Does tax avoidance affect productivity in SMEs?

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Structure Abstract

Purpose

The present paper examines whether tax avoidance practices affect productivity in small and medium-sized enterprises (SMEs). This study also analyses whether this association is moderated by firm size, firm financial constraints, management control of cash flows, or information risk.

Design/methodology/approach

This study used a sample of Spanish SMEs for the period 2006-2020. Tax avoidance was measured as the difference between the statutory tax rate and the effective tax rate, and three proxies for productivity were used: overall productivity, capital productivity and labour productivity. Firm fixed effects regressions, propensity score matching and change regressions were used to address the potential sample selection bias and endogeneity between tax avoidance and productivity.

Findings

The results of the empirical analysis suggest that tax avoidance increases productivity in SMEs. This beneficial effect of tax avoidance was found to be higher in small firms than in medium-sized firms, but smaller in firms that faced financial constraints. Furthermore, the findings showed that the tax avoidance effect on productivity was stronger in firms where managers had less control over the cash flow –i.e. dividend-paying firms–, and weaker in firms with lower quality of financial information – i.e. firms with qualified audit reports.

Research implications

This study contributes to the research on the economic consequences of tax avoidance by examining its impact on firm-level productivity in SMEs. From additional analyses, the findings of the study suggest that the positive effect of tax avoidance on firm productivity

depends on firm size, the financial slack of the firm, and the costs of agency conflicts and information problems associated with tax avoidance.

Practical implications

The results of this study have implications for SMEs, suggesting that cash flows obtained through tax avoidance, if properly used, may increase firm productivity. In planning their tax avoidance practices, SME managers could take advantage of specific tax incentives designed for SMEs, which is particularly relevant given the low productivity levels of these firms. The findings also highlight the importance of maintaining high-quality information and implementing mechanisms to mitigate the agency risks associated with tax avoidance to enhance the productivity of SMEs.

Social implications

This study provides important insights to policymakers on SME tax policy, supporting the special tax rules for SMEs − in force in many OECD and EU countries− which aim to create an environment conducive to SME growth. The findings of the study also have macroeconomic implications, given the importance of firm productivity as a determinant of economic growth and the relevance of SMEs in most national economies.

Originality/value

This study provides novel empirical evidence on the effects of tax avoidance on firm-level productivity in SMEs. Despite the prevalence of SMEs as the predominant type of organization in most countries, no prior research has comprehensively examined this issue for this type of firm. This research question was addressed by considering proxies for overall, capital, and labour productivity and by examining how SME characteristics affect this relationship.

Keywords: Tax Avoidance, Productivity, Investment efficiency, SMEs.

JEL Classification: M41, M48.

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1. Introduction

This study examined whether tax avoidance affects firm-level productivity in small and medium-sized enterprises (SMEs)[1]. Productivity is a measure of the firm efficiency in the conversion of inputs into outputs and a crucial business factor at the micro level with repercussions at the macro level, mainly on growth and employment, and with huge divergences across industries and firms (Syverson, 2011)[2]. In particular, it has been documented that SMEs are on average less productive than large firms (e.g. OECD, 2021; Owalla *et al*, 2022, Chen & Lee, 2023). Tax avoidance may affect the firm productivity in two opposing directions. On the one hand, in line with the traditional view of tax avoidance, the cash tax savings are considered as an additional or alternative source of financing (e.g. Edwards *et al*., 2016), that can be used to finance productivity-enhancing activities (e.g. Fresard, 2010; Chang & Tang, 2021; Levine & Warusawitharana, 2021). On the other hand, within the agency theory framework, Desai & Dharmapala (2006, 2009) predicted that tax avoidance activities may exacerbate managerial rent extraction and information asymmetry, leading firms to make decisions that negatively affect firm productivity.

Despite the prevalence of SMEs as the dominant type of organization in most countries, to the best of the authors' knowledge, no prior paper has analysed the effect of tax avoidance on productivity for this type of firm. One previous paper that did examine

[1] In this paper, following Hanlon & Heitzman (2010), tax avoidance was considered as those practices that reduced the firm's explicit taxes, regardless of whether they were illegal practices, they were completely legal or they fell within a grey or ambiguous area of tax law.

[2] For instance, Syverson (2004) found that in the US manufacturing sector, in the same four digit SIC industry, firms in the 90th percentile had a total factor productivity which was almost double (1.92) that of those in the 10th percentile. See Syverson (2011) for a review of the factors that may explain differences in productivity across firms.

the impact of tax avoidance on firm productivity focused on listed firms (Gkikopoulos *et al*., 2021). As is well known, there are great differences between large firms and SMEs in terms of firm-level characteristics and tax avoidance practices. SMEs do not have the means to engage in aggressive tax avoidance practices (Bergner *et al*., 2017) and they face fewer agency problems between managers and shareholders (e.g. Degryse *et al*., 2012). In addition, SMEs suffer from more financial constraints and greater adverse selection than large firms (Berger & Udell, 2006; Beck *et al*., 2008; European Central Bank, 2018). Thus, in this setting, the benefits of tax avoidance are expected to outweigh the associated costs, so that cash tax savings can be used for productive projects, leading to an improvement in firm productivity. However, prior research has also shown that, compared to listed companies, private firms are less likely to mitigate investment and productivity inefficiencies due to their lower financial reporting quality (e.g. Chen *et al.*, 2011; Barrios *et al*., 2019). Therefore, the relationship between tax avoidance and firm productivity for SMEs is still an open empirical question.

In addition to examining the overall effect of tax avoidance on SME productivity, this study split productivity into capital and labour productivity. This enabled the authors to examine how tax avoidance affects the ability of SMEs to use capital and labour resources to produce output. Furthermore, the study delved deeper into this research question by examining how this association was moderated by various characteristics that prior research has shown to determine tax avoidance, such as firm size (e.g. Glover & Levine, 2023), financial constraints (e.g. Edwards *et al.*, 2016; Elbannan & Farooq, 2020), agency problems and information risk (e.g. Desai & Dharmapala, 2006, 2009; Ha & Feng, 2021).

The present paper used a sample of Spanish SMEs for the period 2006-2020. Tax legislation and productivity characteristics of Spanish firms make Spain an ideal setting

for this study. Spanish tax legislation offers SMEs, as opposed to large firms, several types of incentives– tax base, tax rate and tax credit– to reduce their standard tax rate, the highest in any EU country (European Commission, 2015). This opens up a wide range of opportunities to engage in tax avoidance, especially in relation to new investments. Moreover, Spanish SMEs are characterized by a low degree of separation between ownership and control (Hernández-Cánovas *et al*., 2016). Thus, in line with Desai & Dharmapala (2006), the agency costs associated with tax avoidance due to opportunistic behaviour of managers are low, which limits the negative effects of tax avoidance.

In terms of productivity, Spanish firms have been characterised as being smaller, less productive, and having a wider productivity gap between small and large firms than in many other European countries (IMF, 2015). International entities have also shown that there are still persistent problems with the productivity of enterprises in Spain, especially with labour productivity, due to factors such as low innovation and the low educational level of workers (Arregui & Shi, 2023). Spain, together with Italy and Portugal, belongs to a group of countries that are characterised by a high proportion of financially constrained firms (European Central Bank, 2021). This is important because the lack of access to external finance is a key determinant of the lower productivity of SMEs (Motta, 2020; Chen & Lee, 2023). Finally, in terms of the relevance in the Spanish economy, SMEs represent 99.9% of firms, while they account for 66% of total employment (Spanish Ministry of Industry, 2018).

Tax avoidance was measured as the difference between the statutory tax rate and the effective tax rate, and three proxies for productivity based on previous research were used (Jacob, 2021): overall productivity, capital productivity and labour productivity. To control for potential correlated omitted variables, such as managerial ability (Koester *et*

al., 2017), the paper ran firm fixed effects regressions. Propensity score matching and change regressions were also used to address the potential sample selection bias and endogeneity between tax avoidance and productivity.

The findings showed that, in SMEs, tax avoidance was associated with higher productivity: overall, capital, and labour. These results were robust to the use of different estimation methods: firm fixed effect regressions, propensity score matching and change regressions. In additional analyses, the results suggested that the relationship between tax avoidance and productivity in small firms was stronger for labour productivity. Furthermore, financial constraints were found to reduce the positive effect of tax avoidance on productivity. Finally, the effect of tax avoidance on productivity was stronger in firms with less manager control of cash flows due to dividend payments, whereas poor financial information, measured as audit qualifications, reduced the tax avoidance effect on productivity.

This study contributes to the literature on the real effects of tax avoidance. As Jacob (2022) pointed out, in this albeit extensive literature little attention had been paid to the role of tax avoidance on productivity, capital investment, and labour investment, which are key drivers of aggregate economic growth (e.g. Solow, 1957). To fill this gap, this study provided novel empirical evidence on tax avoidance and firm productivity with a focus on SMEs. Consequently, the findings also complement the literature that examines the use of cash tax savings by firms (e.g. Guenter *et al*., 2020; Green & Kerr, 2022), in general, and the association of corporate tax avoidance with investment efficiency (e.g. Khurana *et al*., 2018; Asiri *et al*., 2020; Ha & Feng, 2021), in particular. Similarly, since firm productivity is a measure of firm-level performance, the present paper also complements studies on the impact of tax avoidance on firm value (e.g. Desai &

Dharmapala, 2009; Drake *et al*., 2017; Akbari *et al*., 2018; Hasan *et al*., 2021), which is the main proxy for firm performance, but difficult to estimate for SMEs. Within the theoretical and empirical debate on whether tax avoidance can be regarded as a potentially value-enhancing or risk engendering decision, the findings of this study support the former view by providing evidence of a positive impact of tax avoidance on firm productivity for SMEs.

Moreover, by shedding light on the effects of tax avoidance on capital and labour productivity in various settings defined by firm characteristics, this study extends the literature that investigates the influence of the tax policy and corporation tax on firm productivity (e.g. Romero-Jordán *et al.*, 2020; Liu *et al*., 2022; Hosono *et al*., 2023). Finally, this study also contributes to the research on SME productivity, which has received increased attention since mid-2000, as a result of the slowdown in firm productivity levels since the Great Recession (e.g. Owalla *et al*., 2022; Chen & Lee, 2023).

Regarding its practical implications, this study may be of interest to SME owner/managers and policymakers. The findings suggest that SME managers may design tax-avoidance planning to improve firm performance, which is especially relevant due to the low productivity level of these firms. This study also provides important insights to policymakers about SME tax policies, supporting the special tax rules for SMEs − in force in many OECD and EU countries− which aim to create an environment conducive to SME growth. Finally, the findings also have macroeconomic implications, given the importance of firm productivity as a determinant of economic growth and the relevance of SMEs in most national economies.

The rest of the study proceeds as follows. Section 2 presents the literature review and the hypothesis development, Section 3 discusses the research design, Section 4 reports the empirical results, and the final section concludes.

2. Prior research and hypothesis development

Research on tax avoidance is embedded in the theoretical framework of agency theory. In this framework, managers act as agents for the owners, but in making decisions they may pursue their own interests rather than those of the owners (moral hazard), leading to an agency conflict (Jensen & Meckling, 1976), When managers are aligned with the interests of owners, in line with the traditional view of tax avoidance, corporate tax savings can be used to fund value-creating activities, leading to an increase in shareholder wealth (e.g. Desai & Dhamarpala, 2009; Blaylock, 2016). However, complex tax avoidance practices may be used to increase the opacity of the financial information (Balakrishnan *et al*., 2019) in order to hide tax aggressive activities from the tax authorities (Mills, 1998; Hanlon *et al.*, 2017). A less transparent external information environment can be exploited by managers using tax savings for their own benefit, diverting these resources from maximising shareholder wealth (Desai and Dharmapala, 2009). As a consequence, tax avoidance may also create adverse selection problems for financial fund providers (e.g. Hasan *et al.*, 2014; Shevlin *et al.*, 2020) and loss of corporate reputation (Gallemore *et al*., 2014).

The literature on the real effects of tax avoidance has assumed this cost-benefit framework to examine the consequences of tax avoidance on firms' investment efficiency (e.g. Blaylock, 2016; Khurana *et al*., 2018; Asiri *et al*., 2020; Ha and Feng, 2021), financing conditions (e.g. Hasan *et al*., 2014; Goh *et al*., 2016; Shevlin *et al*., 2020;

Sánchez-Ballesta & Yagüe, 2023), and firm value (e.g. Desai & Dharmapala, 2009; Drake *et al*., 2017; Akbari *et al*., 2018; Hasan *et al*., 2021). Similarly, the impact of tax avoidance on firm productivity may depend on the trade-off between the positive effects of tax avoidance − the use of the tax savings for productivity-enhancing activities−, and its negative effects, such as the creation of a shield for managerial opportunism and the diversion of rents (Desai & Dhamarpala, 2009).

From the perspective of tax avoidance as an economic-value-adding activity, several prior studies have shown that cash tax savings can improve credit quality, reduce firm default risk and the cost of debt and equity, and increase future firm performance (e.g. Blaylock, 2016; Goh *et al*., 2016; Lim, 2011; Koverman, 2018; Sánchez-Ballesta & Yagüe, 2023). In this context, tax avoidance would be associated with lower financial frictions, which would favour firm productivity growth (Levine & Warusawitharana, 2021). Thus, firms can use cash tax savings to finance investments or activities that increase their productivity and competitiveness, such as efficient physical investments, innovative projects, R&D, information technology, advertising expenses, hiring more productive employees, or employee training (Fresard, 2010; Chang & Tang, 2021; Levine & Warusawitharana, 2021).[3]

In contrast, previous research has also shown that tax avoidance can have negative effects on firm efficiency. Several studies have shown that cash tax savings can be misused by managers, who may divert these corporate resources for their personal benefit (e.g. to increase compensation) or to make sub-optimal investment decisions (Desai &

[3] Previous research has shown that corporate tax burdens reduce capital investment, R&D investment, and product innovation (Djankov *et al*., 2010; Mukherjee *et al*., 2017). Tax burdens reduce the profitability of investment and make it more difficult to finance investment projects, which has a negative impact on productivity growth (Romero Jordán *et al*., 2020).

Dharmapala, 2006, 2009). Hence, managerial opportunistic behaviour may lead firms to situations of overinvestment or underinvestment (e.g. Khurana *et al.*, 2018) that may affect productivity. However, the previous studies that have examined the relationship between tax avoidance and investment efficiency produced mixed evidence. Blaylock (2016) failed to find a significant association between tax avoidance and overinvestment. Other studies have shown that the relationship between tax avoidance and investment efficiency is moderated by managerial ability and corporate governance (Khurana *et al*., 2018) or the quality of the firm information environment (Asiri *et al*., 2020; Ha & Feng, 2021).

Furthermore, lenders may perceive tax avoidance as a risk-increasing rather than a value-adding business decision. In this line, prior studies have documented that the costs associated with tax avoidance (i.e. the risk of managerial rent extraction, informational opacity, audits and penalties by tax authorities, and reputational costs) increase the cost of debt and tighten debt covenants (e.g. Hasan *et al*., 2014, Shevlin *et al*., 2020). Previous studies have shown that a more severe tightening of credit conditions leads to a decline in firm productivity growth, with this effect being stronger for firms in a weaker financial situation (e.g. Duval *et al.*, 2020). Finally, the uncertainty about future payments associated with tax avoidance (e.g. fines, penalties, or additional taxes) may lead firms to forgo productive investment in order to maintain an abnormal amount of precautionary cash holdings (Hanlon *et al*., 2017).

To date, to the best of the authors' knowledge, the only empirical evidence on the effect of tax avoidance on firm productivity was provided by Gkikopoulos *et al*. (2021) for a sample of US-listed firms over the period 1994 to 2017. They found that firms with higher levels of tax avoidance were more productive, suggesting that the marginal

benefits of tax avoidance were higher than its costs for their US sample. They also found that the positive relationship between tax avoidance and productivity was stronger for financially constrained firms. However, the focus of the present paper is on SMEs, which the authors consider relevant due to the low productivity levels that characterise these types of firms (e.g. Motta, 2020; Chen & Lee, 2023) and the negative impact of taxes on productivity growth in small firms (Romero-Jordán *et al*., 2020).

The case of SMEs is clearly different from that of large firms. On the one hand, the financial constraints that they face – adverse selection, limited access to the capital market– and their dependence on bank credit (Berger & Udell, 2006; Beck *et al*., 2008; European Central Bank, 2018) make cash savings extremely advantageous and investment sensitive (Fazzari *et al*., 1988; Whited, 1992). Due to the high concentration of ownership in SMEs, the existence of agency conflicts and the risk of managerial rent diversion, cash flow problems are lower in SMEs than in large listed firms (e.g. Degryse *et al*., 2012). Furthermore, the tax avoidance practices implemented by SMEs are less complex than those of large firms (European Commission, 2015), which would suggest that the costs associated with tax avoidance are not high for SMEs. This, together with the characteristics of the SMEs mentioned above, may lead to tax savings being reinvested in productivity-enhancing activities.

On the other hand, SME management is less professionalized than that of large firms− SME directors usually have less experience, more limited knowledge and fewer skills (Gorman & Sahlman, 1989). SMEs also have a lower financial reporting quality, which can negatively affect investment efficiency (Biddle *et al*., 2009; Chen *et al.*, 2011) and firm productivity (Barrios *et al*., 2019). In addition, SMEs that benefit from favourable tax incentives may have an incentive to forego growth in order to avoid paying more taxes

(OECD, 2015). As a result, the inefficient use of free cash flows − e.g. managers extracting rents, undertaking value-destroying projects, or maintaining high levels of precautionary cash holdings instead of investing in productive projects− may also occur in SMEs.

Based on the above discussion of the potentially countervailing effects of tax avoidance on productivity, the following null hypothesis is proposed:

H1: Tax avoidance is not related to productivity in SMEs

3. Research design

2.1. Regression models and variable definitions

The hypothesis on the association between tax avoidance and productivity was tested with the following cross-sectional regression model:

$$Productivity_t = \beta_0 + \beta_1 TAXAV_t + \sum_i \beta_i Controls_t + \mu + \eta + \varepsilon_t, \quad (1)$$

where *Productivity* represents the three different proxies for productivity, *TAXAV* refers to tax avoidance measures, *Controls* are the firm-level control variables considered, μ are industry-year fixed effects; η are firm fixed effects, and ε is the error term. The model was estimated with firm fixed effects using *t*-statistics based on standard errors clustered at the firm level which are robust to both heteroskedasticity and within-firm serial correlation (Petersen, 2009; Goh *et al*., 2016). This estimation method and the variables included in the model allowed the researchers to control for time-varying heterogeneity across industries and unobservable firm characteristics that vary across firms but were time-invariant for each firm. This helped to mitigate endogeneity concerns arising from time-invariant omitted variables.

Productivity measures were based on previous research (Jacob, 2021). Specifically, to estimate the overall productivity (*ALL_PR*), the following model was run:

$$VAD_t = \beta_0 + \beta_1 \ln (FXA)_t + \beta_1 \ln (TWG)_t + \varepsilon_t, \quad (2)$$

where *VAD* is *Value Added*, defined as the natural logarithm of earnings before tax plus depreciation and total wages, *FXA* are fixed assets, and *TWG* are total wages. Model (2) was estimated cross-sectionally for each year-industry, requiring a minimum of 15 observations per each regression. The industry groups were based on the Spanish National Classification of Economic Activities (CNAE) at the 1-digit level. For each firm-year, the residuals from the model (2) regressions represented the overall productivity (*ALL_PR)*. *Capital Productivity* (*CAP_PR*) and *Labour Productivity* (*LAB_PR*) were estimated in a similar way. Thus, *CAP_PR* was calculated as the residual from the regression of *Value Added* on the natural logarithm of fixed assets, and *LAB_PR* as the residual from the regression of *Value Added* on the natural logarithm of total wages.

Tax avoidance (*TAXDIF*) was measured as the difference between the statutory tax rate that corresponded to a firm-year observation and its effective tax rate (ETR).[4] The ETR was calculated as tax expense over pre-tax income and, as in previous studies, only positive values of pre-tax income were considered and the observations of ETR outside the interval [0,1] were truncated to avoid confusing interpretations of ETR (Dyreng *et al.*, 2008; Chen *et al.*, 2010; Koester *et al*., 2017). A long-run measure of tax avoidance was also used, *TAXDIF3y*, as an average of three consecutive years of *TAXDIF* (Dyreng *et*

[4] The normal tax rate for Spanish companies was 35% until 2006, 32.5% in 2007, 30% from 2008 to 2014, 28% in 2015 and 25% from 2016 to 2020. In the Basque Country the special tax rate for general companies was 28% until 2017, 26% in 2018, and 24% in 2019 and 2020, whereas in Navarre, the special tax rate for general companies was 28% in the period 2005-2020. A progressive schedule with a reduced (top) tax rate of 30% (35%) in 2005 and 2006, 25% (30%) from 2007 to 2014, and 25% (28%) in 2015 was applied to small Spanish firms. In the Basque Country the special tax rate for small firms was 24% until 2017, 22% in 2018, and 20% in 2019 and 2020, whereas it was 23% in Navarre from 2005 to 2020.

al., 2008; Koester *et al.*, 2017). By definition, higher values of *TAXDIF* and *TAXDIF3y* indicate higher levels of tax avoidance.

Control variables were included in model (1) following prior studies on productivity (e.g. Gkikopoulos *et al.*, 2021; Jacob, 2021, Chen & Lee, 2023). To control for whether firm rigidity might affect productivity, the following variables were included: firm size (*SIZE)*, measured as the natural logarithm of sales; firm age (*AGE*), measured as the natural logarithm of the years since the inception of the firm plus 1; firm growth (*GROW*), calculated as the increase in sales from *t*-1 to *t* divided by sales in *t*-1; and the level of investment (*INVEST*), proxied by capital expenditures deflated by lagged total assets. To capture the impact of financial constraints on productivity, the study included the following variables: return on assets (*ROA*), calculated as the ratio of operating income over total assets; leverage (*LEV*), calculated as the ratio of debt to total assets; and cash holdings (*CASH*), calculated as the ratio of cash and cash equivalents to total assets. Volatility of sales, σ(*SALES)*, calculated as the standard deviation of sales over assets between *t*-2 and *t*, was also included to control for firm risk, which might have affected the information environment, the cost of capital and the investment decisions.

3.2. Sample

The data for this study were obtained from SABI (Bureau van Dijk) for the period 2004-2020. The sample was selected according to the criteria of the European Commission (Regulation 2014/651, June 2014, and Recommendation 2003/361, May 2003), which defines SMEs as firms "which employ fewer than 250 persons and which have an annual turnover not exceeding EUR 50 million, and/or an annual balance sheet total not exceeding EUR 43 million". Micro-enterprises, defined as those with fewer than 10

employees and whose annual turnover and/or annual balance sheet total does not exceed EUR 1 million and EUR 2 million, respectively, were excluded from the sample.

The initial sample consisted of 620,441 firm-year observations (70,883 firms). Observations with errors were dropped (e.g. positive expenses or negative asset values) and the sample was reduced to 600,342 firm-years (70,013 firms). Subsequently, the variables for the study were computed. The proxies for tax avoidance required positive values of pre-tax income, and the estimation of some variables, such as the standard deviation of sales, required values in *t*-1 and *t*-2. Thus, the sample period effectively covered the period 2006-2020 with a sample reduced to 407,066 observations for the productivity variables and 305,473 observations for the tax avoidance variables. Finally, outliers were removed by winsorizing key variables (i.e. productivity, tax avoidance, size, age, profitability, growth, leverage, investment, cash flow, sales volatility) at 1% and 99%. As a result, the final sample consisted of 227,368 firm-years (47,771 firms) for the period 2006-2020.

4. Empirical results

4.1. Descriptive statistics

Table 1 shows the descriptive statistics of the variables used in the analyses. The average (median) overall productivity in the sample was 0.085 (0.027), with figures of 0.139 (0.101) for capital productivity and 0.089 (0.026) for labour productivity. These values were similar to those found by Jacob (2021) for Swedish firms, reflecting the higher productivity of capital compared to labour. The zero median values of *TAXDIF* and *TAXDIF3y* and the dispersion of these variables showed that the sample included firms that engaged in tax avoidance (positive values in *TAXDIF* and *TAXDIF3y*) and firms that

did not engage in tax avoidance (negative values in *TAXDIF* and *TAXDIF3y*). Regarding the control variables, the average *SIZE* was 8.47, which corresponded to an average turnover of 6.77 million euros. The average of *AGE* in the sample was 3.09, which corresponded to 23.4 years. The average firm in the sample was profitable (average *ROA* of 8.06%, as for the calculation of *TAXDIF* only firms with positive pre-tax profit were included). The average annual growth in sales was 4.64% and the average growth in capital expenditure to assets was 1.09%. The average debt to assets ratio was 49.4% and the average level of cash on the balance sheet was 13.6%.

[INSERT TABLE 1]

Table 2 reports the correlation matrix between all the variables. Productivity variables showed positive and significant correlations with each other, as did tax avoidance variables (at the 1% level). For the research question, tax avoidance variables were positively correlated (at the 1% level) with productivity variables. As expected, firms that were larger, more profitable and with more growth had higher productivity (correlations significant at the 1% level), while firms with higher leverage had lower productivity (at the 1% level). In general, the correlations between the independent variables ruled out any problem of collinearity that could have affected the regressions.

[INSERT TABLE 2]

4.2. Main analysis

4.2.1. Firm fixed effect regressions

Table 3 reports the results from the firm fixed effects estimations of model (1) for the three productivity variables (overall, capital, and labour) and for the two proxies for tax avoidance (*TAXDIF* and *TAXDIF3y*). The coefficients on *TAXDIF* and *TAXDIF3y* were

positive and significant at the 1% level, indicating a positive effect of tax avoidance on overall, capital and labour productivity. These results are consistent with those of Gkikopoulos *et al*. (2021) for a sample of U.S. public firms, confirming that tax avoidance is also a value-creating activity for SMEs. They are also consistent with the negative effect of the corporate tax rate on productivity found by Romero-Jordán *et al.* (2020).

Regarding the control variables, larger and more profitable SMEs, and those with larger cash holdings were more productive (associations were significant at the 1% level). The positive associations of size and profitability with productivity have also been found in previous literature (Gkikopoulos *et al.*, 2021). This is consistent with the existence of economies of scale and with greater investment opportunities for firms that generate more internal funds and, therefore, have more financial slack to finance their projects. This was further supported by the positive effect of cash holdings on productivity. In contrast, firms with higher leverage, higher sales volatility and higher capital expenditures were less productive (at the 1% level, except for a model of labour productivity for *INVEST*, which was significant at the 5% level). Financial constraints, as indicated by high leverage, and business risk (sales volatility) could explain these associations. The lower productivity of firms that had invested more in capital could be explained by situations of overinvestment in SMEs. In general, older firms had higher capital and labour productivity, while the results for sales growth were inconclusive.

[INSERT TABLE 3]

4.2.2. Control for reverse causality

It is very difficult to establish a causal link between tax avoidance and productivity because reverse causality may affect the relationship between tax avoidance and

productivity, i.e. productivity levels may determine the engagement in tax avoidance. For instance, low-productivity firms may find in tax avoidance the alternative financial resources they need to survive and to increase their productivity (Gkikopoulos *et al*., 2021). In addition, firm characteristics such as industry, size or profitability, which may determine productivity may also be correlated with tax avoidance. To address concerns about reverse causality and sample selection this study employed two sensitivity tests: a propensity score matching method (Rosenbaum & Rubin, 1983; Smith & Todd, 2005) and a change analysis.

For the propensity score matching method, firms were classified into tax aggressive (those that engaged in tax avoidance) and non-tax aggressive (those that did not engage in tax avoidance). This study considered tax aggressive (non-tax aggressive) firms those firm-years with positive (zero or negative) values of *TAXDIF* and *TAXDIF3y*, respectively. A probit regression was used to estimate the probability of a firm being tax aggressive/non-tax aggressive conditional on firm characteristics: size, age, ROA, growth, capital expenditures, leverage, cash holdings and industry-year dummies. Then, based on the probability (score) obtained in the probit regression, each tax aggressive firm was matched with the closest non-tax aggressive firm. Finally, the difference in productivity variables between tax aggressive and non-tax aggressive firms was estimated.

Panel A of Table 4 shows the results of the probit models for *TAXDIF* and *TAXDIF3y*. Firms that were larger, more profitable and had more capital expenditure were more likely to engage in tax avoidance, whereas firms that were more leveraged and held more cash holdings were less likely to engage in tax avoidance. Panel B of Table 4 reports the results of the three productivity variables for aggressive and non-aggressive firms. In all cases

tax aggressive firms were found (at the 1% level) to be significantly more productive overall, in capital and in labour than non-tax aggressive firms.

[INSERT TABLE 4]

As a second test to better assess the causality from tax avoidance to productivity, the annual change in productivity (from *t*-1 to *t*) was regressed on the annual change in tax avoidance (from *t*-1 to *t*). Table 5, Panels A and B, displays the results for firm fixed effects and OLS (ordinary least squares) estimations, respectively, of this modified version of model (1). In all cases, an increase in tax avoidance was found to be significantly associated (at the 1% level) with an increase in overall, capital and labour productivity.

[INSERT TABLE 5]

4.3. Additional analyses

4.3.1. Tax avoidance effect by firm size

Previous studies have shown that productivity increases with firm size (e.g. IMF, 2015). In contrast, Garicano *et al*. (2016) found that implicit taxes –costs introduced by the regulation at a certain size threshold, this being 50 employees, for their analysis in France– created distortions in the productivity distribution. Romero-Jordán *et al*. (2020) also found that taxes penalised investment decisions in small firms more than in large ones, due to incentives in the tax code that discouraged firms from "jumping" above tax thresholds. Consequently, the effectiveness of cash tax savings in enhancing productivity could be moderated by firm size.

In this section, the relationship between tax avoidance and productivity was examined in two size categories: small (fewer than or equal to 50 employees) vs. medium-sized firms (more than 50 but fewer than 250 employees). In Spain, firms with more than 50 employees have more obligations than those with fewer than 50 employees. Examples of these commitments include those relating to the preparation and disclosure of financial information, the hiring of workers with disabilities, the establishment of equality plans under labour legislation, and the negotiation of more extensive agreements with trade unions. The following modified version of model (1) was estimated:

$$Productivity_t = \beta_0 + \beta_1 TAXAV_t + \beta_2 TAXAV_t \text{ x } Small + \sum_i \beta_i \, Controls_t + \mu + \eta + \varepsilon_t, \quad (3)$$

where *Small* was a dummy variable that took the value 1 for small firms and zero for medium-sized firms. The other variables were defined above for model (1). β_1 captures the effect of tax avoidance on productivity for medium-sized firms and β_2 the difference in this effect between small and medium-sized firms, so that $\beta_1+\beta_2$. reflects the impact of tax avoidance for small firms. The authors also tested whether the sum of the coefficients on *TAXDIF* (*TAXDIF3y*) and the interaction *TAXDIF* x *Small* (*TAXDIF3y* x *Small*) was zero ($\beta_1+\beta_2 =0$).

Table 6 shows the results of estimating model (3). The results showed a positive association between tax avoidance and overall, capital, and labour productivity in both small and medium-sized firms (β_1 was significantly different from 0, as was $\beta_1+\beta_2$). More importantly, the positive impact of tax avoidance on productivity was higher for small firms for overall and labour productivity (the coefficients on *TAXDIF* x *Small* and *TAXDIF3y* x *Small* were positive and significant at the 1% level for overall and labour productivity regressions), which is consistent with the findings of Garicano *et al*. (2016).

However, the results for capital productivity were inconclusive with respect to differences in the strength of the positive effect of tax avoidance on productivity between small and medium-sized firms.

[INSERT TABLE 6]

4.3.2. Tax avoidance effect by firm financial constraints

Since tax avoidance may alleviate financial constraints (Edwards *et al.*, 2016), it may allow firms to undertake projects for which they could not find sufficient financial resources (Fazzari *et al.*, 1988). From this perspective, a more positive relationship between tax avoidance and productivity might be expected for firms facing financial constraints. However, as Hanlon *et al.* (2017) pointed out, cash tax savings may also be used to maintain precautionary cash flow levels to offset future negative consequences of tax avoidance (i.e. fines, penalties or repayments of the tax savings imposed by tax authorities). Alternatively, these cash tax savings can be used to reduce the current dependence on external financing and preserve the ability to undertake future investment opportunities (Guenter *et al*., 2020). This would make more financially constrained firms more sensitive to the allocation of cash tax savings. Consistent with this, Guenter *et al*. (2020) found that cash tax savings were associated with a lower allocation to capital expenditure, acquisitions, and R&D spending in these types of firms, which hampered productivity growth. Consequently, in line with Chang & Tang's (2021) findings on corporate cash holdings and productivity, this study suggests that the positive effect of tax avoidance on productivity could also occur for non-financially constrained firms.

Financial constraints are defined by considering two variables that are (inversely) related to the firm's resources available for investment: *CASH* and *LEV* as in Biddle *et al.*

(2009). First, firms were ranked into deciles of *CASH* and *LEV* (*CASH* was multiplied by -1 before ranking). Then a composite score measure (*Finconstr*) was created as the average of the ranked values of *CASH* and *LEV* and re-scaled to range between zero and one. Thus, the variable *Finconstr* took values between zero and one, and which increased with financial constraints. A similar analysis to that for firm size in model (3) was carried out, but here *Finconstr* interacted with the tax avoidance variables. Hence, the estimated β_1 measured the association between tax avoidance and productivity for the firms in the bottom decile, i.e. firms with the lowest financial constraints (firms with the highest amount of cash holdings and the lowest amount of leverage). Similarly, the sum of the coefficients on tax avoidance and financial constraints, $\beta_1+\beta_2$, measured the association between tax avoidance and productivity for those with the highest financial constraints (those in the top decile, firms with the highest amount of leverage and the lowest amount of cash holdings).

Table 7 shows that tax avoidance significantly increased overall, capital, and labour productivity in firms with and without financial constraints. Moreover, the positive effect of tax avoidance on the three productivity measures was smaller in firms with more financial constraints. These findings suggest that financially constrained SMEs may not have used the additional funds from tax avoidance as efficiently as those that were not financially constrained, which is consistent with Guenter *et al.* (2020) and Chang & Tang (2021). There are several plausible explanations: one is that in SMEs' cash tax savings may be redirected into precautionary cash holdings (Hanlon *et al.*, 2017). Another is that these funds are used to reduce SMEs' dependence on external financing (Edwards *et al.*, 2016). The reason for this is that these funds may not be sufficient to carry out the most profitable investment projects, which may require more funding than these firms have

available due to their financial constraints. Consequently, these restrictions could lead financially constrained firms to make less ambitious investment decisions than SMEs without financial constraints.

[INSERT TABLE 7]

4.3.3. Tax avoidance effect by manager control of cash flows

Tax avoidance generates cash flows that can lead to free cash flow problems (Desai & Dharmapala, 2006, 2009). The corporate finance literature has also shown that paying dividends reduces the agency costs of free cash flow available for managers' discretionary use (Jensen, 1986). To the extent that the payment of dividends reduces the opportunities for rent diversion provided by tax avoidance, the observed positive effect of tax avoidance on firm productivity is expected to be stronger for dividend paying firms. Therefore, this section examined whether the payment of dividends affected the relationship between tax avoidance and productivity. For this analysis, the subsample of firms that report cash flow statements (firms with between 50 and 250 employees) was considered, and these firms were classified into dividend payers (*Div* =1), and non-dividend payers (*Div*=0). Model (3) was modified by interacting the tax avoidance variables with *Div*.

Table 8 shows that overall tax avoidance increased the three types of productivity for both dividend paying and non-dividend paying firms (β_1 and $\beta_1+\beta_2$ were significantly positive in 5 out of 6 regressions). However, the positive effect of tax avoidance on productivity was significantly stronger for those firms that paid dividends, especially for labour productivity and overall productivity (β_2 was significantly positive). In contrast, the payment of dividends was not associated with differences in capital productivity. Therefore, the reduced discretionary use of cash holdings by managers may have been

effective in improving labour productivity. One explanation is that when managers have less discretion over cash holdings, firms may allocate these resources to investments that reduce the need for temporary workers or, alternatively, that these cash holdings may be used for staff training programmes aimed at increasing productivity.

[INSERT TABLE 8]

4.3.4. Tax avoidance effect by information risk

Prior research has documented that information frictions hinder the efficient allocation of resources within firms. Accounting information plays a key role in reducing information asymmetries, which may affect investment choices and hence firm productivity (Roychowdhury *et al*., 2019). Several studies have examined the effect of financial reporting quality on investment efficiency, showing that higher accounting quality increases investment efficiency (e.g. Biddle *et al*., 2009; Chen *et al*., 2011). Among the studies that focused on the impact of tax avoidance on investment efficiency, Asiri *et al*. (2020) and Ha & Feng (2021) found that tax avoiding firms with lower financial statement quality had higher levels of investment inefficiency (overinvestment and underinvestment). This evidence suggests that the use of less reliable accounting information increases adverse selection, hinders manager monitoring by fund providers, and impairs the allocation of resources to the appropriate investment projects (e.g. Chen *et al.*, 2011). Therefore, accounting information quality is expected to moderate the relationship between tax avoidance and firm productivity.

Since previous research has shown that the audit opinion is a signal of the information quality of the financial statements prepared by the firms (e.g. Butler *et al*., 2004), this analysis focused on the subsample of audited firms and associated qualified

(unqualified) audit reports with lower (higher) financial information quality. Table 9 shows the results of model (3) modified by the interaction between tax avoidance and the variable *Op*, which took the value 1 for qualified audit opinions in *t*-1 and 0 for unqualified audit opinions in *t*-1. In this case, the coefficients on the interaction *TAXDIF* x *Op*, although negative, were not found significant at conventional levels. However, the results for *TAXDIF3y* x *Op* indicated that the association between tax avoidance and the three types of productivity was not significant for firms with lower accounting information quality ($\beta_1 + \beta_2$ was not significantly different from 0). Overall, these findings are consistent with previous evidence showing that lower financial reporting quality negatively affects investment efficiency in private firms (e.g. Chen *et al*., 2011).

5. Conclusions

This paper examined the effect of tax avoidance in SMEs on firm-level productivity. A large sample of Spanish SMEs over the period 2006-2020 was used. The results indicated that tax avoidance increased productivity in SMEs. A significant positive relationship between the proxies for tax avoidance and the measures of overall, capital, and labour productivity was found. The results were robust to different estimation methods, such as firm fixed effects regressions, propensity score matching and change regressions.

In additional analyses, the positive impact of tax avoidance on productivity was found to be stronger for small than for medium-sized firms, especially for labour productivity. The positive relationship between tax avoidance and the three measures of productivity was found to be smaller for financially constrained firms. Finally, the results showed that the positive effect of tax avoidance on productivity was stronger in SMEs that paid

dividends – firms where managers had less control over cash tax savings– and in those whose audit reports were unqualified – firms with higher financial information quality.

Overall, the results of this study are consistent with the traditional view of tax avoidance as a value-creating activity. From an agency perspective, the SME characteristics (high ownership concentration and owner-managed) and the low aggressive tax avoidance strategies of SMEs are consistent with tax avoidance not exacerbating moral hazard (managerial rent extraction) or adverse selection problems in these firms. In fact, the findings showed that the positive effects of tax avoidance on productivity were larger in those SMEs that were less likely to face these agency problems.

The findings have several implications for both SMEs and policymakers. In planning their tax avoidance practices, SME managers could take advantage of specific tax incentives designed for SMEs to generate more cash flow. If properly invested, these cash tax savings have the potential to improve firm productivity and growth. The findings also highlight the importance of financial reporting quality and the implementation of agency risk mitigation mechanisms in improving SME productivity. In terms of policy implications, the findings support the tax incentives adopted in the OECD and EU countries that specifically target SMEs in order to alleviate their burdens and stimulate their development and growth. However, policymakers should pay special attention to medium-sized enterprises and financially constrained SMEs, as the results of this study showed that the reduction of the tax burden was not necessarily associated with increased productivity in these groups of firms. Finally, given the significant contribution of SMEs to national economies, the effect of tax avoidance revealed in this study could have a significant impact on macroeconomic growth.

This study has certain limitations and leaves opportunities for future research in this area. First, obtaining data with specific details on ownership structure and governance variables (e.g. family firms vs. non-family firms) would enable the examination of how these factors affect the relationship under study. Second, the sample for this study was concentrated in one country, namely Spain. Spanish SMEs are characterized by a high dependence on bank financing, high ownership concentration, and a low level of agency conflict between managers and shareholders. Consequently, the risk of free cash flow problems is lower than in contexts with dispersed ownership and strong capital markets. It might be interesting to analyse the relationship between tax avoidance and SME productivity in settings with different characteristics. These future research lines would contribute to a more comprehensive understanding of the productive use of cash tax savings.

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Appendix

Table A1. Variables definition

Variable	Definition
Dependent variables	
ALL_PR	Overall productivity. The residual value from the industry-year regression of Value Added (*VAD*) on the natural logarithm of total wages (*TWG*) and the natural logarithm of fixed assets (*FXA*). *VAD* is the natural logarithm of earnings before tax plus depreciation and total wages.
CAP_PR	Capital productivity. The residual value from the industry-year regression of Value Added on the natural logarithm of fixed assets.
LAB_PR	Labour productivity. The residual value from the industry-year regression of Value Added on the natural logarithm of wages.
Independent variables	
TAXDIF	The difference between the statutory tax rate that corresponds to a firm-year observation according to the tax legislation and its total effective tax rate (ETR), defined as tax expense over pre-tax income.
TAXDIF3y	Long-run *TAXDIF* considering an average of three consecutive years.
Control variables	
SIZE	The natural logarithm of sales.
AGE	The natural logarithm of the years since the inception of the firm +1
ROA	Ratio of operating income to total assets
GROW	Firm growth, calculated as sales in *t* divided by sales in *t*-1.
INVEST	Capital expenditure in *t* divided by total assets in *t*-1.
LEV	Ratio of total debt to total assets.
CASH	Ratio of cash and cash equivalents to total assets.
σ(SALES)	The standard deviation of sales from operations over total assets from *t*-2 to *t.*
Small	Dummy variable that equals 1 if the firm has less than or equal to 50 employees (small firms) and 0 if the firm has more than 50 but less than 250 employees (medium-sized firms).
Finconstr	Financial constraint measure following Biddle *et al*. (2009). A ranked variable based on the average of a ranked (decile) measure of leverage and cash (multiplied by minus one). This measure takes values between 0 and 1, with higher values indicating greater financial constraints.
Div	Dummy variable that equals 1 if the firm pays dividends and 0 otherwise
Op	Dummy variable that equals 1 if the firm has a modified audit opinions in *t*-1 and 0 otherwise

Table 1. Descriptive statistics

	# obs.	Mean	SD	10th perc.	Median	90th perc.
ALL_PR	227,368	0.0846	0.2363	-0.1588	0.0268	0.4160
CAP_PR	227,368	0.1386	0.6133	-0.6386	0.1011	0.9772
LAB_PR	227,368	0.0893	0.2585	-0.1779	0.0258	0.4535
TAXDIF	227,368	0.0086	0.0819	-0.0500	0.0000	0.0946
TAXDIF3y	227,368	0.0079	0.0671	-0.0522	0.0002	0.0878
SIZE	227,368	8.4731	0.8179	7.4601	8.3920	9.6525
AGE	227,368	3.0916	0.4778	2.4849	3.1781	3.6376
ROA	227,368	0.0806	0.0704	0.0169	0.0590	0.1738
GROW	227,368	0.0464	0.1743	-0.1485	0.0344	0.2441
INVEST	227,368	0.0109	0.0623	-0.0369	-0.0028	0.0740
LEV	227,368	0.4940	0.2280	0.1765	0.4997	0.7998
CASH	227,368	0.1360	0.1421	0.0083	0.0846	0.3468
σ(*SALES*)	227,368	0.1710	0.1738	0.0307	0.1164	0.3741

Notes: This table reports descriptive statistics of the variables used. Variable definitions are in Appendix.

Table 2. Correlation matrix

	ALL_PR	*CAP_PR*	*LAB_PR*	*TAXDIF*	*TAXDIF3y*	*SIZE*	*AGE*	*ROA*	*GROW*	*INVEST*	*LEV*	*CASH*
ALL_PR	1											
CAP_PR	0.334***	1										
LAB_PR	0.950***	0.233***	1									
TAXDIF	0.075***	0.092***	0.096***	1								
TAXDIF3y	0.081***	0.109***	0.104***	0.669***	1							
SIZE	0.249***	0.635***	0.277***	0.090***	0.102***	1						
AGE	-0.012***	0.049***	0.022***	0.024***	0.016***	0.084***	1					
ROA	0.607***	0.366***	0.510***	0.037***	0.034***	0.088***	-0.127***	1				
GROW	0.087***	0.093***	0.079***	0.023***	0.014***	0.122***	-0.087***	0.168***	1			
INVEST	-0.009***	-0.007***	0.031***	0.053***	0.044***	0.033***	-0.043***	0.040***	0.124***	1		
LEV	-0.296***	-0.065***	-0.286***	-0.061***	-0.074***	0.153***	-0.240***	-0.217***	0.119***	0.084***	1	
CASH	0.206***	0.101***	0.106***	-0.002	0.005**	-0.102***	0.012***	0.286***	-0.023***	-0.052***	-0.326***	1
σ(*SALES*)	-0.035***	0.072***	-0.111***	-0.042***	-0.049***	0.142***	-0.196***	0.115***	-0.006***	0.065***	0.2335***	0.060***

Notes: Variable definitions are in Appendix. *** and ** denote significance levels at two-tail tests of 1% and 5%, respectively.

Table 3. Effect of tax avoidance on productivity.

	Dependent variable					
	ALL_PR		*CAP_PR*		*LAB_PR*	
	(1)	(2)	(3)	(4)	(5)	(6)
TAXDIF	0.064***		0.066***		0.070***	
	(15.60)		(10.51)		(16.73)	
TAXDIF3y		0.050***		0.050***		0.059***
		(7.86)		(4.55)		(8.80)
SIZE	0.075***	0.075***	0.584***	0.584***	0.081***	0.082***
	(33.09)	(33.11)	(119.39)	(119.39)	(33.46)	(33.46)
AGE	0.009	0.009	0.060***	0.060***	0.022***	0.022***
	(1.42)	(1.52)	(4.96)	(5.01)	(3.25)	(3.35)
ROA	2.041***	2.042***	1.736***	1.737***	1.991***	1.993***
	(171.16)	(171.26)	(112.06)	(112.17)	(162.54)	(162.64)
GROW	0.004**	0.003*	-0.111***	-0.111***	-0.003*	-0.004*
	(2.00)	(1.94)	(-36.08)	(-36.10)	(-1.88)	(-1.92)
INVEST	-0.104***	-0.102***	-0.271***	-0.270***	-0.012***	-0.011**
	(-24.86)	(-24.47)	(-42.26)	(-42.00)	(-2.79)	(-2.43)
LEV	-0.043***	-0.044***	-0.171***	-0.172***	-0.022***	-0.023***
	(-8.81)	(-8.94)	(-20.41)	(-20.50)	(-4.12)	(-4.25)
CASH	0.102***	0.102***	0.198***	0.198***	0.048***	0.048***
	(23.74)	(23.69)	(26.60)	(26.58)	(10.65)	(10.62)
σ(SALES)	-0.016***	-0.016***	-0.011***	-0.011***	-0.025***	-0.025***
	(-6.49)	(-6.46)	(-2.59)	(-2.58)	(-9.81)	(-9.78)
Intercept	-0.718***	-0.721***	-4.629***	-4.632***	-0.890***	-0.892***
	(-24.51)	(-24.59)	(-84.55)	(-84.63)	(-27.31)	(-27.37)
Ind-year f.e.	Yes	Yes	Yes	Yes	Yes	Yes
Firm f.e.	Yes	Yes	Yes	Yes	Yes	Yes
R^2 *within*	0.5880	0.5872	0.6182	0.6179	0.5590	0.5582
#obs.	227,368	227,368	227,368	227,368	227,368	227,368

Notes: This table reports the results of estimation models with firm fixed effects that examined the effect of tax avoidance on productivity. Variable definitions are in Appendix. The *t* statistics reported in parentheses were based on standard errors clustered at the firm level. ***, **, and * denote significance levels at two-tail tests of 1%, 5%, and 10%, respectively.

Table 4. Propensity score matching

Panel A: Probit regression: tax aggressive firms vs non-tax aggressive firms

	TAXDIF	*TAXDIF3y*
SIZE	0.223***	0.212***
	(63.68)	(60.65)
AGE	0.010	-0.046***
	(1.60)	(-7.59)
ROA	0.083*	0.117***
	(1.95)	(2.74)
GROW	-0.011	-0.020
	(-0.69)	(-1.20)
INVEST	0.908***	0.839***
	(20.78)	(19.17)
LEV	-0.589***	-0.552***
	(-43.50)	(-40.83)
CASH	-0.129***	-0.032
	(-6.14)	(-1.52)
Intercept	-1.962***	-1.601***
	(-19.79)	(-16.41)
Ind-year f.e.	Yes	Yes
Pseudo R^2	0.0429	0.0392
#obs.	227,368	227,368

Panel B. Propensity score matching using *ALL_PR*

	Variable					
	ALL_PR		*CAP_PR*		*LAB_PR*	
	TAXDIF	*TAXDIF3y*	*TAXDIF*	*TAXDIF3y*	*TAXDIF*	*TAXDIF3y*
Tax aggress.	0.10799	0.10583	0.20519	0.20360	0.11983	0.11652
Non-tax aggress.	0.08534	0.08855	0.18468	0.18142	0.08784	0.09061
Difference	0.02265	0.01728	0.02051	0.02218	0.03199	0.02591
t-stat	16.37***	12.55***	5.71***	6.16***	21.28***	17.29***

Notes: This table reports the results of propensity matching score estimation models that examined the effect of tax avoidance on overall productivity. Panel A reports the propensity score estimation using a probit regression model with the tax aggressiveness/non-tax aggressiveness as the dependent variable. Tax aggressive firms were defined as those firm-year observations with positive values of *TAXDIF* or *TAXDIF3y*, while those with negative or zero values of *TAXDIF* or *TAXDIF3y* were considered non-tax aggressive firms. Panel B reports the results of the average cost of debt for the treatment sample (tax aggressive) and the control sample (non-tax aggressive). Variable definitions are in Appendix. *** and * denote significance levels at two-tail tests of 1% and 10%, respectively.

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Table 5. Effect of change in tax avoidance on change in productivity

Panel A: Firm fixed effects estimation

	Dependent variable					
	ALL_PR		*CAP_PR*		*LAB_PR*	
	(1)	(2)	(3)	(4)	(5)	(6)
TAXDIF	0.074***		0.077***		0.076***	
	(15.43)		(13.91)		(15.94)	
TAXDIF3y		0.060***		0.068***		0.062***
		(6.38)		(5.89)		(6.60)
Controls.	Yes	Yes	Yes	Yes	Yes	Yes
Ind-year f.e.	Yes	Yes	Yes	Yes	Yes	Yes
Firm f.e.	Yes	Yes	Yes	Yes	Yes	Yes
R^2 *within*	0.3157	0.3138	0.3893	0.3881	0.3087	0.3066
#obs.	164,633	164,633	164,633	164,633	164,633	164,633

Panel B: OLS estimation

	(1)	(2)	(3)	(4)	(5)	(6)
TAXDIF	0.078***		0.082***		0.081***	
	(16.78)		(15.21)		(17.35)	
TAXDIF3y		0.070***		0.077***		0.073***
		(8.61)		(7.80)		(8.93)
Controls.	Yes	Yes	Yes	Yes	Yes	Yes
Ind. dum.	Yes	Yes	Yes	Yes	Yes	Yes
Year dum.	Yes	Yes	Yes	Yes	Yes	Yes
R^2 *adj*	0.1955	0.1935	0.3341	0.3329	0.1849	0.1828
#obs.	164,633	164,633	164,633	164,633	164,633	164,633

Notes: This table reports the results of a version of model (1) where the dependent variable is the year-on-year change in the three proxies for productivity (*ALL_PR*, *CAP_PR*, *LAB_PR)* and the independent variable of interest is the year-on-year change in each proxy for tax avoidance. Panel A shows the results from the firm fixed effects estimation and Panel B those from the OLS estimation. Variable definitions are in Appendix. The *t* statistics reported in parentheses were based on standard errors clustered at the firm level. *** denotes significance level at two-tail tests of 1%.

Table 6. Effect of tax avoidance on productivity and firm size.

	Dependent variable					
	ALL_PR		*CAP_PR*		*LAB_PR*	
	(1)	(2)	(3)	(4)	(5)	(6)
TAXDIF	0.026***		0.063***		0.035***	
	(3.50)		(5.27)		(4.65)	
TAXDIF x *Small*	0.050***		0.003		0.046***	
	(5.75)		(0.25)		(5.21)	
TAXDIF3y		0.008		0.093***		0.021*
		(0.67)		(4.58)		(1.77)
TAXDIF3y x *Small*		0.056***		-0.056**		0.049***
		(4.25)		(-2.48)		(3.57)
SIZE	0.075***	0.075***	0.584***	0.584***	0.082***	0.082***
	(33.17)	(33.21)	(119.35)	(119.30)	(33.53)	(33.54)
AGE	0.009	0.009	0.060***	0.060***	0.022***	0.023***
	(1.42)	(1.53)	(4.96)	(5.00)	(3.24)	(3.36)
ROA	2.040***	2.042***	1.736***	1.738***	1.990***	1.992***
	(171.13)	(171.23)	(111.97)	(112.13)	(162.51)	(162.60)
GROW	0.004**	0.003*	-0.111***	-0.111***	-0.004*	-0.004*
	(1.98)	(1.93)	(-36.08)	(-36.10)	(-1.89)	(-1.93)
INVEST	-0.104***	-0.102***	-0.271***	-0.269***	-0.012***	-0.011**
	(-24.90)	(-24.50)	(-42.25)	(-41.97)	(-2.83)	(-2.46)
LEV	-0.043***	-0.044***	-0.171***	-0.172***	-0.022***	-0.023***
	(-8.82)	(-8.96)	(-20.41)	(-20.49)	(-4.13)	(-4.27)
CASH	0.102***	0.102***	0.198***	0.198***	0.048***	0.048***
	(23.72)	(23.67)	(26.60)	(26.60)	(10.63)	(10.60)
σ(SALES)	-0.016***	-0.016***	-0.011***	-0.011***	-0.025***	-0.025***
	(-6.50)	(-6.47)	(-2.59)	(-2.57)	(-9.82)	(-9.80)
Intercept	-0.719***	-0.723***	-4.629***	-4.631***	-0.890***	-0.894***
	(-24.54)	(-24.66)	(-84.54)	(-84.55)	(-27.33)	(-27.43)
Test $\beta_1 + \beta_2$	254.12***	75.22***	86.32***	8.97***	275.11***	84.68***
Ind-year f.e.	Yes	Yes	Yes	Yes	Yes	Yes
Firm f.e.	Yes	Yes	Yes	Yes	Yes	Yes
R^2 *within*	0.5881	0.5873	0.6182	0.6179	0.5591	0.5582
#obs.	227,368	227,368	227,368	227,368	227,368	227,368

Notes: This table reports the results of estimation models with firm fixed effects that examined the effect of tax avoidance on productivity for small (*Small*=1) and medium-sized (*Small*=0) firms. Variable definitions are in Appendix. The *t* statistics reported in parentheses were based on standard errors clustered at the firm level. ***, **, and * denote significance levels at two-tail tests of 1%, 5%, and 10%, respectively.

Table 7. Effect of tax avoidance on productivity and financial constraints.

	Dependent variable					
	ALL_PR		*CAP_PR*		*LAB_PR*	
	(1)	(2)	(3)	(4)	(5)	(6)
TAXDIF	0.128***		0.122***		0.145***	
	(10.67)		(6.95)		(11.67)	
TAXDIF x *Finconstr*	-0.095***		-0.079***		-0.105***	
	(-5.58)		(-3.00)		(-5.98)	
TAXDIF3y		0.119***		0.125***		0.147***
		(7.07)		(4.56)		(8.16)
TAXDIF3y x *Finconstr*		-0.088***		-0.095**		-0.107***
		(-3.63)		(-2.26)		(-4.14)
SIZE	0.069***	0.069***	0.550***	0.550***	0.082***	0.082***
	(62.83)	(62.82)	(168.77)	(168.81)	(62.29)	(62.24)
AGE	-0.001	-0.001	0.005	0.005	0.016***	0.016***
	(-0.90)	(-0.73)	(0.97)	(1.06)	(7.96)	(8.15)
ROA	2.009***	2.010***	1.813***	1.815***	1.947***	1.948***
	(187.09)	(187.29)	(126.22)	(126.36)	(173.99)	(174.20)
GROW	0.010***	0.010***	-0.097***	-0.097***	0.002	0.002
	(6.35)	(6.29)	(-34.53)	(-34.55)	(1.20)	(1.16)
INVEST	-0.090***	-0.089***	-0.265***	-0.264***	0.008*	0.010**
	(-22.21)	(-21.79)	(-41.80)	(-41.53)	(1.86)	(2.25)
LEV	-0.090***	-0.090***	-0.173***	-0.173***	-0.082***	-0.083***
	(-26.04)	(-26.13)	(-24.08)	(-24.15)	(-20.98)	(-21.04)
CASH	0.087***	0.087***	0.215***	0.215***	0.017***	0.017***
	(23.18)	(23.08)	(30.38)	(30.30)	(4.26)	(4.18)
σ(SALES)	-0.040***	-0.040***	-0.020***	-0.019***	-0.059***	-0.059***
	(-18.11)	(-18.09)	(-4.56)	(-4.55)	(-24.78)	(-24.76)
Intercept	-0.524***	-0.525***	-4.268***	-4.269***	-0.716***	-0.717***
	(-31.01)	(-31.10)	(-121.37)	(-121.47)	(-34.88)	(-34.96)
Test $\beta_1 + \beta_2$	25.05***	9.55***	12.84***	2.19	33.06***	13.82***
Ind-year f.e.	Yes	Yes	Yes	Yes	Yes	Yes
Firm f.e.	Yes	Yes	Yes	Yes	Yes	Yes
R^2 *within*	0.5854	0.5846	0.6123	0.6120	0.5545	0.5536
#obs.	227,368	227,368	227,368	227,368	227,368	227,368

Notes: This table reports the results of estimation models with firm fixed effects that examined the effect of tax avoidance on productivity considering firm financial constraints. Firms were classified into financially constrained (*Finconstr* =1) and non-financially constrained (*Finconstr* =0). Variable definitions are in Appendix. The *t* statistics reported in parentheses were based on standard errors clustered at the firm level. ***, **, and * denote significance levels at two-tail tests of 1%, 5%, and 10%, respectively

Table 8. Effect of tax avoidance on productivity and manager control.

	Dependent variable					
	ALL_PR		*CAP_PR*		*LAB_PR*	
	(1)	(2)	(3)	(4)	(5)	(6)
TAXDIF	0.054***		0.046***		0.056***	
	(6.46)		(3.67)		(6.62)	
TAXDIF x *Div*	0.039**		0.032		0.045**	
	(2.24)		(1.36)		(2.50)	
TAXDIF3y		0.036***		0.005		0.048***
		(2.88)		(0.26)		(3.70)
TAXDIF3y x *Div*		0.056***		0.038		0.067***
		(2.69)		(1.23)		(3.05)
SIZE	0.080***	0.080***	0.557***	0.557***	0.087***	0.087***
	(16.56)	(16.59)	(67.05)	(67.15)	(16.45)	(16.47)
AGE	-0.009	-0.009	0.059**	0.059**	-0.005	-0.005
	(-0.62)	(-0.62)	(2.56)	(2.55)	(-0.30)	(-0.30)
ROA	2.414***	2.412***	2.157***	2.154***	2.346***	2.344***
	(89.27)	(89.11)	(70.64)	(70.54)	(82.07)	(81.94)
GROW	0.014***	0.013***	-0.089***	-0.089***	0.007	0.006
	(3.49)	(3.37)	(-14.77)	(-14.83)	(1.62)	(1.50)
INVEST	-0.085***	-0.084***	-0.290***	-0.288***	0.003	0.004
	(-8.72)	(-8.56)	(-21.21)	(-21.11)	(0.28)	(0.41)
LEV	-0.047***	-0.048***	-0.144***	-0.146***	-0.037***	-0.038***
	(-4.29)	(-4.37)	(-9.35)	(-9.46)	(-3.15)	(-3.21)
CASH	0.104***	0.103***	0.217***	0.217***	0.052***	0.052***
	(10.68)	(10.66)	(14.29)	(14.27)	(5.13)	(5.12)
σ(SALES)	-0.019***	-0.019***	-0.006	-0.005	-0.025***	-0.025***
	(-3.46)	(-3.38)	(-0.69)	(-0.65)	(-4.17)	(-4.09)
Intercept	-0.714***	-0.712***	-4.597***	-4.598***	-0.808***	-0.806***
	(-11.26)	(-11.21)	(-43.21)	(-43.15)	(-11.94)	(-11.88)
Test $\beta_1 + \beta_2$	32.69***	19.22***	13.10***	1.85	35.91***	27.36***
Ind-year f.e.	Yes	Yes	Yes	Yes	Yes	Yes
Firm f.e.	Yes	Yes	Yes	Yes	Yes	Yes
R^2 *within*	0.5894	0.5886	0.6210	0.6206	0.5565	0.5558
#obs.	56,332	56,332	56,332	56,332	56,332	56,332

Notes: This table reports the results of estimation models with firm fixed effects that examined the effect of tax avoidance on productivity for SMEs that prepared the cash flow statement. Firms were classified into those that paid dividends (*Div*=1) and those that did not pay dividends (*Div*=0). Variable definitions are in Appendix. The *t* statistics reported in parentheses were based on standard errors clustered at the firm level. *** and ** denote significance levels at two-tail tests of 1% and 5%, respectively.

Table 9. Effect of tax avoidance on productivity and information risk

	Dependent variable					
	ALL_PR		*CAP_PR*		*LAB_PR*	
	(1)	(2)	(3)	(4)	(5)	(6)
TAXDIF	0.081***		0.072***		0.088***	
	(8.96)		(5.37)		(9.40)	
TAXDIF x *Op*	-0.023		-0.007		-0.028	
	(-1.36)		(-0.26)		(-1.62)	
TAXDIF3y		0.082***		0.035		0.103***
		(5.42)		(1.35)		(6.59)
TAXDIF3y x *Op*		-0.053**		0.023		-0.076***
		(-2.15)		(0.56)		(-2.94)
SIZE	0.087***	0.087***	0.575***	0.575***	0.092***	0.092***
	(17.74)	(17.76)	(67.09)	(67.16)	(17.75)	(17.76)
AGE	0.008	0.008	0.100***	0.100***	0.002	0.002
	(0.51)	(0.51)	(3.79)	(3.79)	(0.12)	(0.12)
ROA	2.360***	2.358***	2.073***	2.071***	2.302***	2.300***
	(89.63)	(89.54)	(67.24)	(67.13)	(84.55)	(84.48)
GROW	0.018***	0.017***	-0.100***	-0.101***	0.011***	0.010**
	(4.42)	(4.30)	(-15.57)	(-15.66)	(2.59)	(2.48)
INVEST	-0.100***	-0.098***	-0.304***	-0.302***	0.001	0.003
	(-10.44)	(-10.22)	(-21.04)	(-20.91)	(0.06)	(0.29)
LEV	-0.049***	-0.050***	-0.161***	-0.162***	-0.039***	-0.040***
	(-4.62)	(-4.68)	(-10.18)	(-10.25)	(-3.44)	(-3.48)
CASH	0.099***	0.099***	0.213***	0.213***	0.048***	0.048***
	(10.70)	(10.71)	(14.05)	(14.05)	(5.07)	(5.08)
σ(SALES)	-0.023***	-0.023***	-0.010	-0.010	-0.031***	-0.031***
	(-3.92)	(-3.88)	(-1.11)	(-1.08)	(-5.13)	(-5.10)
Intercept	-0.887***	-0.885***	-4.839***	-4.840***	-0.957***	-0.954***
	(-12.83)	(-12.81)	(-45.04)	(-45.04)	(-12.33)	(-12.29)
Test $\beta_1 + \beta_2$	14.54***	1.58	7.77***	2.24	13.64***	1.28
Ind-year f.e.	Yes	Yes	Yes	Yes	Yes	Yes
Firm f.e.	Yes	Yes	Yes	Yes	Yes	Yes
R^2 *within*	0.6029	0.6021	0.6210	0.6301	0.5742	0.5734
#obs.	59,735	59,735	59,735	59,735	59,735	59,735

Notes: This table reports the results of estimation models with firm fixed effects that examined the effect of tax avoidance on productivity for firms with high (*Op*=1) and low (*Op*=0) information risk. Variable definitions are in Appendix. The *t* statistics reported in parentheses were based on standard errors clustered at the firm level. *** and ** denote significance levels at two-tail tests of 1% and 5%, respectively.