dropped. Moreover, if the ratio of liability to total assets exceeded unity, the observations were dropped. Similarly, if the ratio of intangible assets to total assets exceeded unity, these observations were also dropped.

3. Econometric Specification

This study investigates productivity drivers from the viewpoint of maturity of debt and intangibility of assets, controlling for firm characteristics. The regression equation used to identify firm-specific factors that could change productivity is defined as follows:

$$\begin{aligned} ln(TFP_{i,j,t}) = {} & \beta_1 + \beta_2 ln(TFP_{i,j,t-1}) + \beta_3 ShortTerm\_Debt_{i,j,t-1} + \beta_4 LongTerm\_Debt_{i,j,t-1} \\ & + \beta_7 Asset\_Intangibility_{i,j,t-1} + \beta_5 ln(Size_{i,j,t}) + \beta_6 ln(Age_{i,j,t}) + \mu_{j,t} + v_i \\ & + \varepsilon_{i,j,t} \end{aligned} \tag{1}$$

where the subscripts i, j, and t represent the firm, industry, and time period, respectively. $ln(TFP_{i,j,t})$ is the natural logarithm of TFP. β_1 is a constant term. $ShortTerm\_Debt_{i,j,t}$ is short-term debt divided by total assets. $LongTerm\_Debt_{i,j,t}$ is long-term debt divided by total assets. $Asset\_Intangibility_{i,j,t}$ is intangible fixed assets divided by total assets. $ln(Size_{i,j,t})$ is the

natural logarithm of the number of employees. $ln(Age_{i,j,t})$ is the natural logarithm of firm age.$\mu_{j,t}$ represents the industry-specific time-fixed effects, v_i represents the firm fixed effects, and $\varepsilon_{i,j,t}$ is an error term.[4] To avoid endogeneity problems arising from simultaneous decisions made by firms, the relevant explanatory variables (i.e., short-term debt, long-term debt, and asset intangibility) are lagged.

This study compares regression analyses across countries but does not attempt to generate a pooled estimation across countries. This is because the estimated coefficients of each country are used to analyze how country-level institutional arrangements affect the productivity dynamics across countries. Additionally, it is infeasible to merge all country data for a pooled estimation because some companies are multinational. For example, the headquarters of a firm in one country has subsidiaries in other countries, indicating that they are not independent observations, especially because they share many intangible assets (including blueprints, brand equity, copyrights, software, organizational capital, etc.).[5]

The empirical analysis resembles that of Rajan and Zingales (1995) in that they used samples of the same balance sheet variables for each country and reported within-country regressions. They also assessed the stability of the regression coefficients across countries and suggested possible explanations for discrepancies based on institutional differences. However, they did not examine productivity.

4. Results

The baseline results in Table 2 indicate that long-term debt is negatively associated with TFP level in most countries. This finding supports the hypothesis that informational asymmetry between lenders (commercial banks) and borrowers (firms) causes negative effects on firm productivity. Namely, less intense monitoring by borrowers due to the long maturity of debt and fewer fears of liquidation associated with long-term debt could lower firm productivity.

In contrast, short-term debt is positively associated with firm productivity in most countries. The short maturity of debt prevents firms from moral hazard owing to informational asymmetry, and firms make efforts to improve productivity by purchasing new productivity-enhancing technology, for example. The fear of liquidity risks also stimulates firms' effort to perform better by improving productivity.

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[4] Omitted variable bias is not considered serious in the specification in this study. Potential omitted variable bias comes from exports/foreign ownership (Chauvet and Ehrhart 2018), business environment (Commander and Svejnar 2011), regulatory environment (Aterido *et al*. 2011), training, and so on; however, there is no such information in the data in the current study. Nevertheless, omitted variables that are common for the same industry, such as business and regulatory environments, are controlled by the four-digit level industry-specific time-varying fixed effects ($\mu_{j,t}$). Furthermore, firm-specific omitted variables such as export status, foreign ownership, and training, are captured by the firm-specific fixed effects, v_i, if they are not time-variant.

[5] In the case of Japanese multinationals, sharing the same intellectual property is evidenced by the repatriation of royalties from foreign affiliates to parent companies (Tajika and Nakatani 2008).

Moreover, asset intangibility is found to have positive effects on TFP only in three countries: Italy, Japan, and Spain. Since the existing literature examines only manufacturing firms, the results of the current study may be driven by the inclusion of the service sector. Therefore, in Table 3, the same exercise is conducted using the data sample of service firms.

The results for the service sector are reported in Table 3. Asset intangibility is not statistically significant in most countries. Additionally, the negative effects of long-term debt on TFP are similar to the baseline results, while the statistical significance of the positive coefficients of short-term debt decreased in some countries.

Finally, firm size is positively associated with the TFP of service firms in most countries. The size of the estimated coefficients for firm size is larger in the service sector compared to the baseline estimation with all industries. This is because some service industries, such as network industries, require large fixed costs, so economies of scale should prevail in those industries (Nakatani 2022).

The effects of long- and short-term debt on productivity between large companies and SMEs, are presented in Tables 4 and 5, respectively. The results for large companies in Table 4 reveal that in some countries (i.e., Hungary and Italy), the effects of long-term debt on productivity are positive. This can be explained by the fact that large companies do not face credit constraints because they have sufficient collaterals, and thus, can use long-term financing for productivity-enhancing long-term investment. By contrast, the effects of long-term debt are negative for SMEs in Table 5, which is the same as the baseline estimation in Table 2. Thus, the results of Table 2 are driven by SME samples that account for large shares of sample data across countries.

Using the estimated coefficients across countries, this study investigates how institutional factors affect productivity dynamics across countries. The relationship between the product market regulation index obtained from the OECD and the estimated coefficients of asset intangibility is illustrated in Figure 8.[6] Countries with more product market regulations tend to have lower effects from asset intangibility. This relationship is more evident for the service industry (i.e., the red line has a steeper slope than the blue line). Intuitively, countries with less regulated product markets have more room for innovative activity, including digitalization and automation, and benefit from productive intangible assets such as patents and R&D. Network service industries are affected more by such regulatory burdens, which seems to explain the finding of a stronger effect in the service industry. Although the relationship between product market regulations and productivity has been examined in the literature (e.g., Égert 2016; Nicoletti *et al*. 2003), the finding on the relationship between intangible assets and regulations is a novel contribution of this study.

Furthermore, this study investigates how countries' financial development affects the effects of long- and short-term debt on productivity. The relationship between the IMF's financial development index and the estimated coefficients of long-term debt from Table 2 is illustrated in Figure 9. The value of the financial development index is the average value of the index during the data period reported in Table 1 for each country. The figure depicts the positive relationship between financial development and the effects of long-term debt. An economic intuition behind this finding is that as the access and depth of financial markets of countries develop, lenders have

[6] The value of 2013 is used because this is the only data that cover all countries examined in this analysis.

stronger institutions to prevent moral hazard caused by long maturity of debt. By contrast, there is a negative correlation between financial development and the effects of short-term debt in Figure 10. The economic intuition is that in countries with less developed financial markets, short-term debts are allocated to firms that can generate higher productivity. These are new findings that, to the best of the author's knowledge, have never been studied in the literature before.

5. Conclusion

The firm-level analyses of productivity drivers across countries, focusing on the liability and asset sides of corporate balance sheets, reveals the following eight findings.

The answer to the question "Does debt maturity matter for productivity?" is yes. The suggested theoretical explanation is that long-term debt induces moral hazard for firms to improve productivity because of the less intense monitoring of performance.

Second, this study also derived contrasting results for the effects of short-term debt on productivity. The results indicate that short-term debt improves firm productivity. This finding can be theoretically explained by the liquidation fears as short-term debt can serve as a disciplinary device for firm performance.

Third, in terms of whether asset intangibility improves productivity, the answer is yes for some countries, but this effect is less relevant for service industries.

Fourth, regarding "What are the important productivity drives for service firms?" the empirical results reveal economies of scale in the service industry are an important productivity driver.

Fifth, regarding "How different is the effect of debt maturity between large firms and SMEs?", the results indicate that the effects of long-term debt on productivity can be positive for large firms, probably because they can use long-term financing for long-term productivity-enhancing investment.

Sixth, the productivity of countries with fewer product market regulations benefits more from asset intangibility and this effect is more evident in the service industry.

Seventh, as financial markets and institutions develop in the country, the negative effects of long-term debt on productivity dissipate.

Eighth, in countries with less developed financial markets, short-term debts are allocated to firms that can generate higher productivity.

A limitation of this study is that the results could depend on the definition of TFP,[7] so the preliminary results may be treated with a caveat. Future studies could clarify how different TFP estimation methods influence the effects of debt maturity on productivity.

[7] See the results in Appendix Table based on TFP estimates using Levinsohn and Petrin's (2003) method with Ackerberg *et al.*'s (2015) correction. The disciplinary effects of short-term financing implied by the statistically significant positive coefficients of short-term debt are still observed in several countries, while the effects of long-term debt differ. As explained in the data section, this could be due to the fact that their method is older and less sophisticated compared to Gandhi *et al.*'s (2020), which is used throughout this study, in the sense that it uses the

Future research could also decompose different maturities of debt into loans from private creditors and public lenders. This is because the existing literature presents mixed results on the effects of public grants on productivity (see Dvouletý *et al*. 2021 for a literature survey on empirical studies based on the data sample from EU countries). Future research could examine whether the positive effects of short-term financing and the negative effects of long-term financing on SMEs' productivity are observed for public lending, which could produce useful practical policy implications for the government and public banks when designing public lending schemes.

restricted profit production function with local approximation, which becomes problematic when the variation in production data is large.

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Figure 1: Histogram of TFP in Hungary

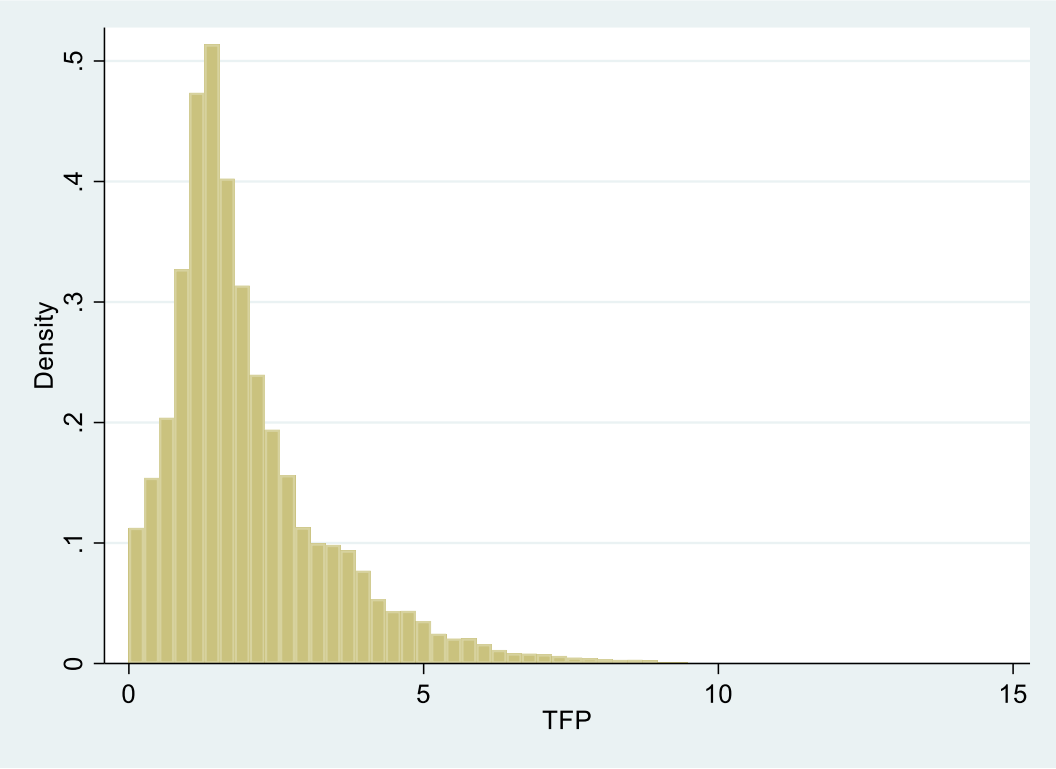

Figure 2: Histogram of TFP in Italy

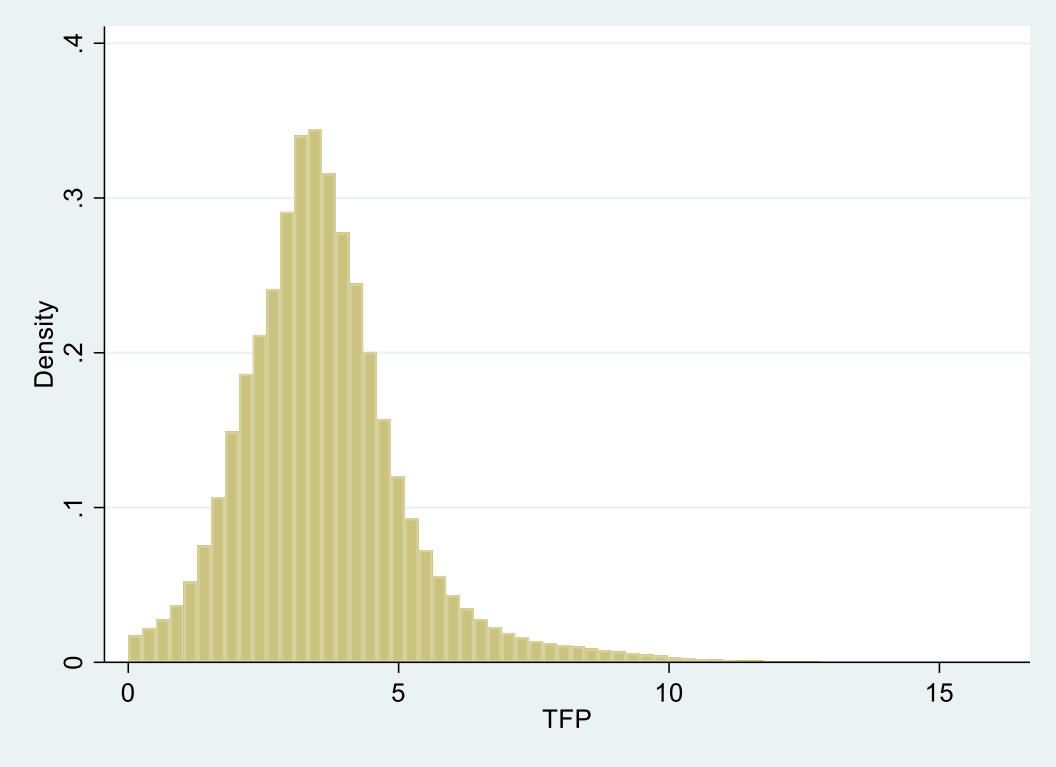

Figure 3: Histogram of TFP in Japan

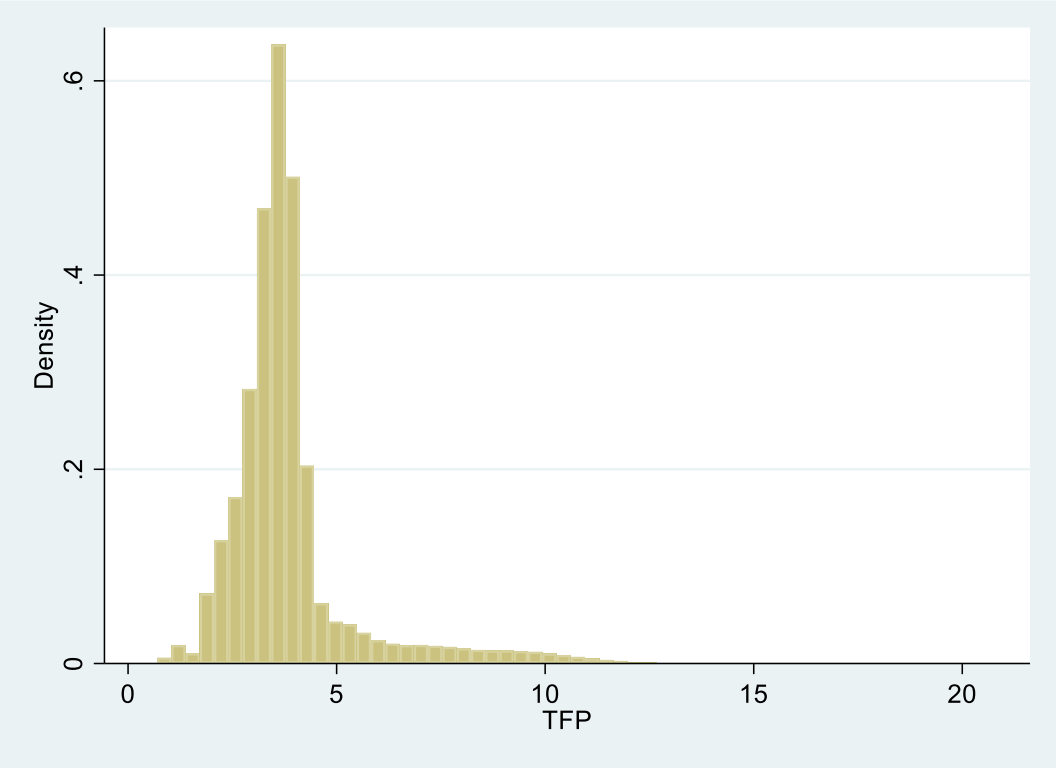

Figure 4: Histogram of TFP in Poland

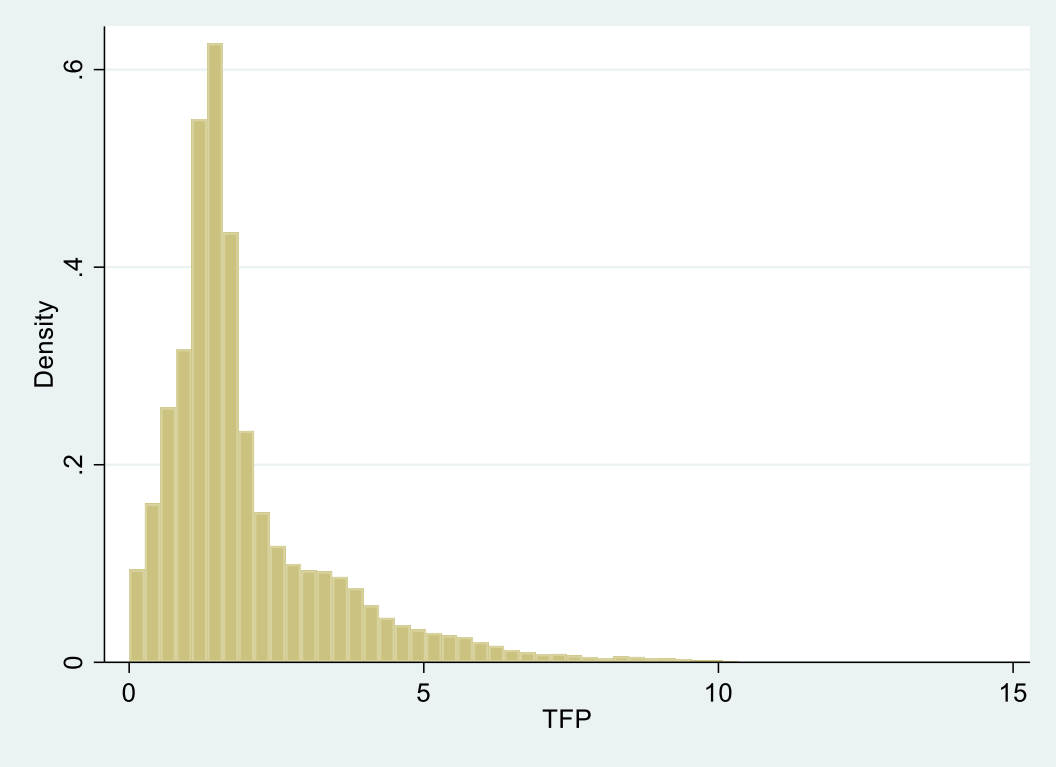

Figure 5: Histogram of TFP in Romania

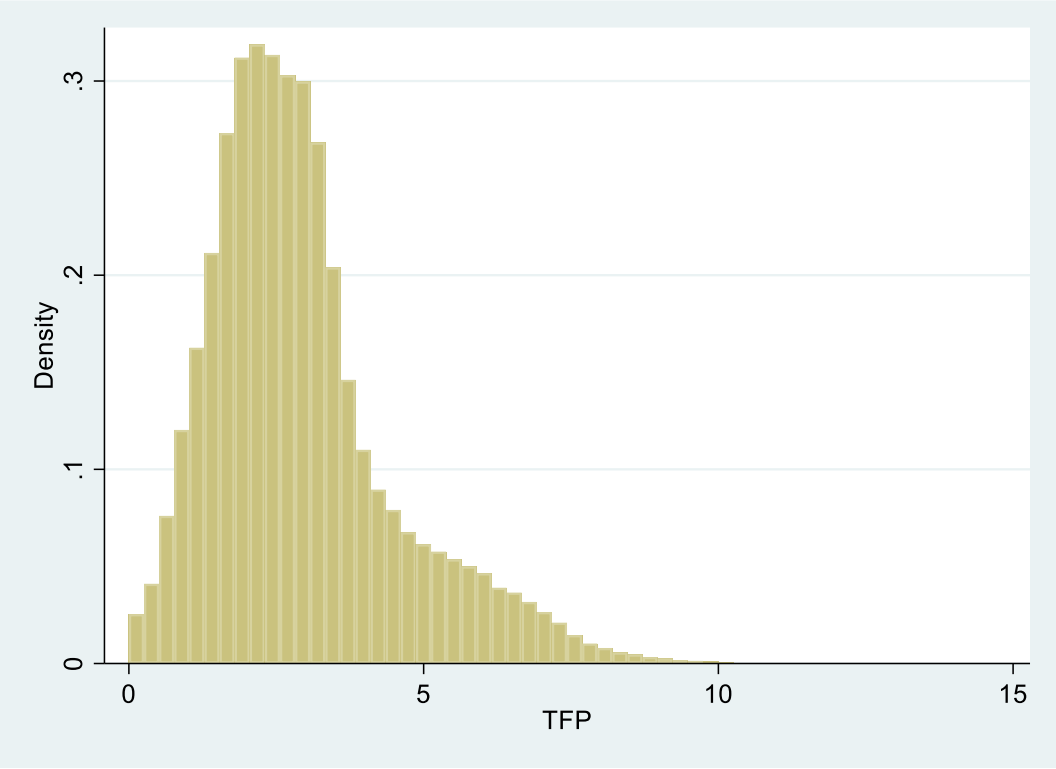

Figure 6: Histogram of TFP in Spain

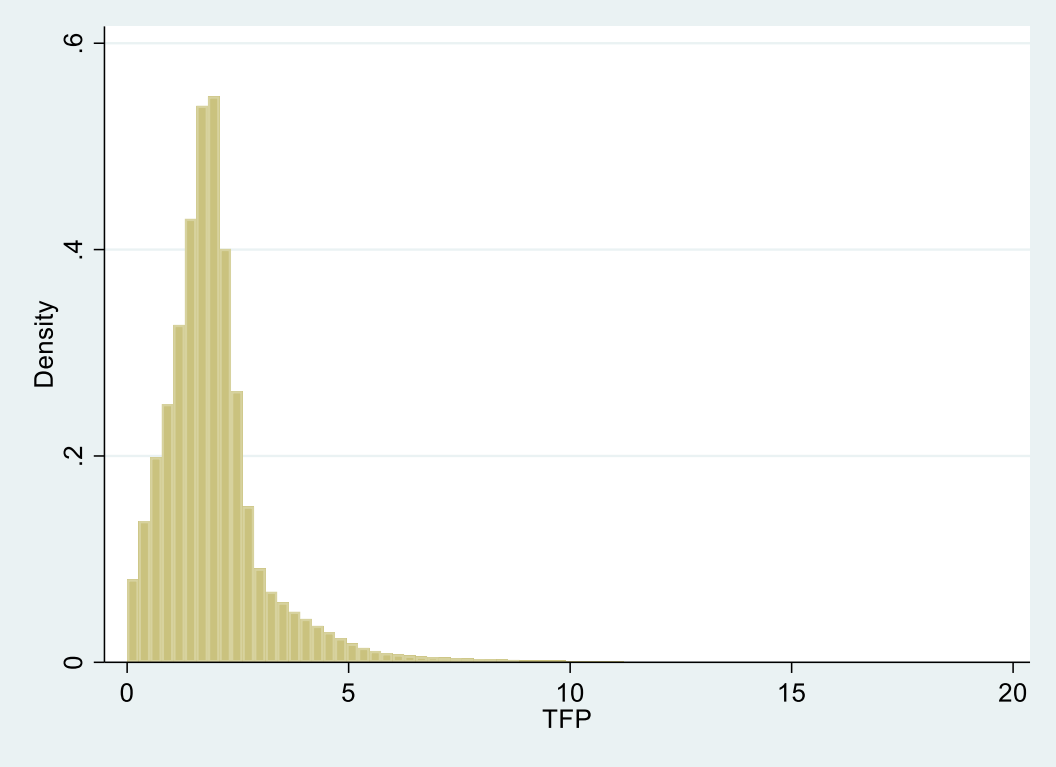

Figure 7: Histogram of TFP in South Korea

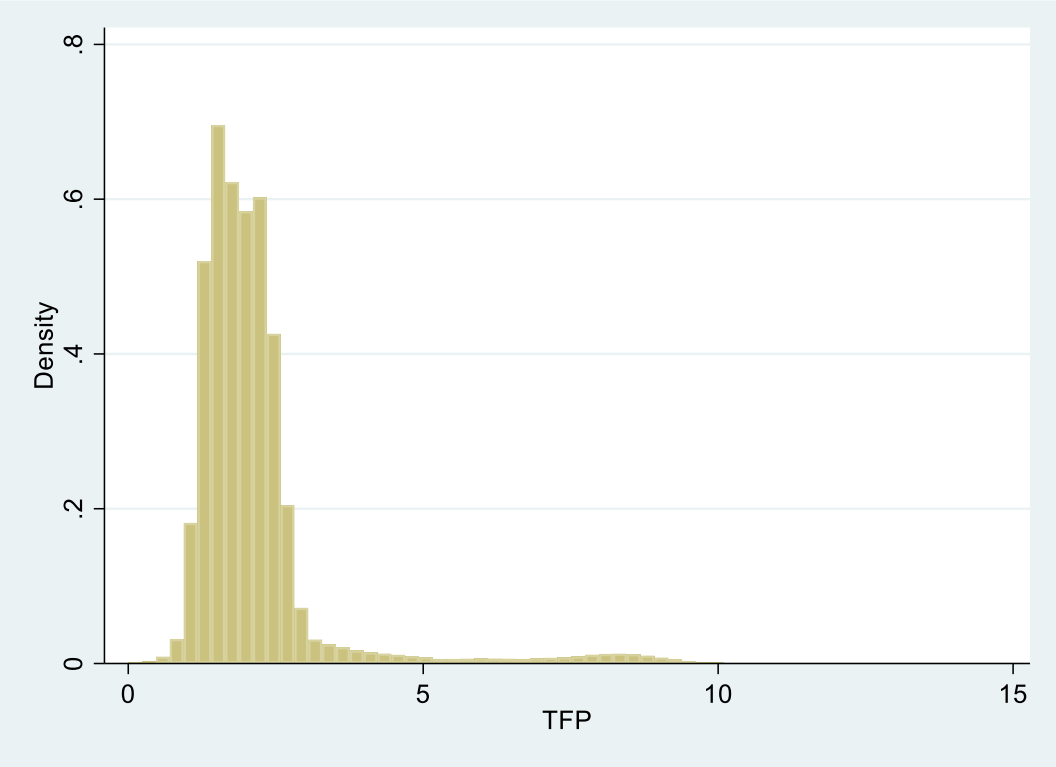

Figure 8: Product Market Regulations and Asset Intangibility

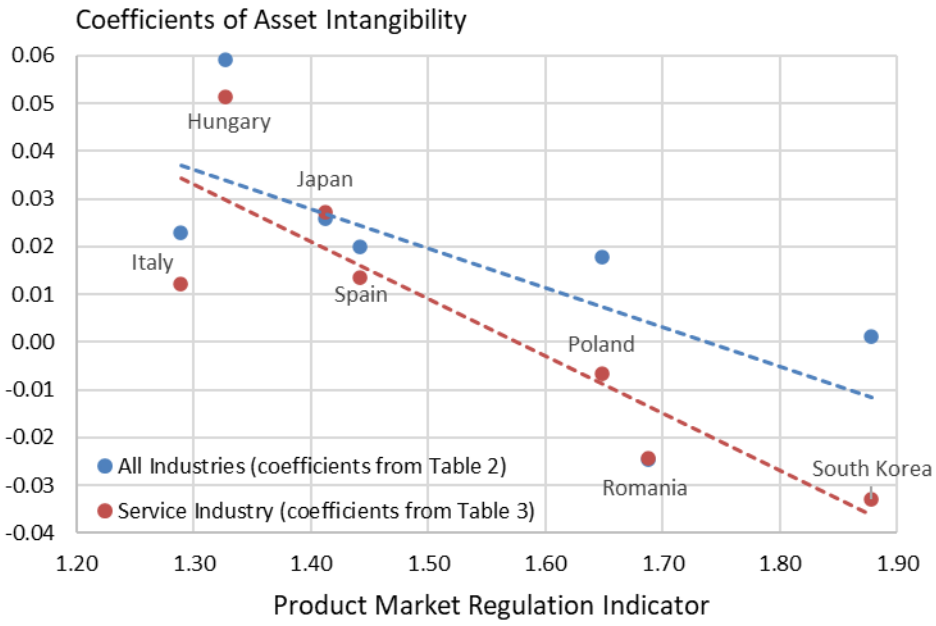

Figure 9: Financial Development and Long-Term Debt

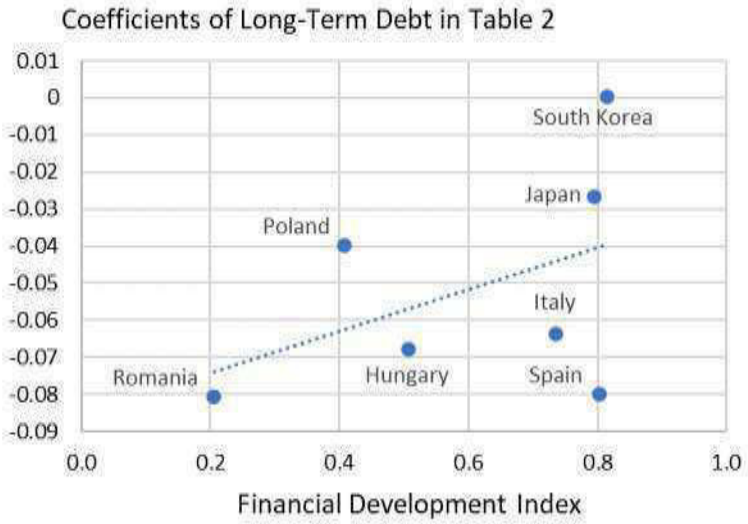

Figure 10: Financial Development and Short-Term Debt

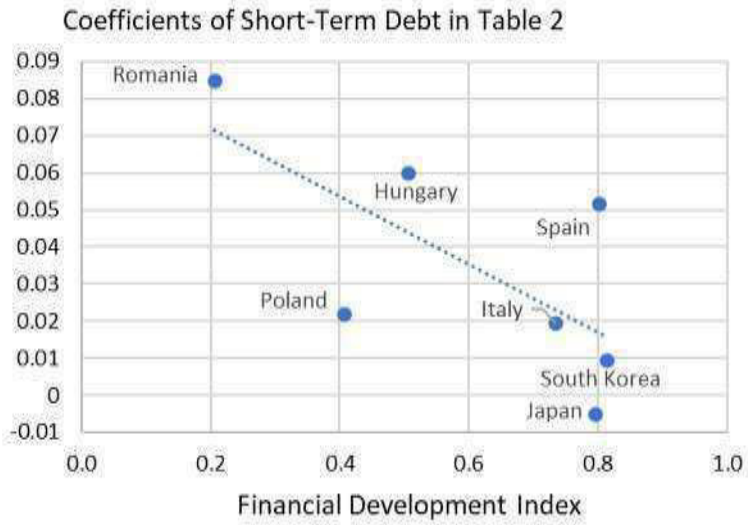

Table 1: Summary Statistics

Country	Hungary	Italy	Japan	Poland	Romania	Spain	South Korea
ln(TFP)							
Mean	1.8444	3.5502	3.8762	1.8960	2.8914	1.8188	2.1022
Standard Deviation	1.5377	1.6508	1.6011	1.5804	1.6320	1.4246	1.3669
Min	-6.6367	-9.0904	-1.7653	-4.4461	-5.8003	-10.2823	-11.0769
Max	11.7897	16.3629	21.2192	12.7253	13.8386	16.6738	13.1447
Long-Term Debt / Total Assets							
Mean	0.0748	0.0510	0.2591	0.0771	0.0072	0.2001	0.1794
Standard Deviation	0.1292	0.1115	0.2181	0.1281	0.0480	0.2028	0.1957
Min	0	0	0	0	0	0	0
Max	0.9838	0.9915	0.9955	0.9673	0.9916	0.9973	0.9997
Short-Term Debt / Total Assets							
Mean	0.0832	0.0987	0.0898	0.0644	0.0163	0.0323	0.1397
Standard Deviation	0.1186	0.1424	0.1311	0.1017	0.0651	0.0823	0.1701
Min	0	0	0	0	0	0	0
Max	0.9111	0.9957	1	0.9263	0.9764	0.9779	0.9874
Intangible Assets / Total Assets							
Mean	0.0443	0.1719	0.0237	0.0302	0.0268	0.1203	0.0420
Standard Deviation	0.1277	0.2454	0.0739	0.1090	0.1346	0.2253	0.1341
Min	0	0	0	0	0	0	0
Max	1	1	1	1	1	1	1
ln(Number of Employees)							
Mean	3.5967	2.0087	2.6637	3.7986	1.8738	2.0234	2.7641
Standard Deviation	1.5115	1.2531	1.2969	1.2925	1.4521	1.1917	1.1859
Min	0	0	0	0	0	0	0
Max	10.7044	11.6457	11.8962	10.7790	10.3774	11.2303	10.2390
ln(Firm Age)							
Mean	2.5711	2.5478	3.3182	2.5804	2.0098	2.4672	2.2912
Standard Deviation	0.5348	0.8022	0.6294	0.6597	0.5938	0.6771	0.6592
Min	0	0	0	0	0	0	0
Max	4.9416	6.8363	5.6733	6.4770	3.2581	5.0173	4.8283
Share of Data Sample							
Small and Medium-Sized Enterprizes	93.4%	99.2%	97.3%	92.5%	97.8%	99.2%	98.2%
Service Industry	54.6%	54.8%	40.6%	58.1%	56.4%	56.6%	28.2%
Year							
Min	2005	1997	2001	2001	2000	1995	2002
Max	2015	2015	2015	2015	2015	2015	2015

Table 2: Baseline Estimation Results

Country	Hungary	Italy	Japan	Poland	Romania	Spain	South Korea
Lagged TFP	0.3342***	0.3486***	0.4484***	0.3453***	0.1738***	0.3590***	0.3662***
	(0.0218)	(0.0021)	(0.0054)	(0.0186)	(0.0058)	(0.0022)	(0.0104)
Long-Term Debt	-0.0677**	-0.0637***	-0.0267***	-0.0399**	-0.0808***	-0.0080***	0.0003
	(0.0325)	(0.0048)	(0.0013)	(0.0192)	(0.0201)	(0.0026)	(0.0029)
Short-Term Debt	0.0598**	0.0193***	-0.0051***	0.0217	0.0848***	0.0516***	0.0093***
	(0.0295)	(0.0033)	(0.0013)	(0.0215)	(0.0170)	(0.0043)	(0.0029)
Asset Intangibility	0.0592	0.0229**	0.0260***	0.0178	-0.0245	0.0200***	0.0011
	(0.0477)	(0.0090)	(0.0037)	(0.0249)	(0.0257)	(0.0019)	(0.0070)
Size	0.0049	0.0029**	0.0415***	0.0084	-0.0300***	-0.0401***	0.0342***
	(0.0101)	(0.0011)	(0.0006)	(0.0073)	(0.0036)	(0.0010)	(0.0010)
Age	-0.0394*	0.0181***	0.0130***	-0.0413***	-0.0019	-0.0014	-0.0084***
	(0.0217)	(0.0021)	(0.0015)	(0.0131)	(0.0092)	(0.0016)	(0.0017)
Constant	1.2870***	2.2512***	1.9892***	1.2643***	2.4246***	1.2392***	1.2534***
	(0.0782)	(0.0093)	(0.0183)	(0.0552)	(0.0264)	(0.0060)	(0.0205)
4 Digit Industry-Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	35,148	2,749,525	1,636,427	63,604	244,601	2,443,034	398,042
R-squared	0.977	0.936	0.997	0.985	0.959	0.940	0.993

Dependent variables are ln(TFP) calculated following Gandhi *et al.* (2020). Robust standard errors are in parentheses.

*, **, and ***= significant at 10%, 5%, and 1%, respectively.

Table 3: Estimation Results for Service Industry

Country	Hungary	Italy	Japan	Poland	Romania	Spain	South Korea
Lagged TFP	0.3357***	0.3540***	0.4804***	0.3466***	0.1665***	0.3693***	0.3949***
	(0.0280)	(0.0027)	(0.0081)	(0.0248)	(0.0078)	(0.0031)	(0.0147)
Long-Term Debt	-0.1284**	-0.0634***	-0.0220***	-0.0708**	-0.0693**	-0.0284***	-0.0012
	(0.0513)	(0.0069)	(0.0025)	(0.0301)	(0.0276)	(0.0035)	(0.0095)
Short-Term Debt	0.0606	0.0217***	-0.0040	0.0209	0.0880***	0.0429***	0.0043
	(0.0447)	(0.0052)	(0.0025)	(0.0295)	(0.0265)	(0.0060)	(0.0078)
Asset Intangibility	0.0513	0.0122	0.0273***	-0.0066	-0.0242	0.0136***	-0.0328*
	(0.0546)	(0.0075)	(0.0063)	(0.0308)	(0.0330)	(0.0027)	(0.0185)
Size	0.0321**	0.0158***	0.0560***	0.0212**	-0.0173***	-0.0351***	0.0450***
	(0.0148)	(0.0017)	(0.0013)	(0.0097)	(0.0052)	(0.0014)	(0.0027)
Age	-0.0221	0.0160***	0.0160***	-0.0557***	0.0045	-0.0139***	-0.0149***
	(0.0354)	(0.0032)	(0.0029)	(0.0195)	(0.0141)	(0.0024)	(0.0054)
Constant	1.3480***	2.4938***	2.1958***	1.2772***	2.6976***	1.3730***	1.7455***
	(0.1159)	(0.0136)	(0.0320)	(0.0759)	(0.0392)	(0.0091)	(0.0429)
4 Digit Industry-Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	19,204	1,506,051	665,204	36,970	137,841	1,382,210	112,073
R-squared	0.971	0.930	0.997	0.987	0.963	0.948	0.994

Dependent variables are ln(TFP) calculated following Gandhi *et al.* (2020). Robust standard errors are in parentheses.

*, **, and ***= significant at 10%, 5%, and 1%, respectively.

Table 4: Estimation Results for Large Companies

Country	Hungary	Italy	Japan	Poland	Romania	Spain	South Korea
Lagged TFP	0.5939***	0.5344***	0.5358***	0.4401***	0.6215***	0.5440***	0.4519***
	(0.0664)	(0.0234)	(0.0582)	(0.0472)	(0.0290)	(0.0318)	(0.0809)
Long-Term Debt	0.1901***	0.0754***	-0.0056	0.0393	-0.1261*	-0.0139	-0.0038
	(0.0709)	(0.0265)	(0.0148)	(0.0393)	(0.0706)	(0.0191)	(0.0284)
Short-Term Debt	0.1513**	-0.0129	-0.0129*	-0.0391	-0.0816	-0.0264	0.0162
	(0.0761)	(0.0259)	(0.0078)	(0.0543)	(0.0617)	(0.0275)	(0.0194)
Asset Intangibility	-0.0313	0.0575**	0.0222	-0.1423*	-0.0772	-0.0052	0.0319
	(0.1422)	(0.0285)	(0.0235)	(0.0802)	(0.0876)	(0.0209)	(0.0507)
Size	-0.0350	0.0721***	0.0750***	-0.0193	0.0456***	0.0347*	0.0634***
	(0.0299)	(0.0141)	(0.0091)	(0.0172)	(0.0178)	(0.0208)	(0.0120)
Age	-0.0464	-0.0098	-0.0242***	-0.0259	-0.0138	0.0155	-0.0257*
	(0.0564)	(0.0128)	(0.0094)	(0.0302)	(0.0241)	(0.0120)	(0.0152)
Constant	0.9450***	1.2195***	2.0819***	1.0948***	0.6779***	0.5852***	1.1806***
	(0.0254)	(0.1219)	(0.2471)	(0.1548)	(0.1400)	(0.1353)	(0.2248)
4 Digit Industry-Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,320	22,678	45,352	5,401	5,494	20,523	7,099
R-squared	0.996	0.989	0.999	0.996	0.990	0.992	0.999

Dependent variables are ln(TFP) calculated following Gandhi *et al.* (2020). Robust standard errors are in parentheses.

*, **, and ***= significant at 10%, 5%, and 1%, respectively.

Table 5: Estimation Results for SMEs

Country	Hungary	Italy	Japan	Poland	Romania	Spain	South Korea
Lagged TFP	0.3101***	0.3463***	0.4408***	0.3363***	0.1639***	0.3569***	0.3533***
	(0.0223)	(0.0021)	(0.0054)	(0.0197)	(0.0059)	(0.0022)	(0.0103)
Long-Term Debt	-0.0672*	-0.0645***	-0.0267***	-0.0448**	-0.0666***	-0.0083***	-0.0008
	(0.0351)	(0.0049)	(0.0013)	(0.0208)	(0.0207)	(0.0026)	(0.0030)
Short-Term Debt	0.0629*	0.0199***	-0.0049***	0.0197	0.0933***	0.0550***	0.0087***
	(0.0315)	(0.0033)	(0.0013)	(0.0233)	(0.0177)	(0.0044)	(0.0029)
Asset Intangibility	0.0520	0.0228**	0.0254***	0.0194	-0.0284	0.0197***	0.0025
	(0.0511)	(0.0091)	(0.0038)	(0.0273)	(0.0270)	(0.0019)	(0.0070)
Size	-0.0032	0.0010	0.0401***	0.0106	-0.0351***	-0.0408***	0.0338***
	(0.0108)	(0.0011)	(0.0006)	(0.0081)	(0.0037)	(0.0010)	(0.0010)
Age	-0.0361	0.0192***	0.0153***	-0.0495***	-0.0030	0.0008	-0.0056***
	(0.0247)	(0.0021)	(0.0015)	(0.0148)	(0.0097)	(0.0017)	(0.0017)
Constant	1.3694***	2.2604***	1.9962***	1.3034***	2.4711***	1.2369***	1.2694***
	(0.0847)	(0.0093)	(0.0182)	(0.0599)	(0.0270)	(0.0061)	(0.0201)
4 Digit Industry-Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	31,794	2,723,865	1,589,415	56,590	237,850	2,419,656	389,795
R-squared	0.975	0.936	0.996	0.984	0.959	0.939	0.993

Dependent variables are ln(TFP) calculated following Gandhi *et al.* (2020). Robust standard errors are in parentheses.

*, **, and ***= significant at 10%, 5%, and 1%, respectively.

Appendix Table: Estimation Results for Alternative TFP Measure

Country	Hungary	Italy	Japan	Poland	Romania	Spain	South Korea
Lagged TFP	0.2661***	0.4858***	0.3444***	0.2057***	0.2733***	0.3119***	0.4515***
	(0.0374)	(0.0228)	(0.0134)	(0.0421)	(0.0287)	(0.0078)	(0.0544)
Long-Term Debt	14.3906	5.8070	-0.0113***	0.0964	43.0112	4.8310***	74.9395***
	(11.6027)	(5.0723)	(0.0009)	(4.6648)	(9.3102)	(0.1830)	(18.1212)
Short-Term Debt	9.7864	23.9819***	0.0017*	-0.1626	12.7326*	7.8443***	70.8546***
	(11.9188)	(3.5685)	(0.0010)	(6.2687)	(6.9393)	(0.4365)	(17.7249)
Asset Intangibility	-10.7595	11.4890	0.0210***	4.4248	2.1375	1.9225***	74.9202***
	(12.4287)	(9.5607)	(0.0025)	(6.7978)	(9.3604)	(0.1315)	(12.5078)
Size	-21.6819***	3.0782*	0.0097***	-2.9753*	-5.4138***	0.2365***	73.3720***
	(3.8427)	(1.5936)	(0.0004)	(1.6438)	(1.2353)	(0.0695)	(7.2696)
Age	11.9565***	12.6461***	0.0026***	1.4492	-15.5545***	1.2105***	-4.6972
	(8.0777)	(3.3902)	(0.0010)	(3.7190)	(5.1392)	(0.1226)	(8.9495)
Constant	192.0793***	348.2033***	1.6460***	122.7306***	181.3593***	32.6409***	168.2493***
	(25.9189)	(11.2117)	(0.0339)	(13.1133)	(9.9181)	(0.0061)	(22.1722)
4 Digit Industry-Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	34,030	2,756,743	1,682,767	63,730	333,193	2,542,484	411,262
R-squared	0.963	0.913	0.998	0.931	0.884	0.878	0.910

Dependent variables are ln(TFP) calculated following Ackerberg *et al.* (2015). Robust standard errors are in parentheses.

*, **, and ***= significant at 10%, 5%, and 1%, respectively.