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Effective corporate tax burden and firm size in South Africa

A firm-level analysis

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Abstract: We investigate the relationship between the corporate income tax burden and firm size in South Africa using a panel dataset from companies' tax returns. We find that medium-sized companies are experiencing the lowest effective tax rate, while the smallest companies are facing the highest effective tax rate.

Keywords: effective tax rate, South Africa, corporate income tax

JEL classification: H25, H26, H32

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1 Introduction

Business profit taxation recently became a topic of particular interest in Africa. The tax burden on firms is crucial for industrial development, which is one of the key components of development policy more broadly. Governments have to strike the right balance between collecting enough revenue to finance the basic functions of the state, promoting equity and redistribution in society, and building an enabling environment for businesses to prosper. Against this background, several studies have focused on the broad issue of business taxation, ranging from evaluation of fiscal incentives (Kinda 2014; Klemm 2010; Klemm and Van Parys 2012) and microeconomic evaluations of the tax burden on firms (Gauthier and Reinikka 2006; Mascagni and Mengistu 2016). Our work relates particularly to the latter and focuses on the tax burden of corporate businesses in South Africa. We build on existing literature on this topic, especially on evidence from African countries, and South Africa in particular. A key such reference is the report of the Davis Tax Committee (2015), which provides a comprehensive review of the tax system of South Africa and its links to economic growth. We build on this body of work and add to it by providing a more focused and detailed analysis of the corporate income tax (CIT) burden across the size distribution.

The focus of our analysis is twofold. First, we aim to quantify the corporate tax burden at the firm level and compare it across relevant dimensions, such as size, sector, and location. Second, we investigate the determinants of the tax burden using the available administrative data. We measure the tax burden using effective tax rates (ETRs), defined as the ratio of business profit tax to gross profit (Tax Policy Center 2010). Although this definition is in line with other studies, part of the literature has included other tax types at the numerator. Clearly, firms pay several taxes, including those on business profits, as well as value-added tax (VAT) and trade taxes, among others. Our focus on business tax is motivated by two elements. First, by modelling only one tax type, we can identify more clearly deviations of actual tax burdens from the tax code. For example, a recent paper has shown that tax systems that are designed to be proportional on paper (as CIT normally is) can actually be regressive in practice (Mascagni and Mengistu 2016). Second, this tax type is particularly important as a policy tool to promote industrial development, as many fiscal incentives across Africa exempt businesses from paying taxes on profits. In addition, corporate taxation in the global South is typically a larger contributor to total revenue than in high-income countries. For example, since 2010, CIT in South Africa is the third highest contributor to tax revenue, after personal income tax (PIT) and VAT, and accounts for almost 20 per cent of the overall gross tax revenue (SARS 2015). Therefore, in these contexts it is even more relevant to understand the determinants and distributional implications of the corporate tax burden.

Our analysis is based on the SARS-NT Firm-Level Panel (SARS-NT 2016), a dataset compiled by UNU-WIDER in collaboration with the South African Revenue Service (SARS) and the National Treasury (NT) on the basis of administrative data from tax returns. The current version of the dataset contains firm-level data of South African companies for the years 2010–13. Although further efforts are ongoing to include more recent years in the dataset, they are not yet available. This administrative dataset is likely to be the most comprehensive source of information on South African firms currently available. However, by its nature, the data includes mostly financial variables and not much information about the business (see Section 4 for more details).

Using this data, we show that, across all sectors examined, the ETR is far lower than the statutory CIT rate of 28 per cent, indicating the degree to which exemption, allowances, and, in general, all deductions reduce companies' tax burdens. We also show that a very large share (86 per cent) of tax revenues is generated by the largest taxpayers. Similar to Mascagni and Mengistu (2016), we document a U-shaped relation between ETR and firm size, with middle-sized businesses paying

the least compared to the others. In addition, our analysis looks at differences across sectors, location, and firms' characteristics such as fixed capital and leverage. Our results add to a growing body of work using administrative data in Africa. Our analysis is largely descriptive and in many cases we do not have full explanations for some of the phenomena that we document. Although our results are to be taken only as initial evidence, they provide some new insights into the corporate tax burden in South Africa.

2 Brief overview of the literature on effective tax rates

The literature has defined ETRs in various ways, which differ in terms of the type of data and the objective of the analysis, among others. On the one hand, macroeconomic studies use aggregate macroeconomic data and define the ETR as the share of total tax collection to total gross operating profit. Although this measure gives an initial indication of the tax burden in the economy as a whole, it hides important differences across firms. For example, it does not allow the investigation of any cross-firm differences in terms of size, location, or other firm-level characteristics. On the other hand, most studies focusing on the microeconomic level (i.e. firms) have used information from the financial accounts of listed companies. However, this type of data is particularly unsuitable for the African continent, where stock exchanges are either non-existent or shallow—thus capturing only a very limited selection of all firms operating in a country, if any at all. In this context, South Africa is an exception as it hosts the largest stock exchange on the continent. Nonetheless, it includes fewer than 500 firms, whereas the number of businesses operating in the country is several multiples of that number. As a response, some researchers have used survey data (Gauthier and Reinikka 2006) or various sources of administrative data (Mascagni and Mengistu 2016; Richmond and Klapper 2010) to explore the tax burden at the firm level in Africa.

In addition to the distinction between macro and micro studies, the literature on ETR presents a further distinction between backward-looking and forward-looking analyses. While the former aims at quantifying the actual tax burden that firms face using historical data, the latter usually calculates the ETR that a firm may face in the future based on the law and on the expected returns from a specific project or set of projects. By doing that, the latter does not take into account that firms differ from each other in the take-up of legal provisions—for example, some firms may not claim all the deductions they could be entitled to because they are not aware of them or do not have the capacity to do so—and in the extent to which they are able to manipulate their books to minimize their tax payments—for example, by inflating their expenses bill.¹ A final distinction, often overlapping with the previous one, is between marginal (looking at the marginal ETR that an investor can expect on an additional project) and average ETRs (representing the overall tax burden for a firm). Since the purpose of this study is to investigate the overall tax burden that firms face, as well as differences across firms, we use the backward-looking average ETR calculated using firm-level data.

Departing from the majority of the existing literature, we use administrative data from taxpayers' returns as a basis for our analysis. The main drawback of this data is that it completely excludes under-reported or unreported income, as it includes only the information that the revenue authority receives from taxpayers—except in the case of audits. Therefore, any unreported income and any firm that is fully informal (i.e. not registered) are not captured by the data. While we acknowledge this drawback, our data still allows us to quantify the tax burden for registered firms.

¹ For a more detailed distinction between various methods to measure the ETR, including backward- and forward-looking measures, please refer to Mascagni and Mengistu (2016).

In other words, it allows us to measure the formal burden resulting from taxes on business profits. The main advantage of this data is that in many African countries it represents the most comprehensive source of data on businesses, as well as the longest available time series.²

As far as the African continent is concerned, data from tax returns has only recently become available for researchers. Therefore, there are few studies to which we can directly compare our results. The ones most directly comparable to our analysis are Mascagni and Mengistu (2016), finding a U-shaped relationship between ETR and size among Ethiopian corporations, and Mascagni et al. (2016), finding that in Rwanda business taxes are more regressive in practice than they are meant to be on paper. Other studies have investigated the average ETR in African countries with, however, different definitions of ETR that make them hardly comparable to our analysis. In Ghana, Nguyen-Thanh and Strupat (2013) found a high variation from the average ETR due to the variety of tax incentives, with tax holidays and preferential income tax rates consistently reducing the tax burden. Finally, an inverse U-shaped relationship has been found by Gauthier and Reinikka (2006) in Uganda and by Gauthier and Gersovitz (1997) in Cameroon. These authors, however, used survey data, a different sample composition, and considered all types of taxes (as opposed to only CIT as in our study). Because of these differences, the results are not comparable in any straightforward way.

Our study builds on previous work on South Africa, most notably a recent World Bank study (World Bank 2015) and the report of the Davis Tax Committee (2015), although both of these studies use a different definition of ETR. The World Bank study investigated the marginal ETR, a forward-looking measure looking at the ETR on future investments and generated on the basis of legal provisions of the South African tax code (World Bank 2015). The authors found that the marginal ETR is lower than the statutory rate of 28 per cent, with an important contribution of allowable deductions, accelerated depreciation schedules, and interest deductibility in consistently reducing the tax burden. Although our results are qualitatively in line with this finding, the difference in our measure of ETR (backward-looking instead of forward-looking, average instead of marginal) does not allow a direct comparison.

The report of the Davis Tax Committee (2015) represents the most comparable analysis to our work because the authors also use a backward-looking measure of the average ETR. However, their analysis does not include a detailed investigation of differences in average ETR across the size distribution. In that sense, our work builds on this report and adds to it by providing a more detailed picture on the relation between ETR and firm size. Moreover, the key definition of ETR used in the report of the Davis Tax Committee is different from our main measure as it is calculated using companies' taxable income (gross profit less all deductions) as the denominator instead of our choice of gross profit (see Section 4). Finally, a third key reference is the yearly report published by SARS on the country's tax statistics. This report provides yet a different definition of the ETR, similar to the one used in the report of the Davis Tax Committee (2015), which again does not allow for direct comparisons with our analysis, for the same reasons discussed above.

Looking beyond the African continent, it may be useful to compare the South African case with other emerging countries that have been analysed in the broader ETR literature, which is largely focused on high-income countries. When looking at the relation between ETR and size, the two hypotheses often cited in the literature are the *political power* versus the *political cost* hypotheses (Gupta and Newberry 1997; Zimmerman 1983). The former hypothesis suggests a negative

² For a detailed discussion of the advantages and disadvantages of administrative data, see Mascagni et al. (2016).

relation due to higher bargaining power of big corporations; the latter contrarily suggests a positive relation due to the high visibility of big tax contributors. For advanced economies, the literature has so far not offered clear evidence about the relationship between firms' size and ETR. Some authors found a positive relationship (Plesko 2003; Zimmerman 1983), some others reported a negative relationship (Chen et al. 2010; Janssen 2005; Richardson and Lanis 2007). Finally, some authors found no statistical impact of firms' size on ETR (Feeny et al. 2006; Fernández-Rodríguez and Martínez-Arias 2014; Gupta and Newberry 1997).

In emerging countries, the limited empirical evidence seems to indicate that large corporations benefit from greater investments in tax-minimizing strategies and from the higher bargaining power with policy makers. In these contexts, this political power may also be due to their leading role in the development of the economy. Evidence of this political power, through which large firms can obtain lower ETRs, is available for countries in the Pacific area (Kim and Limpaphayom 1998), India (Guha 2007), Malaysia (Adhikari et al. 2006; Derashid and Zhang 2003), and China (Wang 1991). However, in China other authors (Liu and Cao 2007) failed to find a significant relation between ETR and size. Focusing on more recent studies, Wu et al. (2012) confirmed the importance of political connections and the prevalent *political power* hypothesis in China, whereas Noor et al. (2010), contrary to what was previously found in Malaysia, presented a positive relation between firms' size and ETR. Therefore, the evidence on the ETR–size relation in emerging countries remains mixed. Moreover, such a relation may be in fact more complex than the linear relation implied by the political power and political cost hypotheses. In fact, our results, along with others in the literature, provide support for a non-linear relationship.

3 Corporate taxation in South Africa

Corporate income tax represents the third highest source of tax revenue in South Africa, after PIT and VAT. The institution collecting all national taxes in South Africa is the SARS. CIT is the tax applied on companies' taxable income, defined as gross profit minus allowable deductions, credits from losses declared in previous years that can be carried forward indefinitely, and exemptions.³ Regarding deductions, companies registered in South Africa can deduct all expenditures that generate income, including interest payments on debt. Companies with their headquarters in South Africa are considered to be residents and pay taxes on their worldwide income. On the contrary, companies considered non-residents pay taxes only on their income generated in South Africa.

South African companies are required to pay at least 80 per cent of their final tax liability in two payments during the applicable year, with the discretionary decision to provide a third payment at the end of the tax year. Companies failing to pay the provisional payments are subject to penalties and payment of interest.

Since 2009, the statutory CIT rate for South African companies has been 28 per cent, with some benefits granted to the farming and mining sectors. For example, the latter that can write off 100 per cent of investments in plant and machinery in the same year they occur. Further, some sectors can have accelerated depreciation of capital assets. For a more detailed explanation of these exceptions, please refer to the SARS Tax Statistics (SARS 2016). Companies with a turnover of less than R14 million (R20 million from 2013 onwards) are classified as 'small business companies' (SBCs) and are eligible for a progressive tax regime, as well as other benefits, instead of the flat

³ In South Africa, CIT also includes the taxable proportion of capital gains tax (SARS 2016).

income tax rate.⁴ Further, micro companies (those with turnover of less than R1 million) may opt to pay only a turnover tax, a basic tax introduced in 2009 to reduce the compliance and administrative burden. SBCs are included in our sample, but micro companies are not. Despite these provisions, the report of the Davis Tax Committee (2015) and recent findings from SARS have shown high variability among sectors, questioning the progressivity and equity of the South African tax system. Tax holidays for newly registered companies are not present in South Africa.

It should be noted that, while in this paper we generically discuss businesses, firms, or companies, we are referring to a narrow definition of firms as corporations. Non-incorporated businesses in South Africa pay PIT on profits, as opposed to CIT. The PIT rate follows a different schedule than the proportional corporate rate. In the remainder of the paper any reference to business or firm uses this narrow definition.

4 Data and methodology

The dataset used in this analysis is the SARS-NT Firm-Level Panel compiled by UNU-WIDER in collaboration with the SARS and the NT. This dataset contains disaggregated data at the firm level for all corporate taxpayers in South Africa for the years 2010–13. Although more years are available in principle, they have not been compiled in a format consistent with the version of the dataset available to us at the time of analysis, and therefore cannot be included. The data includes a large number of variables mostly referring to the companies' financial situation. For example, we have data on turnover, profits, and tax payable, but we have almost no information on the characteristics of the owners. This is due to the fact that data on tax returns is collected for administrative reasons, with the aim of tax collection, and not for academic research, which would ideally require more information beyond financial variables. Although we do have some information on firm characteristics (e.g., sector, location), these often seem unreliable. An example is information on the geographical location of firms. In principle, we could obtain information about location from two sources within the dataset: the address and the tax centre where the firm is registered. However, neither of these variables seems to be sufficiently complete and reliable within this dataset, therefore forcing us to use a subsample (see below).⁵

Another implication of using administrative data is that it includes only firms officially registered with the revenue authority—thus excluding all informal firms. We also do not have any information about income that registered companies may be under-reporting. Therefore, our analysis does not provide any policy recommendation in terms of tax evasion in the form of under-reported or unreported income.

The sample available for this analysis includes 408,767 observations that report positive tax liability and positive gross profit, thus allowing us to calculate the ETR. This sample size is compatible with other studies that used the same data, which also include around 400,000 firms (Pieterse et al. 2016). By including only firms with positive tax liability and gross profit, we are excluding three types of firms: those that reported losses (both in terms of gross profit and in terms of taxable income, which would result in zero tax liability), those that reported zero turnover (i.e. nil-filers), or the ones that benefited from tax exemptions that would reduce their total CIT liability to zero.

⁴ For example, SBCs are also eligible for accelerated write-off of depreciated assets and of all plant and machinery used in manufacturing process. The top rate under the progressive tax regime is 21 per cent.

⁵ Further investigation with SARS and NT may result in a more complete location variable, but that was not available to us in the dataset used for this analysis.

Both tax exemptions and nil-filers are known to be prevalent, although data particularly on the former is lacking. In addition, we exclude a relatively small number of observations (2,803 observations) for which ETR is greater than 1, as we treat them as errors in the data.

Moreover, as mentioned above, many companies do not report information about their addresses, which we would use as an indication of their geographical location. Due to significant geographical differences highlighted in Table 1, the inclusion of region fixed effects in the regression analysis may be necessary to account for regional disparities. Once we include the location variable, our sample falls further to 141,830 observations. This dramatic reduction in the sample clearly speaks to the shortcomings of this dataset. As a robustness check, Table A4 in the Appendix reports the results of the model without region fixed effects.

Our analysis looks at the average ETR for South African companies using historical data from 2010 to 2013. We define ETR as the ratio of tax liability over gross profit. The numerator is the total tax liability due to SARS, including any amount already paid through withholding procedures and foreign tax credits. Gross profit is defined as net sales minus the cost of goods sold, where the latter includes only the cost of raw materials and intermediate goods, but excludes deductions such as depreciation, employment costs, interest payments, and other expenses. For the purpose of this analysis, using gross profit is preferable to the other options, namely taxable income and turnover: on the one hand, it is preferable to taxable income because it allows us to look at variations in the use of deductions, including take-up of, for example, legal provisions for allowances and cases of expenses inflation. Other studies have shown that inflating expenses can be a way for firms to minimize their tax burden (Carrillo et al. 2014; Mascagni and Mengistu 2016). In our case, however, our main result (a U-shaped relation between size and ETR) still holds even if we use taxable income as the denominator.⁶ This suggests that there are factors decreasing the tax burden that are not necessarily related to the tax base, but that may instead operate through the tax rate. On the other hand, using gross profits instead of turnover allows us to take into account differences in profitability across sectors. For a more detailed discussion of the options for the denominator in ETR calculation, see Lazăr (2014) and Nicodème (2002).

This definition of ETR allows our analysis to investigate the firm-specific tax burden, accounting implicitly for all laws and regulations of the country, as well as behavioural practices that may differ across companies even if they are subject to the same tax code. Unlike the marginal ETR, which typically looks at a specific project or investment, our measure identifies the overall burden of the tax on profits of the entire portfolio of projects of each company.

After the presentation of some descriptive results, we estimate an empirical model to support the findings in a multivariate framework. However, our regression analysis is largely descriptive and we do not claim to identify any causal effect. Given the U-shaped relation between tax paid and firm size, highlighted in the descriptive statistics, our main variable of interest is size and size squared. Size is defined as turnover, transformed in log to smooth the distribution and deflated using the gross domestic product deflator provided by STATS SA (2016).⁷ Our regression also includes control variables to allow us to identify the ETR–size relation once other factors are taken into account. Our control variables capture whether the firm is young (<5 years) or old (>10 years), as well as the sector and location of the company. Where possible, we also calculate a measure for capital intensity, as the proportion of fixed assets over total assets, and a measure for leverage

⁶ For a more detailed description, please refer to Table A2 in the Appendix.

⁷ Available at: www.statssa.gov.za/publications/P0141/CPIHistory.pdf.

defined as the proportion of borrowing to firms' assets. A more detailed description of all variables is available in Table A1 in the Appendix.

Given the panel structure of the dataset, we could in principle exploit both the variation between (BE estimator) and within firms over time (FEM, fixed effects model). However, since the number of observations per firm is very limited (on average 1.2), the FEM mode is not particularly suited. Therefore, we focus on the BE estimator, while the results of the FEM model are reported in Table A5 in the Appendix.

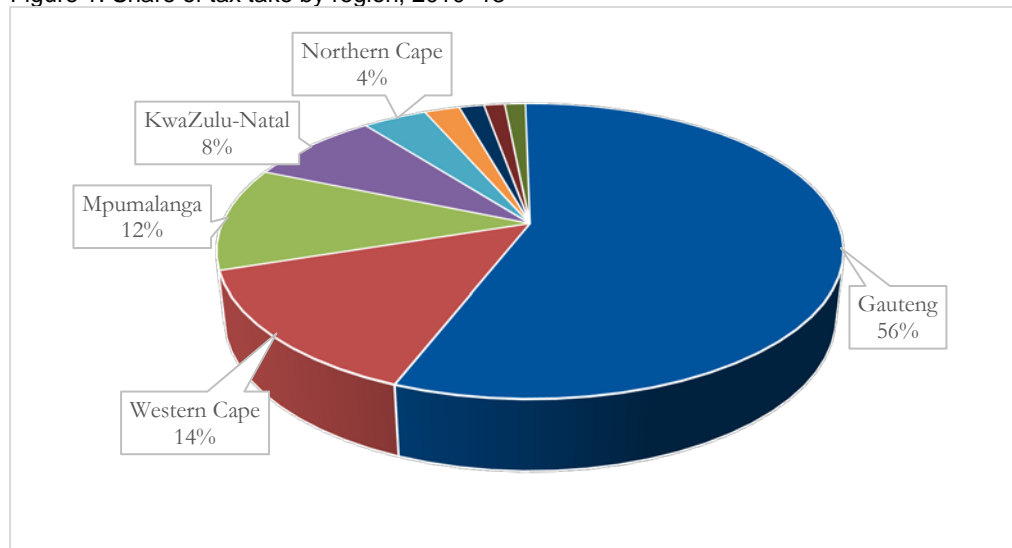
5 Results

This section starts by presenting the descriptive analysis of ETR along various relevant dimensions, including size, sector, and location, and continues by presenting the results of the regression analysis.

5.1 Descriptive analysis

As shown in Figure 1, almost half of our sample is made up of companies based in the region of Gauteng, which contribute 58 per cent of the total CIT revenue for the years 2010–13. Although Gauteng is the smallest province in South Africa, it is the most populous and the main centre of the South African economy due to the presence of Johannesburg and Pretoria.

Figure 1: Share of tax take by region, 2010–13



Source: authors' calculations based on SARS-NT Firm-Level Panel data.

Moving our focus to aggregate sectors, Table 1 presents the overall tax contribution of South African companies at aggregate level for the pooled dataset. The list of aggregate sectors follows the definition provided by SARS in the yearly tax reports, derived from the sectors at the micro level of the dataset.

Table 1: Tax contribution, aggregate sectors, 2010–13

	Tax contribution (R billion)	Share of total tax take*	Average tax per company (R million)	Average ETR
Manufacturing	130.55	33.3	0.68	5.3
Finance	71.72	18.2	0.25	8
Trade	58.72	15.1	0.24	4.6
Transport	51.85	13.4	1.14	4.5
Mining	31.92	7.5	7.65	7.8
Community, social, and personal services (CSPS)	22.54	5.9	0.19	5.2
Construction	10.99	2.9	0.12	4.9
Agriculture	7.40	1.9	0.16	6.4
Utilities	5.38	1.4	0.87	5.2
Total	392.62	16.2	0.38	5.9

Note: * Percentages might not add-up because a small number of firms do not report any sector information.

Source: authors' calculations based on SARS-NT Firm-Level Panel data.

The manufacturing sector is the top contributor to South African tax revenues, followed by finance and transport. Companies in the mining sector, which represent the fifth contributor in absolute terms, also pay by far the highest average tax per company. Looking at the ETR, companies in the finance and mining sectors face the highest ETR—almost 30 per cent higher than the average ETR for the whole sample. This seems to be at odds with tax incentives for this sector (see Section 3). However, the mining sector, along with agriculture, also presents a higher percentage of companies reporting losses.

Moving the focus of this analysis to companies' size, we split our sample into turnover deciles, calculated for each year and considering only companies with positive values of gross profit. Table 2 reports the main statistics for the years 2010–13 by turnover deciles.⁸

It is interesting to note from Table 2 how South African tax revenues primarily rely on the biggest taxpayers contributing over 90 per cent of the overall tax revenues, with a large gap between the ninth and tenth deciles. Further, South Africa's smallest companies face the highest ETR—far above the total sample average. Table 2 also shows a U-shaped relationship between ETR and the size of the companies, as illustrated in Figure 2.

⁸ For the complete table reporting all years of the analysis, please refer to Table A2 in the Appendix.

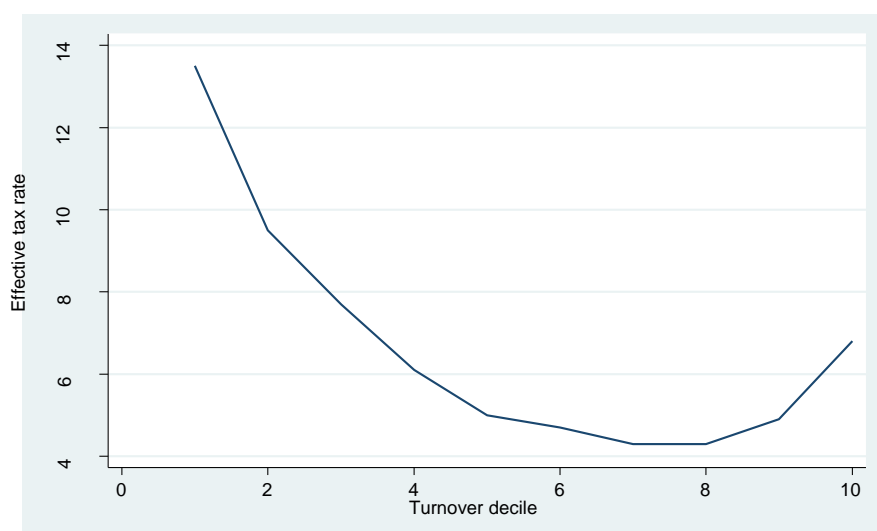
Table 2: Descriptive statistics by turnover deciles, 2010–13

Decile turnover	Tax contribution (R billion)	Share of total tax take	ETR
1	0.44	0.1	13.5
2	1.02	0.3	9.5
3	1.41	0.4	7.7
4	2.13	0.6	6.1
5	2.98	0.8	5.0
6	4.30	1.1	5.0
7	6.55	1.7	4.3
8	11.24	3	4.4
9	22.97	6.1	5.0
10	327.60	86	6.8
Total	380.64	100	6.7

Note: averages are calculated by pooling the data for all years.

Source: authors' calculations based on SARS-NT Firm-Level Panel data.

Figure 2: Average ETR by decile turnover, 2010–13⁹



Note: averages are calculated based on pooled data for all years.

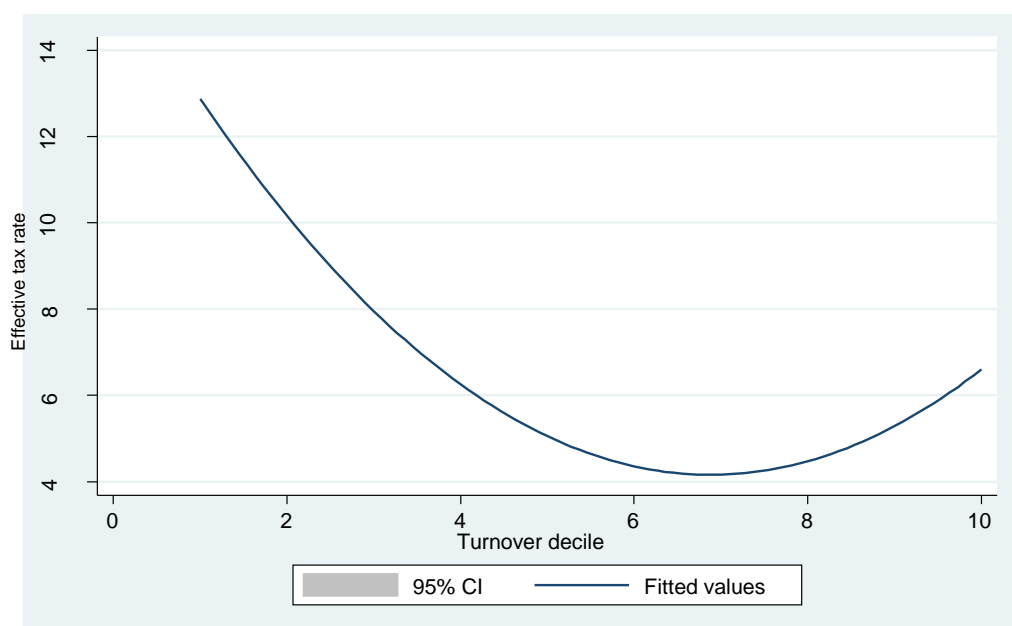
Source: authors' own elaboration based on SARS-NT Firm-Level Panel data.

As shown in Figure 2, there seems to be a U-shaped relationship between ETR and size, with companies in the middle deciles facing the lowest tax burden. This evidence is also confirmed by Figure 3, which reports the fitted values of the predicted quadratic relations between ETR and size.¹⁰

⁹ For the graphs by year, please refer to Figure A2 in the Appendix.

¹⁰ For the graphs by year, please refer to Figure A2 in the Appendix

Figure 3: ETR–size relation, 2010–13



Note: the graph is produced based on pooled data for all years.

Source: authors' own elaboration based on SARS-NT Firm-Level Panel data.

Surprisingly, companies in the low deciles are the ones experiencing the highest tax burden and they do not seem to benefit from the simplified schemes or exemptions for micro and small businesses explained in Section 3. Smaller companies, instead, face the highest tax burden, highlighting a scenario that needs further investigation.

The descriptive results are strongly suggestive of a U-shaped relation between ETR and size of company that needs to be tested in a multivariate framework to ensure it is, indeed, related to size and not to other variables.

5.2 Regression analysis

The BE estimator shows how the explanatory variables affect ETR across companies. Table 4 reports the results as follows: column 1 reports the results of the model including the variables available for all firms. Column 2 reports the results for a subset of companies for which we can calculate the indicators of capital intensity and leverage. Finally, column 3 reports the estimates of the model in column 1 for the restricted sample of column 2.

Table 3: Regression results¹¹

	BE (1)	BE (2)	BE (3)
<i>Size</i> (ln)	-6.99*** (-76.12)	-12.97*** (-28.68)	-13.28*** (-25.97)
<i>Size</i> ² (ln)	0.22*** (71.89)	0.36*** (24.70)	0.36*** (25.49)
<i>Export</i>	1.00*** (11.32)	1.14*** (7.83)	1.11*** (7.65)
<i>Old</i>	-1.02*** (18.46)	0.11 (0.75)	0.12 (2.08)
<i>Young</i>	-0.63*** (-8.61)	-0.44 (-1.71)	0.42 (0.86)
<i>Leverage</i>		-0.02*** (-4.22)	
<i>Capital Intensity</i>		-0.00 (-0.63)	
<i>Constant</i>	58.76*** (79.91)	124.49*** (26.50)	126.54*** (27.16)
<i>N</i>	141,830	21,842	21,842
<i>Adj. R</i> ²	0.092	0.051	0.051
<i>Sector fixed effects</i>	Yes	Yes	Yes
<i>Region fixed effects</i>	Yes	Yes	Yes

Notes: *t* statistics in parentheses; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Source: authors' own elaboration based on SARS-NT Firm-Level Panel.

We find strong statistical evidence of a U-shaped relationship between ETR and size of the companies in both model specifications. The negative and statistically significant coefficients of the size variable, the magnitude of which is increased with the inclusion of capital intensity and leverage, combined with the positive and statistically significant coefficients of the variable size squared, confirm what is shown by the descriptive statistics. More precisely, an increase in size for small firms is associated with a decrease of the ETR up to the minimum point of the function where the relationship between size and ETR starts increasing.

Focusing on the other variables, leverage reports a small and negative sign indicating a tax system that slightly encourages debt over equity, as expected (interest payments can be deducted, see Section 3). The coefficient on capital intensity is not statistically significant. Export has a positive and statistically significant coefficient in all three specifications. We are not sure how to interpret these results. We would have expected a negative or insignificant coefficient, being more inclined to the latter option due to the fact that in South Africa tax benefits on export operate through other channels than the CIT. A positive and statistically significant coefficient is hard to explain without further analysis. Finally, and only for the sample in column 1, both young and old firms face a lower tax burden than middle-aged ones (the excluded category). For the latter, the lower ETR can be explained by accumulated experience in filing tax returns. However, we are unsure of how to interpret this coefficient for young firms, given the absence of tax holidays for new companies (see Section 3). One speculative interpretation is that small firms have higher costs due to large investments and smaller returns, which reduce the tax burden through the tax base.

¹¹ Please refer to Tables A4–A5 in the Appendix for all results and different specifications.

Our results are hardly comparable to other studies on CIT in South Africa due to the different definition of ETR. The most similar analyses for South Africa are presented in the report of the Davis Tax Committee (2015) and by the World Bank (2015). Looking at the ratio of tax liability over taxable income, following the classic definition of ETR used also in the aforementioned publications and SARS (2015; 2016), our results still show a strong U-shaped relationship (see Table A3 in the Appendix). This result is difficult to interpret without further investigation. We can only speculate that this may be the result of factors other than the tax base, which may instead operate through the tax rate. In absence of any tax benefit or tax incentive, we would expect a constant 28 per cent flat rate for all companies, perhaps with lower tax rates for the smallest companies due to the simplified schemes and exemptions available to them. Our results are, however, directly comparable to the similar results obtained by Mascagni and Mengistu (2016) in Ethiopia. Our results show that small South African companies face the highest tax burden, whereas medium-sized companies are the ones taking greatest advantage of the tax system.

5.3 Possible explanations

We investigate possible causes that might explain this strong U-shaped relationship between ETR and firm size highlighted in our results. One explanation may be related to take-up of provisions related to expenses and deductions. Other studies in the literature have shown that compliance costs are regressive in many African countries (Coolidge 2012; Yesegat 2015), which may result in smaller firms claiming fewer deductions than they could, resulting in a higher tax burden. We investigate this hypothesis by looking at information on expenditure in our dataset, which is fairly reliable and available for roughly 60 per cent of the observations.

Figure A2 in the Appendix plots the ratio of expenditure to turnover, to check for any evidence that the U shape might be explained by a different use of expenditures and deductions. Figure A2 clearly shows a trend falling in turnover, which is consistent with economies of scale that would see costs per unit fall as firms grow. Regarding the largest companies, the explanation of the high tax burden therefore could be related to the lower expenses in relative terms than medium-sized firms. However, the explanation is not so straightforward for small companies. A possible explanation based on high compliance costs, potentially leading small companies to claim lower deductions than they could, does not seem to be supported by our data in the case of South Africa.

We therefore take into consideration companies disbursement in wages including medical, pension, and provident funds. It seems the case that companies in the lowest decile have higher labour intensity than larger companies, as highlighted in Table 4. However, due to data inconsistencies, we cannot provide further evidence about wages as a possible cause of our results.

Table 4: Companies reporting wages by turnover decile

Turnover decile	ETR			
	Companies reporting wages (%)	Companies reporting wages		Wages/gross profit (%)
		No	Yes	
1	48.4	13.49	13.37	0.61
2	52.9	9.09	10.13	0.26
3	56.3	7.25	8.25	0.24
4	59.4	5.48	6.71	0.24
5	73.4	4.42	5.23	0.27
6	95.4	7.14	4.68	0.29
7	96.3	7.00	4.20	0.30
8	96.9	7.04	4.28	0.32
9	97.3	7.58	4.88	0.35
10	97.8	9.56	6.72	0.26

Source: authors' own elaboration based on SARS-NT Firm-Level Panel.

6 Conclusions

In this paper we computed and analysed ETRs for South African corporations, defined as the ratio of tax liability over gross profit. Our results are to be taken as preliminary and initial evidence of the relationship between ETR and size. Despite the necessary caveats of our analysis, we provide some new insight on the tax burden in South Africa and we add to a growing literature using administrative data for tax research.

Our analysis focuses particularly on the relationship between the tax burden and firm size. Our main result is a U-shaped relation between ETR and size, where small companies bear the highest tax burden. The tax burden decreases to a minimum for medium-sized companies, while it increases slightly for the largest ones, which, however, still face a lower tax burden than small corporations. This U-shaped relationship is confirmed when we use a different definition of ETR, using taxable income instead of gross profit at the denominator. Consistent with other studies (Mascagni and Mengistu 2016), we have looked for an explanation by using expense data. However, in the case of South Africa, expenses do not fully explain the pattern of ETR across the distribution, especially for small corporations. Therefore, without further analysis, we are unable to explain this result in any more detail.

Moreover, we also find that tax revenue in South Africa is highly concentrated in the top decile, with 92 per cent of total revenue coming from the largest 10 per cent of firms. The sectors experiencing the highest tax burden are finance, mining, and agriculture. Finally, as expected, almost half of the total tax revenues come from Gauteng Province, the richest province in South Africa and where Johannesburg and Pretoria are located.

Although our analysis provides some initial insights into the corporate tax burden, it presents several caveats. Perhaps the most important one relates to the data. Although the SARS-NT Firm-Level Dataset is likely to be the most comprehensive source of information on corporate taxpayers, it presented a number of puzzling features that would require further investigation. For example, location information seems to be missing for most observations, thus leading to a drastic reduction of the sample when location is included in the analysis.

Furthermore, we can only compute ETRs for firms that are registered with the tax authority and that have a positive tax liability. This clearly does not capture the universe of firms in South Africa. On the contrary, it represents a rather small and selected sample. Further analysis will be needed to shed light on the nature of this selection, for example by showing how firms with a positive tax liability differ from the broader population. We acknowledge that many of the results in this preliminary analysis do not have a straightforward explanation.

Because of these caveats, we are reluctant to provide any specific policy recommendations based on this initial analysis. However, it seems necessary to investigate further the distributional implications of the corporate tax system in practice. Corporate taxation in South Africa is designed to be slightly progressive, with a proportional rate and simplified regimes for smaller companies. However, our results suggest that the practical implications may be less progressive than they are intended to be, with the smallest firms bearing the highest burden. More research is needed to identify the causes of this phenomenon and provide concrete recommendations on how to address it.

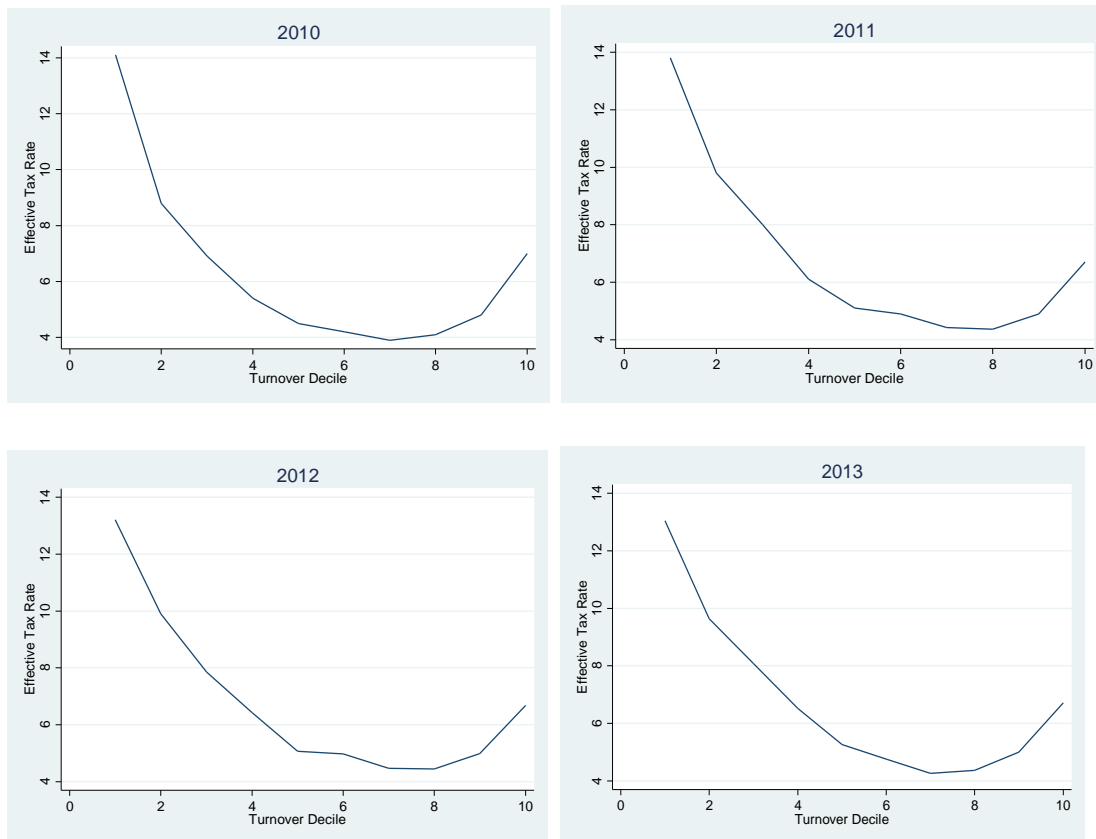
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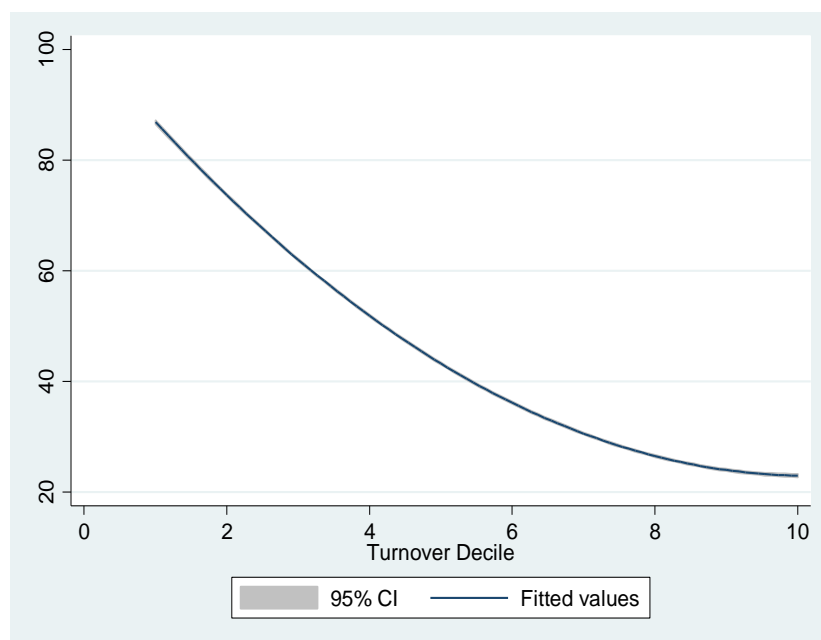
Appendix

Figure A1: Average ETR by decile turnover by year



Source: authors' own elaboration based on SARS-NT Firm-Level Panel.

Figure A2: Relation of expenditure to turnover ratio, decile turnover, 2010–13



Source: authors' own elaboration based on SARS-NT Firm-Level Panel.

Table A1: Description of variables

Variable	Description
<i>Tax</i>	Tax paid + withholding + foreign tax credits
<i>ETR</i>	Tax/gross profit
<i>Region</i>	Geographical location of the company
<i>Size</i>	Log of deflated turnover using inflation data from STATS SA*
<i>Old</i>	Companies older than ten years
<i>Young</i>	Companies younger than five years
<i>Capital intensity</i>	Value of fixed capital over total assets
<i>Leverage</i>	Borrowing as a share of firms' assets

Note: * Available at: www.statssa.gov.za/publications/P0141/CPIHistory.pdf.

Source: authors' own elaboration based on SARS-NT Firm-Level Panel.

Table A2: Descriptive statistics by turnover deciles by year

Decile turnover	Tax contribution					Share tax taken					Average tax (mill R)					Average deductions (mill R)					ETR				
	2010	2011	2012	2013	Total	2010	2011	2012	2013	Total	2010	2011	2012	2013	Total	2010	2011	2012	2013	Total	2010	2011	2012	2013	Total
1	0.09	0.12	0.13	0.11	0.44	0.1	0.1	0.1	0.1	0.1	0.01	0.01	0.01	0.01	0.01	0.14	0.10	0.12	0.08	0.11	14.1	13.8	13.21	13.04	13.5
2	0.18	0.26	0.30	0.28	1.02	0.2	0.3	0.3	0.3	0.3	0.02	0.03	0.03	0.03	0.03	0.40	0.33	0.29	0.25	0.31	8.8	9.8	9.9	9.6	9.5
3	0.27	0.37	0.40	0.37	1.41	0.3	0.4	0.4	0.5	0.4	0.03	0.04	0.04	0.04	0.04	0.70	0.54	0.53	0.46	0.55	6.9	8.0	7.8	8.1	7.7
4	0.39	0.56	0.62	0.56	2.13	0.5	0.6	0.6	0.7	0.6	0.05	0.05	0.06	0.06	0.05	1.08	0.89	0.87	0.73	0.89	5.4	6.2	6.4	6.5	6.1
5	0.60	0.77	0.85	0.76	2.98	0.7	0.8	0.8	0.9	0.8	0.07	0.07	0.08	0.08	0.08	1.56	1.36	1.35	1.18	1.36	4.5	5.1	5.1	5.3	5.0
6	0.88	1.10	1.23	1.09	4.30	1.0	1.1	1.1	1.3	1.1	0.11	0.11	0.11	0.11	0.11	2.16	2.01	2.05	1.81	2.00	4.2	5	5	5.8	5.0
7	1.41	1.63	1.85	1.66	6.55	1.7	1.6	1.6	2.0	1.7	0.17	0.16	0.17	0.17	0.17	3.11	2.91	3.02	2.78	2.95	3.9	4.4	4.5	4.3	4.3
8	2.55	2.78	3.06	2.84	11.24	3.0	2.8	2.7	3.4	3.0	0.31	0.27	0.28	0.29	0.28	4.54	4.59	4.68	4.52	4.59	4.2	4.4	4.4	4.4	4.4
9	4.93	5.87	6.44	5.74	22.97	5.8	5.8	5.7	6.9	6.1	0.60	0.56	0.59	0.58	0.58	7.44	7.71	8.55	8.32	8.04	4.9	4.9	5.0	5.0	5.0
10	72.95	87.39	98.00	69.25	327.6	86.6	86.7	86.8	83.8	86.0	8.85	8.35	9.00	7.00	8.30	101.03	90.0	102.26	74.03	91.68	7.0	6.7	6.7	6.7	6.8
Total	84.23	100.85	112.88	82.65	380.64	10.0	10.0	10.0	10.0	10.0	1.02	0.96	1.04	0.83	0.96	12.22	11.04	12.37	9.42	11.25	6.39	6.83	6.801	6.874	6.72

Source: authors' own elaboration based on SARS-NT Firm-Level Panel.

Table A3: Tax/taxable income by decile turnover

Decile turnover	2010	2011	2012	2013	Total
1	29.37	28.42	27.95	28.14	28.47
2	27.06	26.51	26.19	26.43	26.55
3	23.93	24.17	23.89	24.06	24.01
4	21.43	21.65	21.44	21.48	21.50
5	19.12	19.69	19.22	19.01	19.26
6	18.65	19.40	19.33	18.51	18.97
7	18.91	19.61	19.52	18.59	19.16
8	20.30	20.98	21.04	20.15	20.62
9	23.80	24.23	24.68	24.49	24.30
10	28.49	28.48	28.45	28.46	28.47
Total	23.11	23.31	23.17	22.93	23.13

Source: authors' own elaboration based on SARS-NT Firm-Level Panel.

Table A4: Regression results, BE with sectors

	BE (1)	BE (2)	BE (3)	BE (4)	BE (5)	BE (6)	BE (6)	BE (7)	BE (8)	BE (9)
<i>Turnover</i> (ln)	-6.99*** (-76.12)	-2.85*** (-24.64)	-12.97*** (-28.68)	-13.28*** (-25.97)	-6.99*** (-76.15)	-7.27*** (-96.42)	-8.27*** (-98.18)	-6.24*** (-40.97)	-6.37*** (-41.83)	-7.27*** (-96.43)
<i>Turnover</i> ² (ln)	0.22*** (71.89)	0.18*** (48.06)	0.36*** (24.70)	0.36*** (25.49)	0.22*** (71.92)	-0.23*** (-90.52)	-0.23*** (-82.88)	0.20*** (42.73)	0.23*** (90.54)	-0.23*** (-90.54)
<i>Export</i>	1.00*** (11.32)	1.10*** (13.34)	1.14*** (7.83)	1.11*** (7.65)	1.01*** (11.37)	-1.07*** (-14.02)	-0.75*** (-10.27)	1.15*** (13.86)	1.07*** (14.03)	-1.07*** (-14.03)
<i>Old</i>	-1.02*** (18.46)	-1.22*** (23.67)	0.11 (0.75)	0.12 (2.08)	-1.02*** (18.54)	-1.12*** (24.66)	-1.00*** (23.15)	-0.68*** (11.18)	-1.13*** (24.73)	-1.13*** (24.73)
<i>Young</i>	-0.63*** (-8.61)	-2.12*** (-33.72)	-0.44 (-1.71)	0.42 (0.86)	-0.63*** (-8.63)	-0.54*** (-10.07)	-1.40*** (-30.56)	-0.43*** (-5.40)	-0.55*** (-10.09)	-0.55*** (-10.09)
<i>Leverage</i>			-0.02*** (-4.22)					-0.03*** (-13.85)		
<i>Capital intensity</i>			-0.00 (-0.63)					-0.00*** (-6.81)		
<i>Expenses</i>		-3.07*** (-112.38)					1.31*** (103.46)			
<i>Manufacturing</i>					-1.13*** (-8.86)					-1.44*** (-13.84)
<i>Mining</i>					0.69* (2.26)					0.26 (0.85)
<i>Utilities</i>					-1.08*** (-3.51)					-1.10*** (-4.15)
<i>Constructions</i>					-1.30*** (-9.02)					-1.37*** (-12.03)
<i>Trade</i>					-1.39*** (-10.89)					-1.78*** (-17.52)
<i>Transport</i>					-1.71*** (-10.61)					-1.81*** (-14.11)
<i>Finance</i>					1.66*** (13.31)					1.42*** (14.37)
<i>CSPS</i>					-0.69*** (-5.17)					-1.20*** (-11.08)

<i>Constant</i>	58.76*** (79.91)	52.87*** (61.23)	124.49*** (26.50)	126.54*** (27.16)	59.58*** (85.26)	60.40*** (101.76)	58.71*** (90.13)	52.67*** (-42.55)	52.88*** (-42.65)	61.24*** (-108.83)
<i>N</i>	141,830	140,160	21,842	21,842	141,830	408,141	400,453	134,316	134,316	408,141
<i>Adj. R²</i>	0.092	0.168	0.051	0.051	0.092	0.098	0.141	0.061	0.058	0.098
<i>Sector fixed effects</i>	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	
<i>Region fixed effects</i>	Yes	Yes	Yes	Yes	Yes					

Notes: *t* statistics in parentheses; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Source: authors' own elaboration based on SARS-NT Firm-Level Panel.

Table A5: Regression results, FEM

	FEM (1)	FEM (2)	FEM (3)	FEM (4)	FEM (5)	FEM (6)	FEM (7)
<i>Turnover</i> (ln)	-2.15*** (-4.18)	0.99 (0.77)	6.49 (0.62)	6.64 (0.63)	-5.43*** (-10.88)	-5.55*** (-3.81)	-5.55*** (-3.81)
<i>Turnover</i> ² (ln)	0.05*** (2.54)	0.05 (1.23)	-0.19 (-0.69)	-0.20 (-0.70)	0.17*** (10.00)	0.18*** (4.15)	0.18*** (4.15)
<i>Export</i>	0.42 (11.32)	-0.53 (-1.54)	-0.28 (-0.45)	-0.26 (-0.42)	-0.02 (-0.32)	0.14 (1.16)	0.14 (1.16)
<i>Old</i>	-0.04 (0.22)	-0.23 (-1.33)	-0.70 (-1.13)	-0.68 (-1.09)	0.22*** (3.89)	-0.04 (-0.38)	-0.04 (-0.39)
<i>Young</i>	-0.10 (-0.55)	-0.65* (-2.58)	1.29 (1.40)	1.31 (1.42)	-0.26*** (-5.14)	-0.10 (-0.94)	-0.10 (-0.92)
<i>Expenses</i>		-3.89*** (-17.23)					
<i>Leverage</i>			0.02 (1.49)			0.00 (0.53)	
<i>Capital intensity</i>			0.00 (0.94)			0.00 (0.78)	
<i>Constant</i>	25.99*** (7.27)	33.39*** (3.93)	-48.31*** (-0.50)	-48.84*** (-0.51)	49.17*** (13.19)	46.35*** (3.90)	46.42*** (3.91)
<i>N</i>	141,830	140,160	21,842	21,842	408,141	134,316	134,316
<i>Adj. R2</i>	0.009	0.073	0.008	0.007	0.008	0.004	0.004
<i>Region fixed effects</i>	Yes	Yes	Yes	Yes			

Notes: *t* statistics in parentheses; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Source: authors' own elaboration based on SARS-NT Firm-Level Panel.