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The Right Kind of Help? Tax Incentives for Staying Small

by Dora Benedek, Nina Budina, Pragyan Deb, Borja Gracia,
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Abstract

Some countries support smaller firms through tax incentives in an effort to stimulate job creation and startups, or alleviate specific distortions, such as financial constraints or high regulatory or tax compliance costs. In addition to fiscal costs, tax incentives that discriminate by firm size without specifically targeting R&D investment can create disincentives for firms to invest and grow, negatively affecting firm productivity and growth. This paper analyzes the relationship between size-related corporate income tax incentives and firm productivity and growth, controlling for other policy and firm-level factors, including product market regulation, financial constraints and innovation. Using firm level data from four European economies over 2001–13, we find evidence that size-related tax incentives that do not specifically target R&D investment can weigh on firm productivity and growth. These results suggest that when designing size-based tax incentives, it is important to address their potential disincentive effects, including by making them temporary and targeting young and innovative firms, and R&D investment explicitly.

JEL Classification Numbers: H25, L25, O52, C23

Keywords: size-based taxation, productivity, growth, structural reforms

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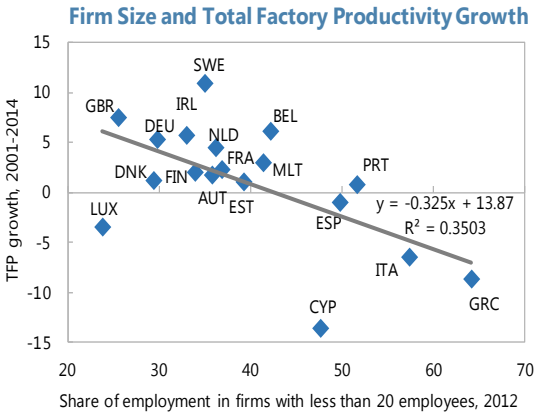
I. INTRODUCTION

Preferential size-based tax policies are often used to support small firms. A number of countries offer tax incentives in the form of reduced corporate income tax (CIT) rate for small firms below a certain size, as measured by the level of firm profits, turnover or number of employees. For example, over 2000–10, small firms benefited from lower CIT rates in ten OECD countries, including in Belgium, France, Hungary, the Netherlands, Spain, and the United Kingdom (OECD, 2015, Annex 2). Size-based tax policies often aim to support employment, start-up creation, and alleviate specific obstacles to small and medium enterprises (SMEs) growth, such as financial constraints, high regulatory or tax compliance costs (IMF, 2017b, forthcoming).

Preferential size-based policies can hamper firm productivity and growth. Size-related tax and labor regulations can affect firm productivity and growth by lowering efficiency of resource allocation and reducing incentives to invest in innovation. Specifically, size-based tax preferences can result in a "small business trap," creating disincentives for more productive firms to grow beyond a certain size and lose the benefit from the tax preference, eventually preventing them from achieving economies of scale (IMF, 2016a and 2017; Almunia, 2014). They could also hamper market selection as investors would be satisfied with lower gross return on their investment due to the tax preference. This implies that resources would be diverted towards less productive firms and their aggregate share would be larger in equilibrium. Finally, the high share of small and less productive firms that benefit from size-based tax preferences can also result in an unfair competition, thereby reducing other firms' incentives to innovate, lowering in turn aggregate productivity growth (Aghion 2005, and Bobbio, 2016).[2] These predictions seem in line with the observed negative correlation between the share of small firms in the economy and productivity in the euro area. Moreover, European small firms are on average 20 percent less productive than larger firms (particularly in manufacturing), less likely to innovate or spend on research and development (R&D), and less exposed to international competition (Brandt, 2004, European Commission, 2010).



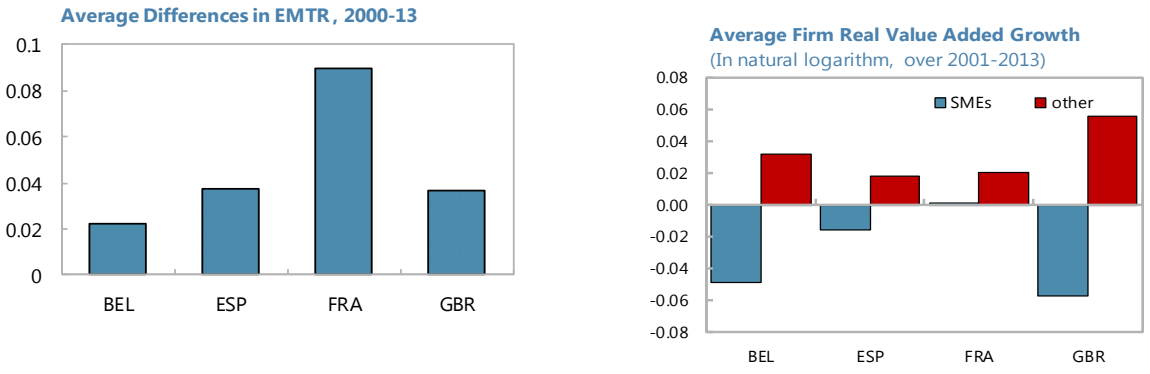
Sources: AMECO, OECD, and IMF staff calculations.

[2] See Aghion et. al., 2013; Andrews et. al., 2014; Buis et. al., 2016; Guner et. al., 2008, Hospido et. al., 2015; IMF, 2016b, 2016c, 2017d; Lanau et. al., 2016; Gopinath et. al., 2015; Restuccia et. al., 2016; Hopenhayn et. al., 1993; Garicano et. al., 2013; Almunia et. al., 2015; and Bobbio, 2016.

This paper assesses empirically the implications of size-related tax incentives for firm productivity and growth. We define size-related tax incentives as the difference between the simulated firm-specific effective marginal tax rates under standard corporate income tax (CIT) rates and those under targeted (lower) CIT rates. The focus of this paper is on headline differences in CIT rates, thus by "incentives" we understand non-targeted incentives, excluding, for example, specific incentives for R&D investment. We estimate firm-specific size-related CIT tax incentives, based on firm level effective marginal tax rate simulations for Belgium, France, Spain and the United Kingdom (Section II). We track their evolution across countries, sectors and various firm characteristics over 2001–13. We then assess their implications for firm productivity and growth, controlling for other policy factors such as regulatory barriers, access to finance, firm-specific innovation, and firm size and age (Section III).

Our findings confirm that size-based tax incentives can weigh on firm productivity and growth. Permanent size-based tax incentives are associated with lower SME total factor productivity (TFP) level and growth, and firm growth, proxied by investment and output growth, after controlling for other policy and firm-level factors, including product market regulation, financial constraints and innovation. The amount of tax incentives to SMEs in Belgium, France, Spain, and the United Kingdom is significant—between 2 and 9 percentage points in the CIT rate, on average over 2000–13. Yet, SME performance, in particular total factor productivity (TFP) level and growth, and output growth, was much weaker compared to large firms over 2000–13 (Figures 1 and 2). These effects are smaller but similar in magnitude to those of financial constraints and regulatory hurdles. Our simulations suggest that removing CIT incentives could provide a significant boost to SME's total factor productivity (TFP). These findings suggest that policy makers should also be aware of the significant unwanted productivity effects of size-related CIT tax policies—apart from their fiscal costs, they create disincentive effects for firms to grow and invest, and consider less distortive alternatives by for example making them temporary and better geared towards young and innovative firms. For example, targeted and time-bound tax incentives, such as R&D tax incentives, or temporary tax policy support to startups can reduce underinvestment in R&D by alleviating potential financing constraints (IMF, 2016a).

Figure 1. Average Size-Related CIT Tax Incentives and Firm Growth



Sources: ORBIS database, and IMF staff calculations.

II. METHODOLOGY, DATA, AND EMPIRICAL STRATEGY

The impact of tax policy on investment decisions has traditionally been measured by effective marginal tax rates (EMTR). The decision on marginal investment depends on the extent to which taxes raise the cost of capital above the (after tax) rate on alternative investment (Devereux and Griffith, 2009). The discrete choice of investment depends in turn on its post-tax net present value (NPV) for a given pre-tax NPV, captured by the effective average tax rate (EATR).[3]

A. Methodology

We compute firm-specific effective tax rates following Devereux and Griffith (2003) and Egger et. al. (2009) (see Appendix I for details). The model considers a hypothetical investment, raising capital stock by one unit, that the firm uses for a single time period and then sells for its residual value. In equilibrium, the increase in output, resulting from using this asset is equal to the revenue from alternative investments plus capital depreciation. The net present value (NPV) of a hypothetical marginal investment is

$$R^* = \frac{p-r}{1+r}. \quad (1)$$

where *p* is the pre-tax real rate of return on capital and *r* is real interest rate.

In the absence of taxation, the NPV of a hypothetical marginal investment does not depend on how it is financed—by using retained earnings, raising new equity or debt.[4]

In the presence of taxation, the NPV of this investment depends on the firm's capital structure, while the cost of investment is reduced by the NPV of tax depreciation allowances per unit of investment discounted by the shareholders' nominal discount rate. Assuming no tax credit, and equal taxes on income and capital gains, the NPV of investment financed through raising new equity or retained earnings would be the same (denoted by R^{RE}, see equation A2 in Appendix I). However, if investment is financed by issuing debt, and interest payments are fully deductible from the tax base, investment costs will be reduced by the amount of taxes saved by issuing debt instead of equity. The after-tax NPV of investment is thus equal to:

$$R = R^{RE} + F. \quad (2)$$

where *F* is a function of tax rate, tax depreciation, nominal interest rate and the shareholder's nominal discount rate (equation A3 in Appendix I).
Devereux and Griffith (2003) define *marginal investment* as investment with an after-tax NPV of zero, with a corresponding cost of capital ($\tilde{p}$), equal to before-tax rate of return for such marginal investment. The *effective marginal tax rate* is then computed as the wedge

[3] Note that in the absence of taxation, the cost of capital is equal to return on capital for investment with the NPV of zero.

[4] This is true if newly issued shares are repurchased in the next period, so that the total number of outstanding shares remains constant.

between the cost of capital of marginal investment with an NPV of zero and after-tax rate of return of an alternative asset over the cost of capital. In the absence of shareholder taxation, this is:

$$EMTR = \frac{(\tilde{p}-r)}{\tilde{p}}. \quad (3)$$

The *effective average tax rate* is computed as the difference between before- and after-tax NPV of investment over the NPV of the pre-tax rate of return on capital:

$$EATR = \frac{R^{*}-R}{\left(\frac{p}{1+r}\right)}. \quad (4)$$

We define the CIT *tax incentive (TI)* as the difference between EMTR computed at the standard corporate income tax rate for all firms and EMTR computed at the effective targeted (lower) rate for small firms (Eq. 5). Targeted (lower) CIT rates apply (i) only to qualifying firms, specified in the national CIT tax code of each country, but usually subject to a size-related threshold based on operating revenues or number of employees, and (ii) only for taxable profits below a certain threshold, as specified in each country's tax code. Thus, the effective marginal targeted rate is computed using the targeted (lower) CIT tax rates for qualifying firms with profits below a certain threshold.[5] The key advantage of using simulated forward-looking effective tax rates instead of effective tax rates calculated as taxes paid over taxable firm profit is that they are independent of firm's tax planning activities, and are therefore exogenous (Egger et. al, 2009).

$$TI_{itc} = EMTR\_nt_{itc} - EMTR_{itc} \quad (5)$$

B. Data and Empirical Strategy

We use the ORBIS firm-level database of Bureau Van Dijk (BvD), compiled by the Research Department of the IMF (Gal and Hijzen, 2016). We use data on balance sheets, income statements, and sectoral classification of around 800,000 active companies from Belgium, France, Spain, and the United Kingdom over 2001–13. We exclude from the analysis firms that do not report the number of employees to ORBIS. Following Eggert et. al. (2009), effective tax rates are computed at the firm level, using firm specific investment and financing data from ORBIS.[6] EMTRs are calculated using country and industry specific characteristics (e.g. composition of assets to determine the depreciation profile of a company), financing structure (debt versus equity) and parameters of the CIT tax system (e.g., tax rates, allowances). We combine data on firms' asset structure and debt financing with country-specific details on CIT tax code, including the evolution of standard and targeted (lower) CIT rates for smaller firms, size-related thresholds to determine the qualifying firms subject to reduced CIT rate, and depreciation allowances under the tax

[5] See Appendix I for more details on the methodology for the calculation of firm-specific EMTR and EATR.

[6] Appendix II provides more details on the calculation of firm-specific EMTR and EATR.

code.[7] Importantly, the firm-specific EMTR computations exclude changes in EMTRs that could potentially reflect endogenous changes in firms' asset/liability structure or changes in other macro variables. Following Eggert (2009), our calculations use exogenous macro assumptions, which do not change over time, across countries and firms. In addition, the computations use fixed shares of machine, land, buildings and intangible assets, as well as fixed firm leverage over time, so that changes in EMTR only represent changes in tax code parameters, namely, changes in CIT standard and targeted rates, size-related thresholds, and depreciation allowances (See Appendix II for details).

We study the association between firm performance and size-related tax incentives. The tax incentive variable, *TI*, varies across firms, due to differences in effective CIT rate, fixed assets level and structure, and debt financing. We estimated the model on an unbalanced panel of firm level data, using firm fixed effects regressions with robust standard errors (Table A.1). Specifically, we estimate the following estimation:

$$Y_{itc} = \beta * TI_{itc} + \delta * Exp_s * Reg_{tc} + \gamma * X_{itc} + \alpha_{ic} + \alpha_{tc} + \varepsilon_{itc} \qquad (6)$$

where Y_{it} denotes firm performance (log total factor productivity (TFP) level[8], TFP growth, value added and investment growth) for firm *i*, at time *t*, and country c, $while\ TI_{itc}$ is the simulated firm-specific size-related tax incentive. We estimated equation 6 using three different TFP proxies, computed by Gal and Hijzen (2016): production function based TFP level estimated using OLS estimation in logs (used in our baseline regressions), production function based TFP level estimated using Wooldridge (2009) methodology in logs, and an index based TFP in logs (used as robustness checks). In addition, we have also used value added growth and investment growth to proxy firm growth. The coefficient β captures the impact of size-related tax incentives on firm performance, with negative β implying a negative association. The firm country fixed effects, α_{ic} capture all time-invariant firm characteristics of firm *i* in country *c*. The year country fixed effects, α_{tc} , directly control for macroeconomic fluctuations in country c, and all other factors that may affect productivity equally across firms. The equation is estimated on annual firm level data and an error term ε_{itc}, corrected for heteroskedasticity, and clustered at the firm level. Coefficients are scaled by the standard deviations of the respective explanatory variables to facilitate comparison.

We control for other policy and firm-specific factors. $Reg_{t,c}$ measures the stringency of product market policies (time-varying indicator at the country level) and Exp_s is an industry level index proxying differences in the impact of regulation on firms operating in different

[7] We use OECD (2015) and country sources for CIT tax code provisions and changes over time. Simulations also incorporate simplifying assumptions about several parameters, including country-specific depreciation rules, sector-specific breakdown of fixed assets as in Egger et. al. (2009) and ZEW (2012).

[8] The original nominal variables from Orbis are deflated using industry-specific (2-digit NACE 2) deflators for output, gross value added, and inputs. Real capital stock used in the computation is constructed using the perpetual inventory method, as the sum of previous period real fixed assets less depreciation and real investment (see Gal, 2015).

sectors.[9] The coefficient δ captures the impact of product market regulation on firm performance. Negative coefficients imply that easing regulation would improve firm productivity. We use the OECD's product market regulation index and two sub-indices (barriers to entrepreneurship and complexity of regulation procedures) which are based on *de jure* data on laws and regulations rather than *de facto* assessments. X_{itc} is a vector of other controls, including proxies of firm financial constraints (debt-to-asset ratio), innovation activities (proxied by the share of intangible in total assets, as in IMF 2016c), firm size (using lagged value added as a proxy), and firm age.

Weak firm balance sheets have negative implications for firm productivity and investment (Duval et al, 2017, Adler et. al., 2017, IMF 2016a and 2017a, and Hospido et. al., 2015). Weak firm balance sheets can reduce firms' ability to invest, by constraining the ability to obtain external financing, and firms' willingness to invest, as firms' debtholders would appropriate a larger share of project returns (IMF, 2016d). Market failures, resulting in borrowing constraints can reduce efficiency of capital allocation, lowering in turn firm productivity and growth. Using a rich cross-country and firm-level data set, Duval et al. (2017) find that a combination of pre-existing firm financial fragilities and tightening credit conditions made an important contribution to the sharp and persistent productivity growth slowdown in advanced economies after the 2008 global financial crisis.

Our measure of size-based tax incentives is based on simulated forward looking marginal effective tax rates, minimizing the endogeneity problems. As discussed in Section A, we use the differential between effective tax burden under the standard CIT tax rate and the effective tax burden under the targeted (lower) CIT tax rate. Insofar as the standard and targeted rates are exogenous, using the differential further minimizes the endogenous impact of unobservable firm specific factors. Furthermore, to control for possible endogeneity from other controls, we have checked the robustness of results using their lagged values. Specifications with productivity and value added growth also include lagged productivity level as an additional control.

The robustness of results is checked for alternative measures and different subsamples. We used alternative measures of firm performance (three different measures of firm productivity and productivity growth, output growth, investment growth, and investment to capital ratio), alternative measure of CIT tax incentives (based on simulated effective average tax rates), lagged firm leverage ratio, and alternative size and age proxies. Finally, we also validated the results for alternative samples: (i) for the individual countries, to ensure that no single country drives the results; (ii) only for SMEs; (iii) for firms in the vicinity of the tax

[9] The PMR index is interacted with sectors' exposure to regulation, proxied by the U.S. firm turnover at the two-digit NACE level, under the assumption that the marginal impact of product market liberalization would be greater for firms operating in industries with naturally low barriers, compared to firms operating in industries with naturally high barriers (Andrews et al., 2014).

preference threshold; and (iv) for samples of less and more productive firms (to shed light on the precise channels through which tax incentives affect productivity).[10]

III. Stylized Facts

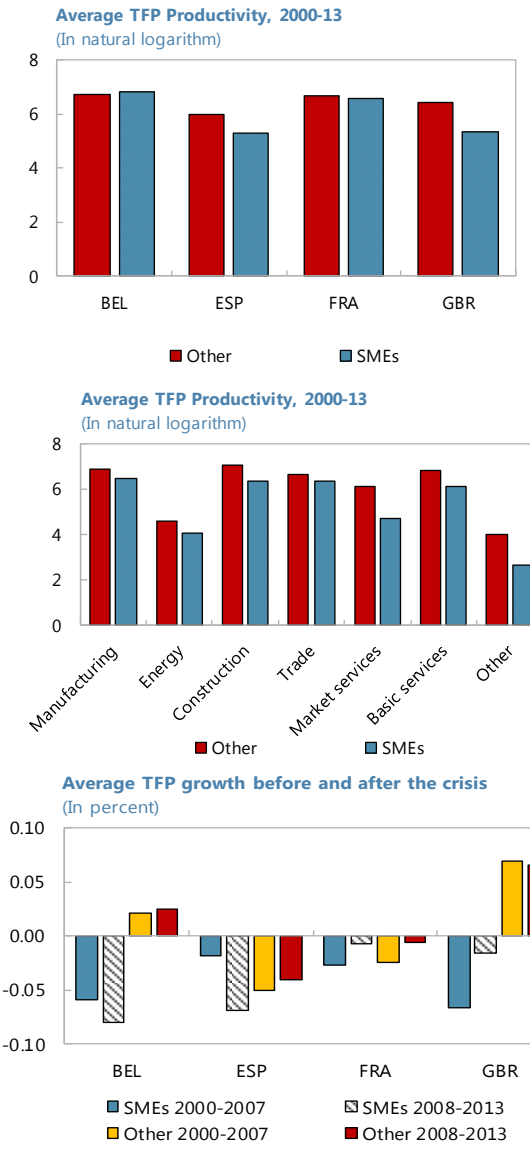
Smaller firms underperform with regard to TFP levels and TFP growth (Figure 2).

- SMEs, and in particular small firms with less than 20 employees, exhibit lower average total factor productivity (TFP), compared to that of large firms, except in Belgium. Yet, micro and small firms (with less than 20 employees) comprise a large share (between 75–83 percent) of firm population in France and in Spain, and lower, but still significant share (21–36 percent) in the United Kingdom and in Belgium in 2013.[11]

- There are also sizeable TFP gaps across sectors, with relatively low level of productivity and large productivity differentials between SMEs and large firms in market services, agriculture, and energy. These productivity differentials are less pronounced in manufacturing and trade.

- SMEs have experienced lower TFP growth, with productivity declining even before the global financial crisis. SMEs were also generally more affected by the crisis—while post-crisis TFP among larger firms stabilized and even recovered, the declining trend is yet to be reversed among smaller firms.

Figure 2. Firm Performance



Sources: ORBIS data and IMF staff calculations.

[10] Less productive firms are defined as those with TFP levels below the 25th percentile, while more productive firms are defined as those with TFP levels above the 75th percentile.

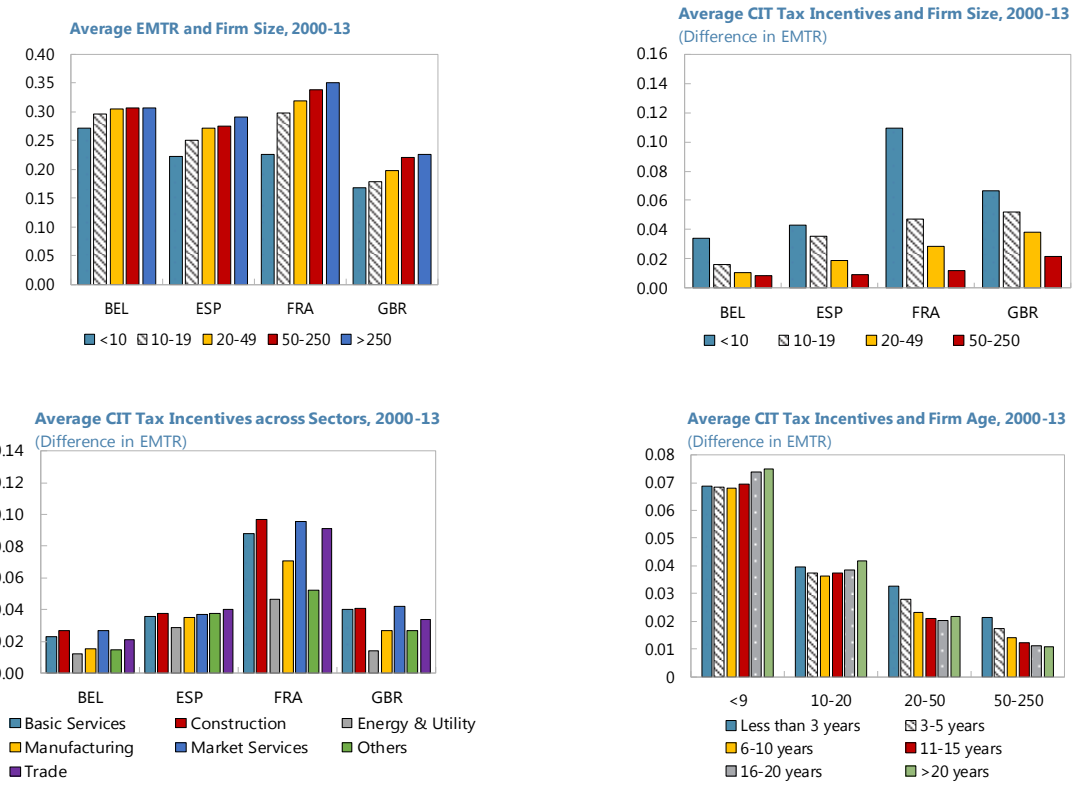
[11] For a more detailed firm analysis of firm productivity in Spain see also IMF, 2015; IMF, 2017; Bank of Spain, 2015 and 2016; and Mora-Sanguinetti, 2012.

Size-related tax incentives vary across firm size, firm age and sectors (Figure 3).

- SMEs are subject to lower forward-looking effective marginal tax rates (EMTRs), on average, compared to those for large firms. EMTRs tend to increase with firm size (proxied by the number of employees) in all the four countries. The EMTR differences across firms with different sizes is the largest in France, followed by Spain and the United Kingdom, and the lowest in Belgium.

- The levels of size-related tax incentives vary significantly across countries, various firm and sectoral characteristics, and over time, between 1 and 10 percent on average. For the sample period, the average size-related tax benefit is estimated to be relatively large for France, the United Kingdom, and Spain, in particular for small firms with less than 20 and less than 10 employees. However, size-related tax benefits have been eliminated in the United Kingdom in 2010 and more recently (2016) in Spain.[12]

Figure 3. Size-Related Tax Incentives



Sources: RES ORBIS data and IMF staff calculations.

[12] See IMF, 2017a.

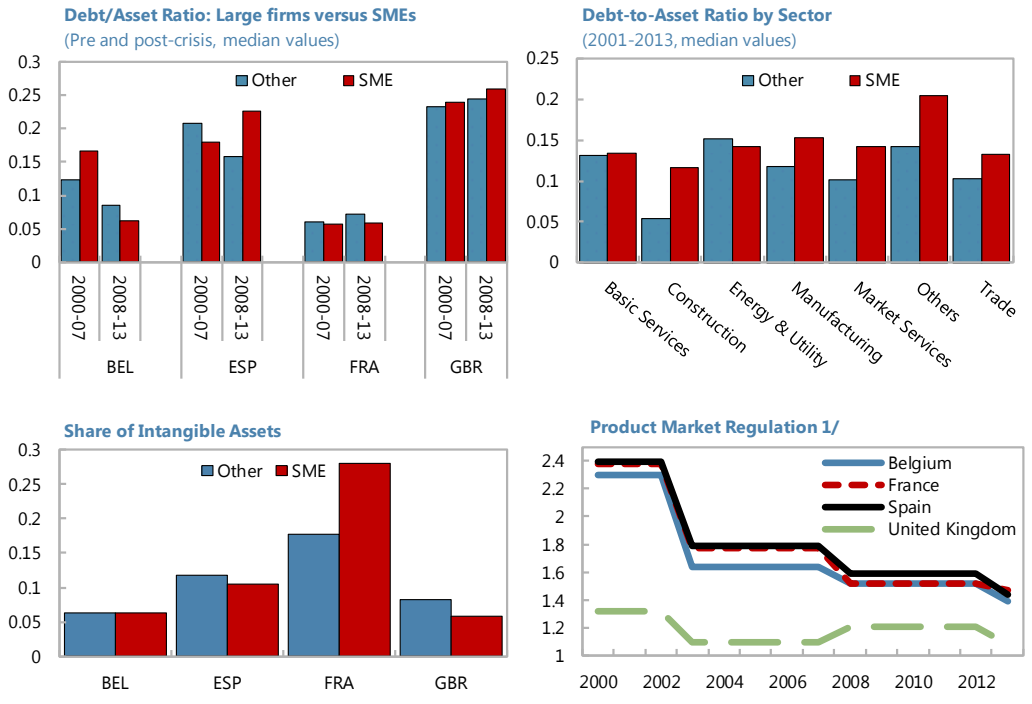
- Given the variation in the composition and size of firm assets and firm debt-to-asset ratio, there are also significant sectoral differences in size-related tax incentives although without a clear pattern across countries. Agriculture and retail benefit more in Spain, construction in France, financial services in the United Kingdom and communication and technology in Belgium.

- Younger firms tend to benefit less from size-related tax incentives, especially for firms between 10–20 employees, which typically comprise a large share of firm populations. This pattern, however, is less pronounced in Belgium and for medium-sized and large firms in general. In Spain, young firms benefit the least from size-related tax incentives.

SMEs also tend to have more debt, while their innovation activity varies across countries (Figure 4).

- The level of debt-to-asset ratio, our proxy for financial constraints, is on average higher for SMEs, compared to larger firms across most sectors of the economy. Debt-to-asset ratios have been particularly high in Spain and in the United Kingdom. Moreover, the SME indebtedness in these two countries seems to have increased further during the crisis. In France, innovation activity, proxied by the share of intangibles in total assets, seems higher in SMEs, compared to larger firms, especially for younger firms, mostly in basic services, trade and construction sectors. In Belgium and in the United Kingdom, innovation in SMEs and other firms is about the same, while SMEs seem to innovate much less compared to large firms in Spain.

Figure 4. Other Control Factors



Source: Research Orbis Data Set and IMF Staff Calculations.

1/ Index of Product Market Regulation, OECD, based on "de jure" data on laws and regulations, with higher values reflecting more stringent regulation.

IV. Estimation Results

Size-related tax incentives have a sizeable negative impact on firm TFP level and growth, and on firm growth (Figure 5). Econometric results suggest that size-related tax incentives have negative and significant implications for firm's total factor productivity level and growth. These results also hold for firm investment level and growth. Moreover, the impact of size-related tax incentives is quantitatively and qualitatively similar for all the four countries, with the United Kingdom having a slightly less negative impact (Figure 6). The estimated coefficients are scaled by the standard deviations of the respective explanatory variables to facilitate comparison.

The negative effect of size-based tax incentives is similar to that of other policy and firm-specific factors, including regulation and access to finance (Figure 5, Annex III).

- As expected regulation and credit constraints have a negative effect on productivity. Notably, size-related tax incentives have a similar quantitative impact as credit constraints, except in Belgium where the impact of tax incentive is somewhat larger than the impact of financial constraints, and in the United Kingdom, where tax incentive coefficient is smaller compared to the impact of financial constraints.

- The impact of tax incentives is about twice the impact of regulation in France and Belgium. In Spain, they are similar in magnitude, and in the United Kingdom the impact of regulation is insignificant, which is consistent with the very low PMR index in the United Kingdom.

- In line with existing literature, we find that firm size and age have a negative impact on productivity growth as bigger firms, being closer to the frontier have lower growth potential, notwithstanding the benefit from economies of scale.

- Innovation has significant positive impact on firm productivity, with the effect of innovation larger for France and the United Kingdom. We also find that the negative impact of tax incentives on productivity is lower for more innovative firms—the interaction between tax incentives and our innovation measure is positive, suggesting that the overall negative impact of tax incentives on productivity is weaker for firms with higher innovation activity, proxied by the share of intangible assets (Table A3.4).

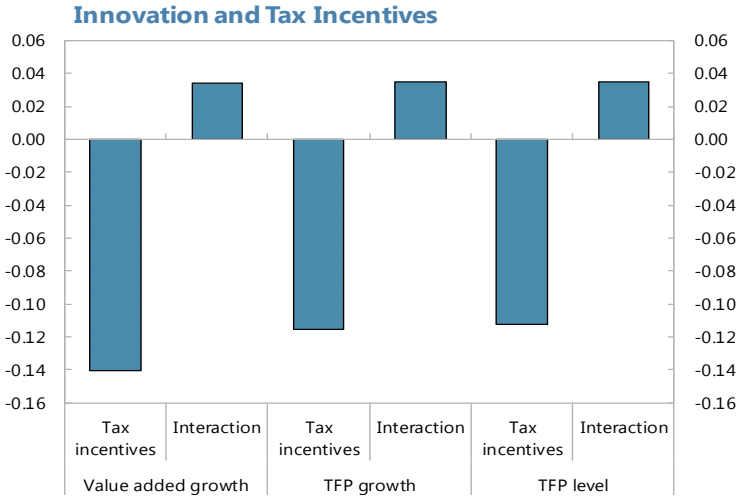
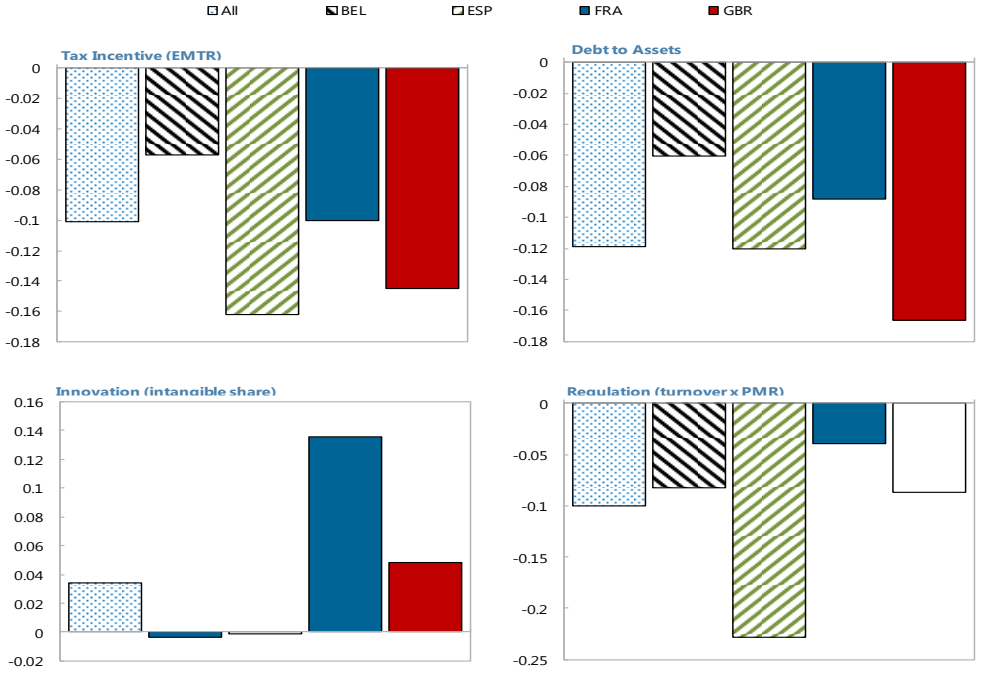


Figure 5. Estimation Results: Factors of Firm Productivity and Growth

Source: IMF staff calculations.

Size-based tax incentives create disincentives for productive firms to grow, but also, affect less productive firms (Figure A3.4). We have re-estimated equation (6) for the sub-samples of more and less productive firms, defined as firms within the top and bottom TFP quintiles. The coefficients remain negative and significant for regressions performed on both subsamples and the standardized coefficients are similar for the sub-sample of more and less-productive firms (Figure A3.4). These results, which also hold for the individual countries, suggest that tax policy support to small firms creates dis-incentives for more productive firms to grow, but also tend to operate much the same way on less productive firms. This would imply that while tax incentives tend to lower firm TFP, investors would still be satisfied with lower rate of return on their capital due to tax preferences, therefore continue to invest in lower productivity firms. Thus, in addition to creating disincentive effects among high productivity firms, tax preferences induce a resource shift towards low productive firms, leading in turn to lower aggregate productivity.

Figure 6. Determinants of TFP Growth
(coefficients are scaled by standard deviations of respective variables)



Source: ORBIS data and IMF Calculations.
Note: Unfilled bars indicate coefficient not statistically significant.

Removing such broad-based size-related tax incentives could have a large positive impact on SMEs' TFP, though potential transition costs should be carefully managed (Figure 7). SMEs' productivity could increase by between 0.8 and 2.9 percentage points (mean weighted by employment) under a counterfactual scenario where the size-related tax incentives are removed. This effect is comparable, but smaller, compared to the TFP gains from minimizing regulation to frontier, which would impact the whole population of firms, therefore having larger aggregate effects.[13] The gains vary by country, with the largest gains estimated for France, where incentives are the highest, and by sectors, with construction showing the largest gains.[14] Note that while the TFP level increases in the counterfactual scenario, some low-productive firms will be forced to exit the market. The magnitude of potential transition costs from eliminating tax incentives will depend on the cyclical position and whether macroeconomic policy support is provided (IMF, 2016b and Cacciatore et. al., 2016).

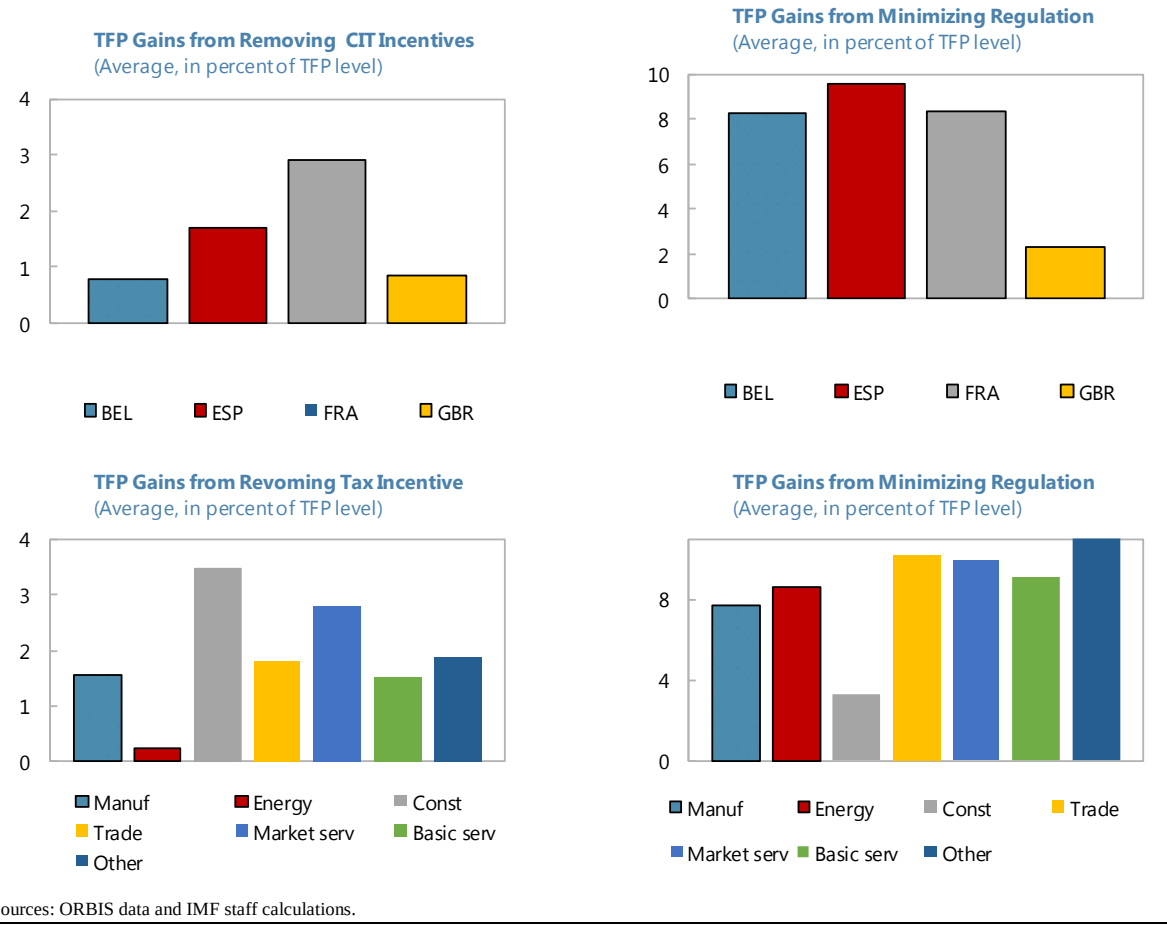
Policy makers should therefore be aware of the significant unwanted productivity effects when deciding to grant size-based tax incentives. While there might be legitimate reasons for countries to grant size-based tax incentives—to support employment, firm entry and innovation, or alleviate other constraints to firm growth, these results suggest that policy

[13] Frontier is defined as the lowest level of the PMR index among the four countries, i.e., the U.K. in 2013.

[14] Add footnote with details about counterfactual exercise.

makers should consider less distortive alternatives and design such incentives in a way that minimizes unwanted costs in terms of firm productivity and disincentive effects for firms to grow. Making these incentives temporary and ensuring that they are better targeted towards young and innovative firms, and R&D investment could help align firm incentives and encourage growth and productivity among small firms (IMF, 2016a and 2017b).

Figure 7. Counterfactual Exercise: TFP Gains



Sources: ORBIS data and IMF staff calculations.

V. CONCLUSIONS

Size-related CIT tax incentives that do not explicitly target R&D investment weigh on firm growth and productivity. Many countries aim to support smaller firms to stimulate job creation, startups, particularly because small firms are often burdened by heavy regulatory burden or financial constraints. However, size-related CIT tax policies tend to have sizeable unwanted effects. They create disincentives for firms to invest and grow and could stand in a way of efficient resource allocation, with negative implications for firm productivity and growth. These results hold even after controlling for other factors, such as the impact of product market regulation, financial constraints, firm innovation activity, and firm size and age. The results also largely hold across country sub-samples and under a number of robustness check specifications. They also indicate that size related tax incentives that do not

explicitly target R&D investment affect firm productivity by two main channels—by creating disincentives for firms to grow, and by shifting resources to less productive firms. Importantly, the impact of such incentives on productivity level and growth is smaller but comparable to the effect of financial constraints and regulatory hurdles.

Our simulations suggest that the TFP gains for SMEs from eliminating size-related tax incentives are potentially sizeable. TFP level gains for SMEs vary between 0.8 and 2.9 percent, weighted by firm employment. These gains are comparable but somewhat smaller than the gains from reducing regulatory hurdles, which would impact the whole population of firms, therefore having larger aggregate effects. However, these results do not account for potential short-term transitional costs, particularly in employment and output, which would need to be carefully managed.

These results point to several important policy implications.

- Apart from fiscal costs, size-related tax incentives that do not explicitly target R&D investment have significant disincentive effects on firm growth and productivity.

- The design of fiscal policy support to small firms should minimize potential disincentive effects. For example, making these incentives temporary and improving their design to better target young and innovative firms, and R&D investment could help reduce such disincentive effects (IMF, 2016a, IMF, 2017b).

- The magnitude of potential transition costs from eliminating such incentives in terms of employment and output in the near term is likely to be smaller during economic expansions and when macroeconomic policy support is provided (IMF, 2016b).

- In addition, tackling directly other factors that limit firm growth, including by reducing regulatory burdens and alleviating financial constraints, could help ensure a more competitive environment and restore the incentives for firms to innovate and grow.

References

Adler, G., R. Duval, D. Furceri, S. K. Çelik, K. Koloskova, and M. Poplawski-Ribeiro, 2017, "The Global Productivity Slowdown: Crisis Legacies and Other Headwinds," IMF Staff Discussion Note, forthcoming.

Aghion, P., U. Akcigit, and P. Howitt, 2013, "What Do We Learn from Schumpeterian Growth Theory," NBER WP 18824 (Cambridge, MA: National Bureau of Economic Research).

Almunia, M., and D. Lopez Rodriguez, 2014, "Heterogeneous Responses to Effective Tax Enforcement: Evidence from Spanish Firms," Oxford University Center for Business Taxation, Working Paper 14/12.

Andrews D., and F. Cingano, 2014, "Public Policy and Resource Allocation: Evidence from Firms in OECD Countries," *Economic Policy* (April), pp. 253–296.

Bank of Spain, 2015, *Annual Report 2014* (Madrid, June).

———, 2016, *Annual Report 2016* (Madrid, June).

Bobbio, E., 2016, "Tax Evasion, Firm Dynamics and Growth," mimeo, Bank of Italy.

Bouis, R., R. Duval and J. Eugster, 2016, "Product Market Deregulation and Growth; New Country-Industry-Level Evidence," IMF Working Papers 16/114 (Washington: International Monetary Fund).

Cacciatore, M., R. Duval, G. Fiori and F. Ghironi, 2016, Market Reforms in the Time of Imbalance Journal of Economic Dynamics and Control, Elsevier, vol. 72(C), pages 69-93.

Devereux, M. P., and R. Griffith, 1999, "The Taxation of Discrete Investment Choices," IFS Working Paper No. W98/16 (London: Institute for Fiscal Studies).

Devereux, M. P. and Griffith, R., (2003), "Evaluating Tax Policy for Location Decisions," *International Tax and Public Finance,* 10: 107–126.

Egger, P., Loretz, S., Pfaffermayr, M., and Winter, H., 2009, "Firm-Specific Forward-Looking Effective Tax Rates," *International Tax and Public Finance*, 16: 85–870.

European Commission, 2010, "Internationalization of European SMEs," Directorate-General for Enterprise and Industry. Available at http://ec.europa.eu/DocsRoom/documents/10008/attachments/1/translations.

Fahling, R., Gemmel, N., Kneller, R., and Sanderson, L., 2013, "Estimating Firm-Level Effective Marginal Tax Rates and the User Cost of Capital in New Zealand," *Motu Working Paper* 13–14, Motu Economic and Public Policy Research.

Gal, P., 2013, "Measuring Total Factor Productivity at the Firm Level Using OECD-ORBIS," Economics Department Working Papers No. 1049 (Paris: Organization for Economic Co-operation and Development).

Gal, P. and A. Hijzen, 2016, "The Short-Term Impact of Product Market Reforms: A Cross-Country Firm-Level Analysis," IMF Working Paper WP/16/116 (Washington: International Monetary Fund).

Garicano, L., C. LeLarge, and J. Van Reenen, 2013, "Firm Size Distortions and the Productivity Distribution: Evidence from France," NBER Working Paper No. 18841 (Cambridge, MA: National Bureau of Economic Research).

Gopinath, G., S. Kalemli-Ozcan, L. Karabarbounis, and C. Villegas-Sanchez, 2015, "Capital Allocation and Productivity in South Europe," NBER Working Paper No. 21453 (Cambridge, MA: National Bureau of Economic Research).

Guner, N., G. Ventura, and Y. Xu, 2008, "Macroeconomic implications of size-dependent policies," Review of economic Dynamics, Volume 11, Issue 4, October 2008, pp. 721–744.

Hopenhayn, H. A., and R. Rogerson, 1993, "Job Turnover and Policy Evaluation: A General Equilibrium Analysis," *Journal of Political Economy*, Vol. 101, pp. 915–938.

Hospido L., and E. Moreno-Galbis, 2015, "The Spanish Productivity Puzzle in the Great Recession," Bank of Spain, Working Paper 1501 (Madrid: Bank of Spain).

International Monetary Fund, 2015, "Obstacles to Firm Growth in Spain," Chapter 2, *Spain—Selected Issues Pape*r, Country Report 15/146 (Washington).

———, 2016a, "Fiscal Policies for Innovation and Growth," Chapter 3, *Fiscal Monitor* (Washington, April).

———, 2016b, "Time for a Supply-Side Boost? Macroeconomic Effects of Labor and Product Market Reforms in Advanced Economies," Chapter 2, *World Economic Outlook* (Washington, April).

———, 2016c, "Firm-Level Productivity and its Determinants: The Irish Case," Ireland—Selected Issues, IMF Country Report 16/257 (Washington).

———, 2016d, "Investment, Firm Size and the Corporate Debt Burden: A Firm Level Analysis of the Euro Area", Chapter 2, *Euro Area Policies*, IMF Country Report No. 16/220 (Washington).

———, 2017a, "Spain: Drivers of Firm Productivity Growth", forthcoming, *Spain 2016 Selected Issues*, Chapter 1, IMF Country Report (Washington).

———, 2017b, "Boosting Productivity: How Van Tax Policy Reduce Resource Misallocation?", Chapter 2, April 2017 Fiscal Monitor, IMF Country Report, (Washington), forthcoming.

Lanau, S. and P. Topalova, 2016, "The Impact of Product Market Reforms on Firm Productivity in Italy," IMF Working Paper, WP/16/119 (Washington: International Monetary Fund).

McKenzie, K. J., Mansour, M., Brule, A., 1998, "The Calculation of Marginal Effective Tax Rates," *Technical Committee on Business Taxation Working Paper*, pp. 97–15.

Mora-Sanguinetti, J. and A. Fuentes, 2012, "An Analysis of Productivity Performance in Spain Before and During the Crisis: Exploring the Role of Institutions," OECD Economics Department Working Paper 50 (Paris: Organization for Economic Co-operation and Development).

Organization for Economic Co-operation and Development (OECD), 2015, "Taxation of SMEs in OECD and G20 Countries," OECD Tax Policy Studies No. 23 (Paris).

Restuccia, D. and R. Rogerson, 2016, "The Causes and Costs of Misallocation," August 2016, draft paper.

Spengel, C., Endres, D., Finke, K., Heckemeyer, J., 2014, "Effective Tax Levels Using the Devereux/Griffith Methodology," Report 2014, TAXUD/2013/CC/120, Centre for European Economic Research (ZEW).

Appendix I. Methodology

The methodology used in this paper, proposed by Devereux and Griffith (2003) and extended to firm specific application in Egger et. al. (2009), considers a hypothetical investment, raising capital stock by one unit, which the firm uses for a single time period and then sells for its residual value. This requires an investment of 1 in period *t.* In period *t+1* the firm can get $(1-\delta)(1+\pi)$ for the asset, where δ is the economic rate of depreciation, and π is the inflation rate.

In equilibrium, when there are no further arbitrage opportunities (Fahling et. al., 2013), this additional capital stock should increase output in period *t+1* by $(p+\delta)(1+\pi)$, where *p* is the pre-tax real rate of return on capital. The net present value (NPV) of such an investment is

$$R^{*} = -1 + \frac{1}{1+i}[(p+\delta)(1+\pi) + (1-\delta)(1+\pi)] = \frac{p-r}{1+r}, \qquad (A1)$$

where the nominal interest rate is $i = (1+r)(1+\pi) - 1$. Simple algebra shows that the NPV of such investment does not depend on whether it is financed through retained earnings, new equity or external debt, assuming that newly issued shares are repurchased in the next period, so that the total number of outstanding shares remains constant.

If taxes are introduced, the cost of investment is now $1-A$, where *A* is the NPV of tax depreciation allowances per unit of investment, discounted by the shareholders' nominal discount rate ρ.[1] The shareholders' discount rate depends on the nominal interest rate, as well as capital gains and personal income tax rates. This paper abstracts from personal taxation issues by assuming that capital gains and income are taxed at the same rate and there is no tax credit in which case $\rho = i$. Taxes also reduce the increase in output in the next period to $(p+\delta)(1+\pi)(1-\tau)$, where τ is the corporate income tax rate.

In the presence of taxation, the NPV of future investment also depends on how it is financed. Specifically, the NPV of investment financed through retained earnings is,

$$R^{RE} = -(1-A) + \frac{1}{1+\rho}[(p+\delta)(1+\pi)(1-\tau) + (1-\delta)(1+\pi)(1-A)]. \qquad (A2)$$

Under the assumption of no tax credit, and equal taxes on income and capital gains, the NPV of investment financed through raising new equity would be the same as in A2. On the other hand, if there is debt financing, the firm has to borrow one unit of capital in period *t.* This amount would have to be repaid with interest $(1+i)$ in the next period. However, if interest payments are fully deductible from income, investment costs are further reduced by $i\tau$.

[1] The methodology for computing *A* follows Devereux and Griffith (1999). For declining balance depreciation method $A = \frac{\tau\phi(1+\rho)}{\rho+\phi}$, where τ is the corporate income tax rate, and φ is the rate at which capital expenditure can be offset against tax. For straight line depreciation: $A = \frac{\tau\phi(1+\rho)}{1+\rho}$.

Hence, compared to the case of retained earnings in (A2), the net present value of investment is different by

$$F = 1 - \frac{(1+i)}{1+\rho} + \frac{i\tau}{1+\rho} = \frac{[\rho - i(1-\tau)]}{1+\rho}. \quad (A3)$$

Thus, the after-tax NPV of investment is equal to:

$$R = R^{RE} + F. \quad (A4)$$

where F = 0, if investment is financed through retained earnings or new equity or equal to (A3), if new investment is financed through debt.

Devereux and Griffith (2003) define *marginal investment* as investment with zero after tax NPV. The cost of capital is defined as before-tax rate of return for such marginal investment, which has an NPV of zero. Using (A2) and (A4), the cost of capital is

$$\tilde{p} = \frac{1-A}{(1-\tau)(1+\pi)}[\rho + \delta(1+\pi) - \pi] - \frac{F(1+\rho)}{(1-\tau)(1+\pi)} - \delta. \quad (A5)$$

The *effective marginal tax rate* is defined as the difference between the cost of capital and the after-tax rate of return of an alternative asset over the cost of capital. In the absence of shareholder taxation, this is:

$$EMTR = \frac{(\tilde{p} - r)}{\tilde{p}}. \quad (A6)$$

Effective marginal tax rate is a measure of the impact of taxation on the scale of investment (Devereux and Griffith, 2003).

The *effective average tax rate* is defined as the difference between the pre-tax NPV of investment and the after-tax NPV of investment over the NPV of the pre-tax rate of return on capital:

$$EATR = \frac{R^* - R}{\left(\frac{p}{1+r}\right)}. \quad (A7)$$

Appendix II. Data Sources and Parametrization

The calculation of firm-specific EMTR requires firm-level information on (i) the parameters of the tax system;[1] (ii) the cost of capital;[2] (iii) the financing structure (to calculate the tax saving on debt financing); and (iv) the firm's asset composition that will define the applicable tax depreciation for tax purposes. This information is obtained or estimated using a combination of (i) assumptions that are common across all countries; (ii) country-specific information; and (iii) firm-specific information. Egger et. al. (2009) show that country specific elements are relatively important for the average tax rate, while firm-specific and industry specific effects are relatively important for the marginal rate.

Common Assumptions

In line with Egger et. al. (2009), we parameterize equations (1) through (7) as follows:

$$p = 0.2, r = 0.05, \pi = 0.02.$$

Different rates of economic depreciation are chosen for different types of assets – machinery (δ^m), buildings (δ^b), inventories (δ^{inv}), intangible assets (δ^I) and land:

$$\delta^m = 0.1225, \delta^b = 0.0361, \delta^{inv} = \delta^L = 0, \delta^I = 0.15,$$

We assume that LIFO inventory valuation methods are used throughout.

Country-Specific Information

Country specific information included thresholds for which targeted corporate income tax rates are applied, targeted and untargeted corporate income tax rates as well as tax depreciation allowances and schedules.

Information on the standard and SME-specific CIT rates and threshold for eligibility are based on the OECD Tax database. Information on tax depreciation allowances and schedules is obtained from Spengel et. al. (2014).

In all four countries, the tax code provided for lower CIT rate for small firms (Figure 5).

- In Belgium, the lowest CIT rate of 24.98 (from 2003 to 2014) percent applied to firms with earnings[3] below 322,500 euro and was applied to the first 25,000 euro of earnings.[4]

[1] Applicable CIT rate and rules of tax depreciation allowance (scheme of allowance, such as straight line or declining balance and applicable rates or number of years by sector or type of firm).

[2] pre-tax real rate of return on capital, economic rate of depreciation, inflation rate, nominal interest rate.

[3] In all cases, this paper uses EBITDA as a proxy for taxable profits due to availability of comparable data, even though the actual tax code may be somewhat more complex.

[4] Abstracting from the second targeted CIT rate, which was only very marginally lower than the headline value.

A higher rate of 31.93 percent applied to earnings between 25 and 90 thousand euro. A third rate of 35.54 percent applied to earnings between 90 and 325 thousand, with the headline CIT rate applying above that threshold.

- In France, the lower CIT rate (reduced to around 15 percent in 2002, compared to the headline rate of between 36 and 38) applied to firms with turnover less than 7.63 million euros. The lower rate applied to the first 38,120 euro of earnings.

- In Spain, the headline CIT rate between 2010–2014 varied between 20 and 30 percent, with the smallest firms (those with less than 25 employees and with turnover below €5 million) taxed at the lowest end of this range; larger SMEs were taxed at 25 percent for the first €300,000 of their profit and at 30 percent for profits exceeding this threshold, while large firms were taxed at the upper end of this range. However, this has changed with the 2015 tax reform that lowered the CIT rate to 25 percent for all firms and replaced the lower CIT rate for small firms with a 15 percent CIT rate for new firms.

- In the U.K., the lower CIT rate was applied to firms with profits below 300,000 pounds. Over time, however, the difference between headline and targeted CIT rate declined to almost zero, on account of lower headline CIT rates.

Firm-Specific Information

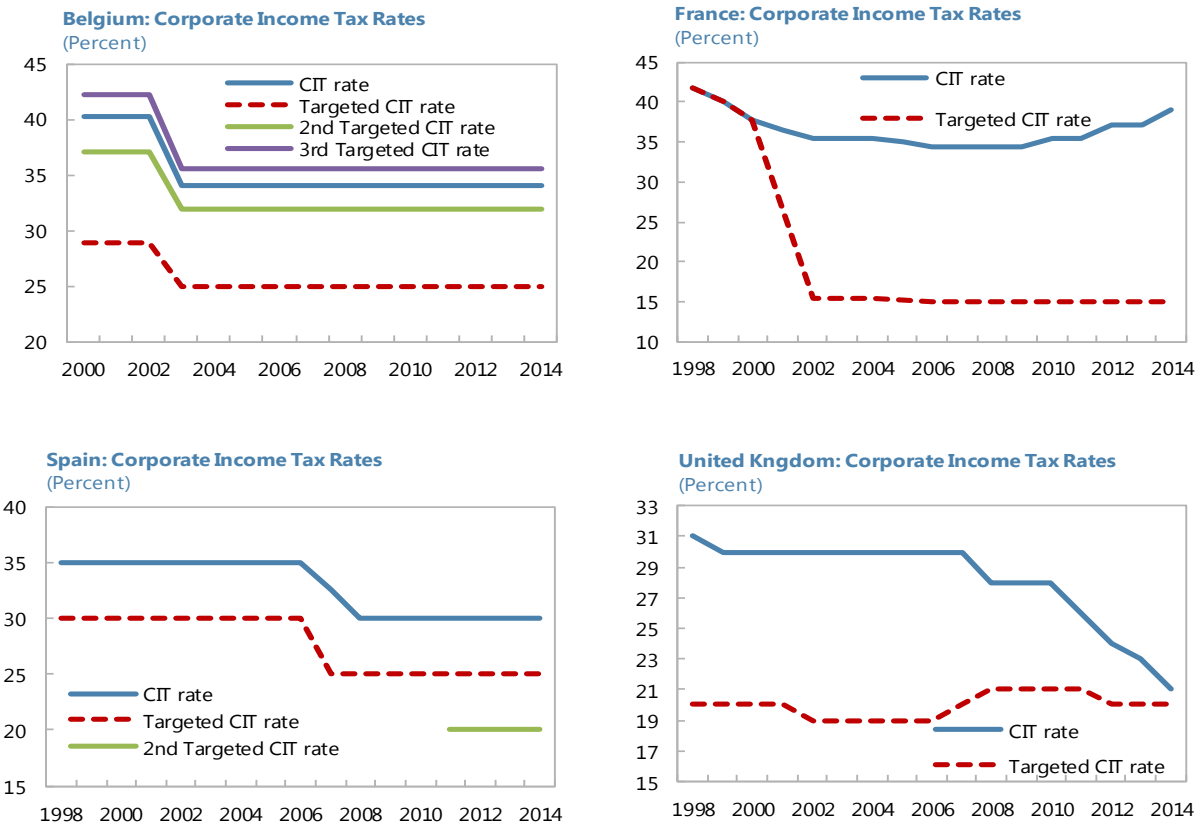
We use firm-specific information from ORBIS on individual firm balance sheets to infer their asset structure. Specifically, firm assets consist of fixed assets and other assets. Fixed assets include machinery, buildings, intangible assets and land, while other assets include only inventories. In order to decompose fixed assets into further asset categories for which different depreciation rates are applied, we first identify the share of intangible fixed assets from ORBIS and then use the asset structure found by McKenzie et.al. (1998), who decompose fixed assets into land, buildings and machinery.

McKenzie et. al. (1998) find that asset structure differs for large and small firms, where small firms are defined as firms with assets less than 100 million dollars (this threshold is different and higher than typical definitions of SMEs found in Europe). Thus the share of particular asset θ_t^x, where *x* can denote land, machinery or buildings for an individual firm at time *t* is:

$$\theta_t^x = w_s^x \times \left(1 - \frac{Intangible\ Fixed\ Assets_{i,t}}{Fixed\ Assets_{i,t}}\right) \times \frac{Fixed\ Assets_{i,t}}{Total\ Assets_{i,t}},$$

where w_s^x is the share of assets found in McKenzie et al. (1998), which differs by type of asset *x* and firm size *s*, but is otherwise the same across countries, and data on intangible fixed assets, fixed assets and total assets, which differs by firm.

Figure A2.1. Statutory CIT Rates by Country



Source: OECD, 2015.

Appendix III. Econometric Results and Robustness Checks

Table A3.1. Regressions with TFP Levels as a Dependent Variable

	(1)	(2)	(3)	(4)	(5)
	All Countries	**Belgium**	**Spain**	**France**	**United Kingdom**
Tax Incentive (EMTR)	-1.76***	-1.94***	-4.85***	-1.08***	-3.60***
Debt to Assets	-0.62***	-0.42***	-0.60***	-0.66***	-0.66***
Innovation (share of intangibles)	0.15***	-0.03	-0.01**	0.49***	0.25***
Size (lagged value added)	0.04***	-0.03***	0.05***	-0.04***	-0.08***
Regulation (turnover x PMR)	-0.01***	-0.01***	-0.02***	-0.01***	-0.01
Age (2.5-5 years)	-0.02***	-0.04*	-0.04***	0	0
Age (5-10 years)	-0.05***	-0.05	-0.05***	-0.02***	0.05
Age (10-15 years)	-0.06***	-0.03	-0.06***	-0.02***	0.1
Age (15-20 years)	-0.07***	-0.03	-0.05***	-0.02**	0.07
Age (Over 20 years)	-0.08***	-0.03	-0.04***	-0.02**	0.07
Time Dummies					
_cons	5.97***	7.17***	6.23***	7.18***	6.78***
Number of obs.	3080492	73707	2085376	848750	72659
Number of firms	804493	15942	501117	260033	27401
R-sq	0.09	0.09	0.12	0.09	0.04

Source: IMF staff calculations.

Table A3.2. Regressions with TFP Growth as a Dependent Variable

	(1)	(2)	(3)	(4)	(5)
	All Countries	**Belgium**	**Spain**	**France**	**United Kingdom**
Lagged Total Factor Productivity (TFP)	-0.80***	-0.67***	-0.80***	-0.77***	-0.97***
Tax Incentive (EMTR)	-1.82***	-2.06***	-4.98***	-1.13***	-3.60***
Debt to Assets	-0.57***	-0.33***	-0.56***	-0.58***	-0.65***
Innovation (share of intangibles)	0.14***	-0.02	-0.01*	0.43***	0.24***
Size (lagged value added)	-0.11***	-0.31***	-0.09***	-0.19***	-0.11***
Regulation (turnover x PMR)	-0.01***	-0.01**	-0.02***	-0.00***	-0.01
Age (2.5-5 years)	0.01***	0.07***	0	0.03***	0.01
Age (5-10 years)	0	0.11***	-0.01**	0.03***	0.07
Age (10-15 years)	-0.01***	0.14***	-0.01***	0.03***	0.12
Age (15-20 years)	-0.02***	0.15***	-0.01	0.03***	0.1
Age (Over 20 years)	-0.03***	0.15***	-0.01	0.03***	0.09
Time Dummies	Yes	Yes	Yes	Yes	Yes
_cons	6.66***	9.04***	6.87***	7.61***	7.04***
Number of obs.	3079338	73663	2085226	847809	72640
Number of firms	804255	15936	501100	259827	27392
R-sq	0.47	0.56	0.46	0.49	0.59

Source: IMF staff calculations.

Table A3.3. Regressions with Value Added Growth as a Dependent Variable

	(1) All Countries	(2) Belgium	(3) Spain	(4) France	(5) United Kingdom
Lagged Total Factor Productivity (TFP)	-0.25***	-0.30***	-0.26***	-0.18***	-0.32***
Tax Incentive (EMTR)	-2.28***	-2.51***	-5.98***	-1.44***	-4.20***
Debt to Assets	-0.39***	-0.12***	-0.38***	-0.29***	-0.56***
Innovation (share of intangibles)	0.13***	0.09***	0.04***	0.04***	0.26***
Size (lagged value added)	-0.63***	-0.66***	-0.61***	-0.69***	-0.76***
Regulation (turnover x PMR)	-0.02***	0	-0.03***	-0.00**	0.01
Age (2.5-5 years)	-0.06***	-0.04	-0.08***	0	-0.05
Age (5-10 years)	-0.06***	-0.01	-0.09***	0.02***	0.04
Age (10-15 years)	-0.08***	0.02	-0.09***	0.04***	0.11
Age (15-20 years)	-0.09***	0.03	-0.09***	0.05***	0.1
Age (Over 20 years)	-0.10***	0.03	-0.09***	0.04***	0.11
Time Dummies	Yes	Yes	Yes	Yes	Yes
_cons	10.75***	12.00***	11.19***	10.55***	12.88***
Number of obs.	3118893	73665	2124362	848226	72640
Number of firms	816094	15936	512743	260023	27392
R-sq	0.47	0.55	0.47	0.47	0.59

Source: IMF staff calculations.

Table A3.4. Regressions with TFP Growth as a Dependent Variable, interactions with the innovation proxy.

	All Countries (1)	Belgium (2)	Spain (3)	France (4)	United Kingdom (5)
Lagged Total Factor Productivity (TFP)	-0.80***	-0.67***	-0.80***	-0.77***	-0.97***
Tax Incentive (EMTR)	-2.09***	-2.05***	-4.96***	-1.15***	-3.68***
Debt to Assets	-0.57***	-0.33***	-0.56***	-0.58***	-0.65***
Innovation (share of intangibles)	0.09***	-0.02	0	0.43***	0.21***
Size (lagged value added)	-0.11***	-0.31***	-0.09***	-0.19***	-0.11***
Regulation (turnover x PMR)	-0.01***	-0.01**	-0.02***	-0.00***	-0.01
Age (2.5-5 years)	0.01***	0.07***	0	0.03***	0.01
Age (5-10 years)	0	0.11***	-0.01**	0.03***	0.07
Age (10-15 years)	-0.01***	0.14***	-0.01***	0.03***	0.12
Age (15-20 years)	-0.02***	0.15***	-0.01	0.03***	0.1
Age (Over 20 years)	-0.03***	0.15***	-0.01	0.03***	0.09
Time Dummies	Yes	Yes	Yes	Yes	Yes
incent_it 1/	1.37***	-0.12	-0.27***	0.10***	1.23
_cons	6.68***	9.04***	6.87***	7.61***	7.04***
Number of obs.	3079338	73663	2085226	847809	72640
Number of firms	804255	15936	501100	259827	27392
R-sq	0.47	0.56	0.46	0.49	0.59

Source: IMF staff calculations.

1/ Shows the interaction between tax incentive (EMTR) and innovation (share of intangibles).

Table A3.5. Regressions with TFP Growth as Dependent Variable, robustness checks (Sample Limited to the Vicinity of the Threshold).

	(1)	(2)	(3)	(4)	(5)
	All Countries	**Belgium**	**Spain**	**France**	**United Kingdom**
Lagged Total Factor Productivity (TFP)	-0.80***	-0.76***	-0.77***	-0.81***	-0.89***
Tax Incentive (EMTR)	-2.39***	-2.71***	-6.08***	-0.18	-2.16***
Debt to Assets	-0.43***	-0.38**	-0.43***	-0.48***	-0.47***
Innovation (share of intangibles)	0.10***	-0.09	-0.01	0.22***	0.05
Size (lagged value added)	-0.12***	-0.17***	-0.11***	-0.13***	-0.15
Regulation (turnover x PMR)	0.02***	-0.05***	0	-0.01**	0.02
Age (2.5-5 years)	0.01	-0.03	0	-0.01	0.1
Age (5-10 years)	0.02	0.06	0.03	-0.02	0.08
Age (10-15 years)	0.07*	0.21	0.08	-0.01	0.14
Age (15-20 years)	0.12***	0.34	0.14*	0.03	0.18
Age (Over 20 years)	0.14***	0.36	0.18**	0.02	0.17
Time Dummies					
_cons	5.68***	9.87***	6.09***	7.38***	6.60***
Number of obs.	32805	3124	12657	10613	6411
Number of firms	11235	859	3901	3771	2704
R-sq	0.49	0.51	0.46	0.53	0.55

Source: IMF staff calculations.

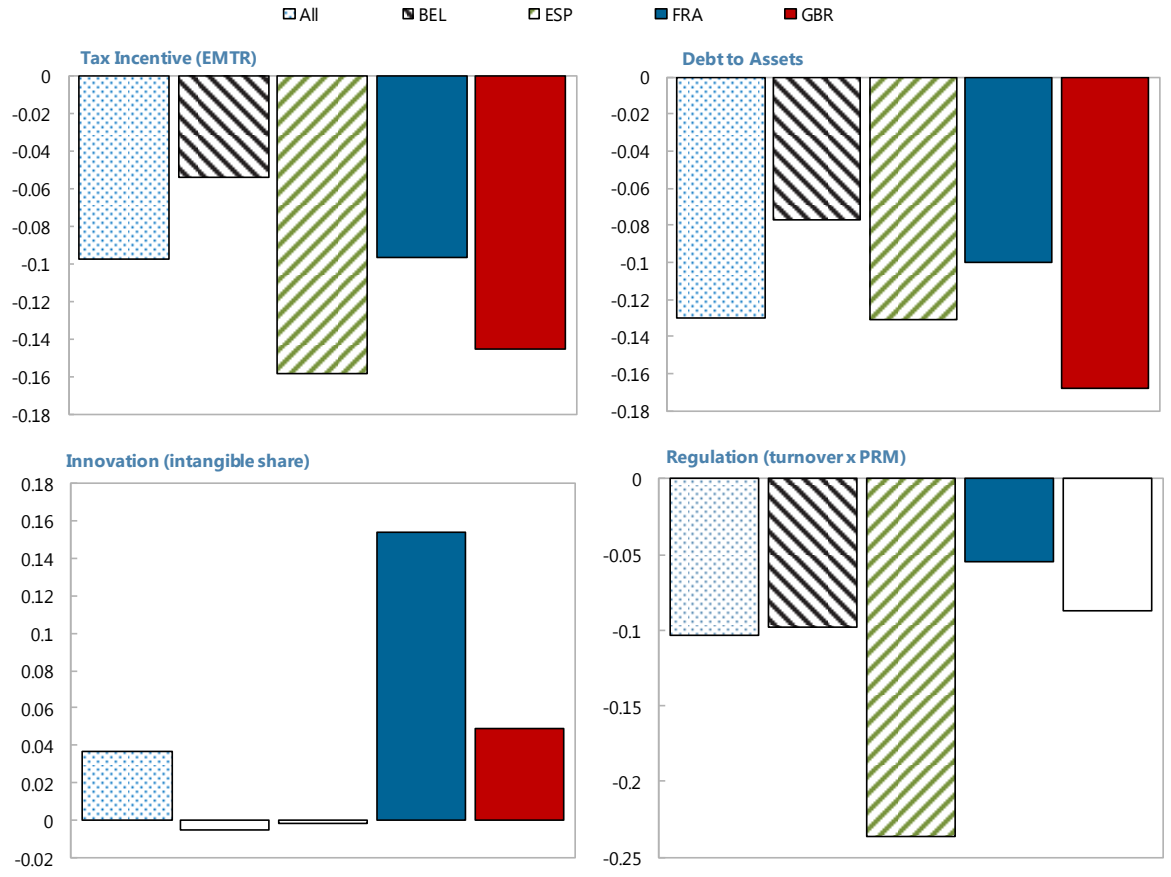
Table A3.6. Regressions with TFP Level as Dependent Variable (Sample Limited to the Vicinity of the Threshold)

	(1)	(2)	(3)	(4)	(5)
	All Countries	**Belgium**	**Spain**	**France**	**United Kingdom**
Lagged Total Factor Productivity (TFP)	-2.39***	-2.81***	-5.87***	-0.16	-2.21***
Tax Incentive (EMTR)	-0.48***	-0.44**	-0.52***	-0.50***	-0.48***
Debt to Assets	0.11***	-0.06	-0.02	0.23***	0.07
Innovation (share of intangibles)	0.02	0.04	0.04*	-0.02	-0.06
Size (lagged value added)	0.02***	-0.06***	0	-0.01**	0.03
Regulation (turnover x PMR)	-0.04	-0.06	-0.05	-0.06	0.09
Age (2.5-5 years)	-0.03	0.02	-0.02	-0.08*	0.07
Age (5-10 years)	0.01	0.15	0.03	-0.08	0.12
Age (10-15 years)	0.06	0.26	0.08	-0.04	0.16
Age (15-20 years)	0.07	0.28	0.12	-0.04	0.16
Age (Over 20 years)	0	0	0	0	0
Time Dummies	Yes	Yes	Yes	Yes	Yes
_cons	4.44***	8.00***	4.98***	6.96***	5.60***
Number of obs.	32807	3124	12657	10613	6413
Number of firms	11236	859	3901	3771	2705
R-sq	0.07	0.07	0.12	0.06	0.10

Source: IMF staff calculations.

Figure A3.1. Determinants of Total Factor Productivity

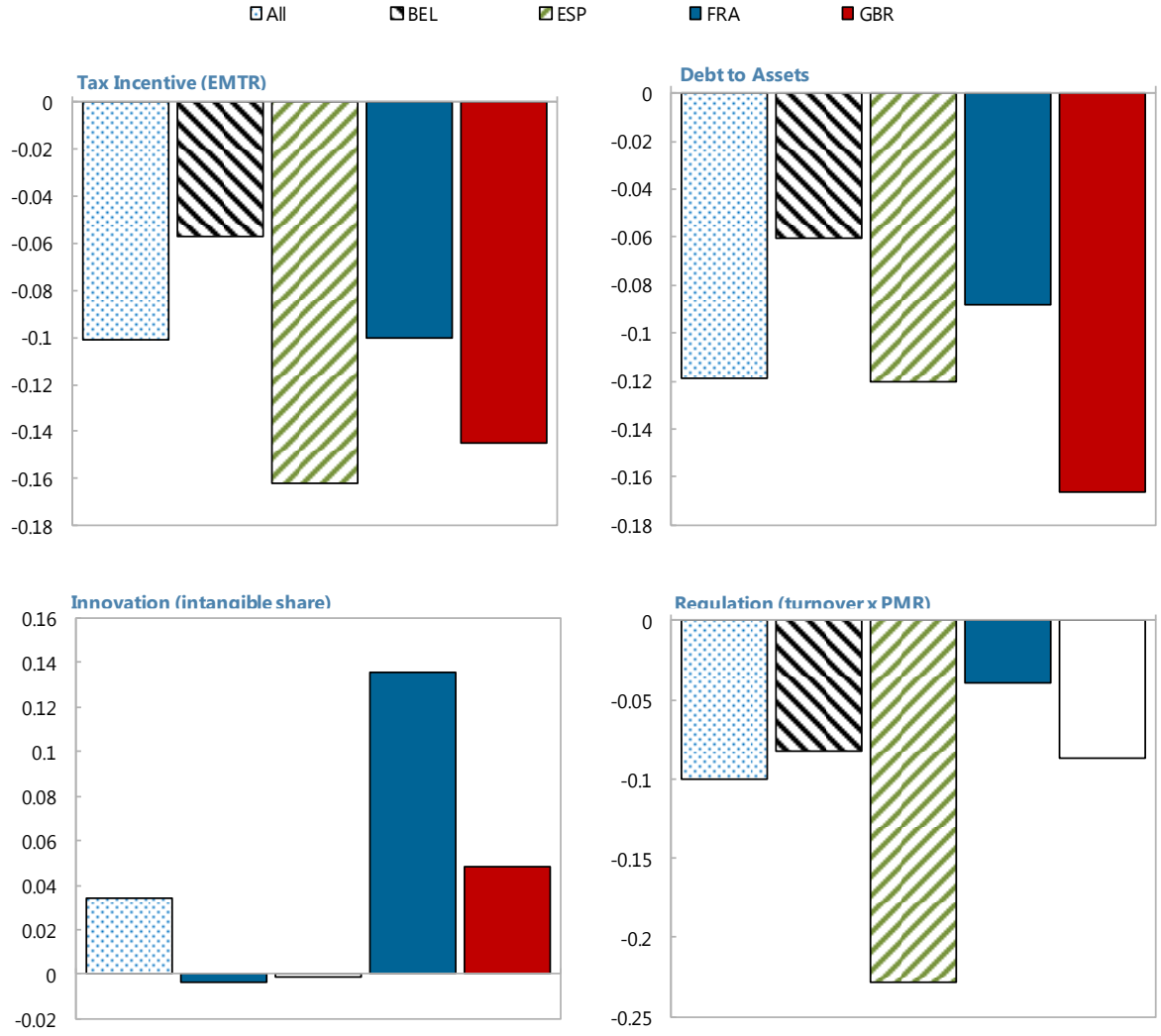
(coefficients are scaled by standard deviations of respective variables)



Sources: ORBIS data and IMF calculations.
Note: Unfilled bars indicate coefficient not statistically significant.

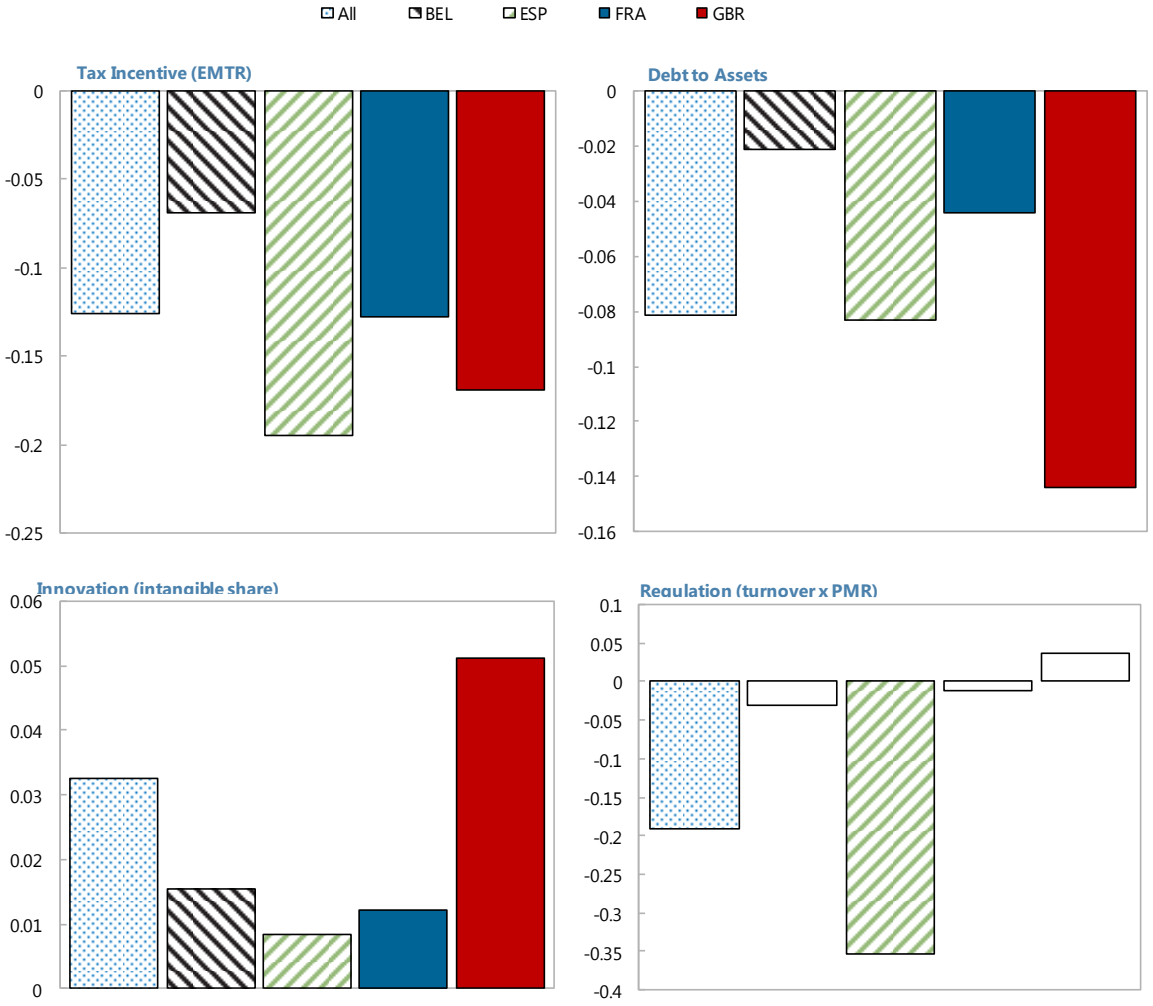
Figure A3.2. Determinants of Total Factor Productivity Growth

(coefficients are scaled by standard deviations of respective variables)



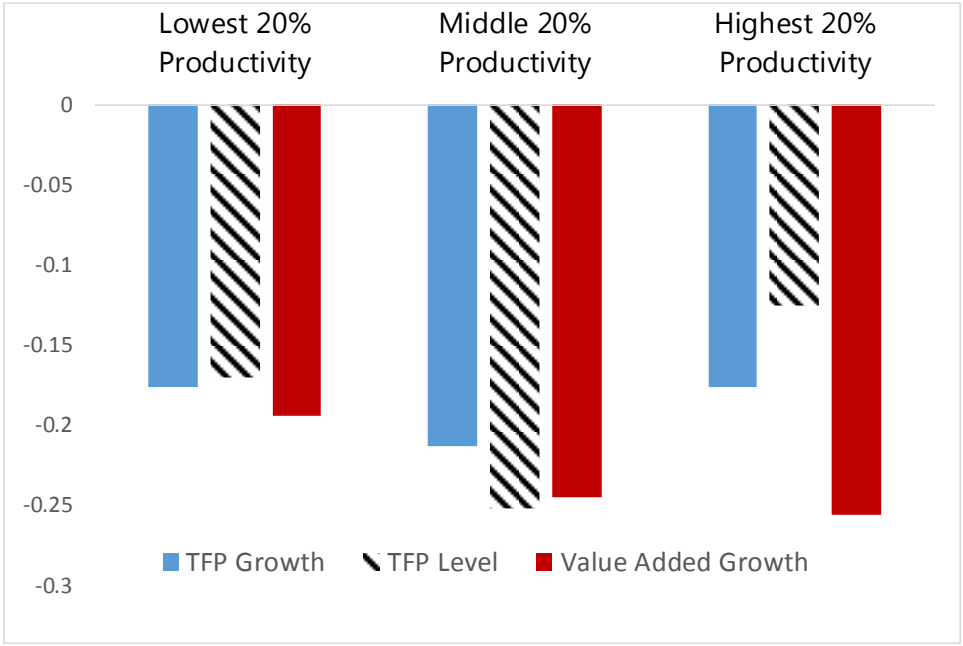
Sources: ORBIS data and IMF calculations.
Note: Unfilled bars indicate coefficient not statistically significant.

Figure A3.3. Determinants of Total Value Added Growth
(coefficients are scaled by standard deviations of respective variables)



Sources: ORBIS data and IMF calculations.
Note: Unfilled bars indicate coefficient not statistically significant.

Figure A3.4. Tax Incentives Impact by Productivity Quintile
(coefficients are scaled by standard deviations of respective variables)



Sources: ORBIS data and IMF calculations.
Note: Unfilled bars indicate coefficient not statistically significant.