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Productivity, Financial Performance, and Corporate Governance: Evidence from Romanian R&D Firms

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Productivity, Financial Performance, and Corporate Governance: Evidence from Romanian R&D Firms

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Abstract

We study the impact of financial performance and corporate governance on the productivity of the Romanian Research and Development (R&D) sector. We draw on a dataset consisting of 116 Romanian R&D companies covering the time span from 2007 to 2016. Firm productivity is computed using several metrics of TFP (total factor productivity). We show, based on bootstrap panel quantile regressions, that size, financial profitability, and foreign ownership are key drivers of R&D companies' productivity. Intangible assets and taxation have no significant effect on R&D firms' productivity, while the degree of independence in decision-making and owners' presence in firms' management negatively impact TFP. With women on the board, state-owned applied research institutes benefit from higher productivity compared with R&D private firms, if they are in lower quantiles.

Keywords: productivity; R&D firms; corporate finance and governance; panel quantile regression; Romania

JEL Classification: D24, O30, G32, C33

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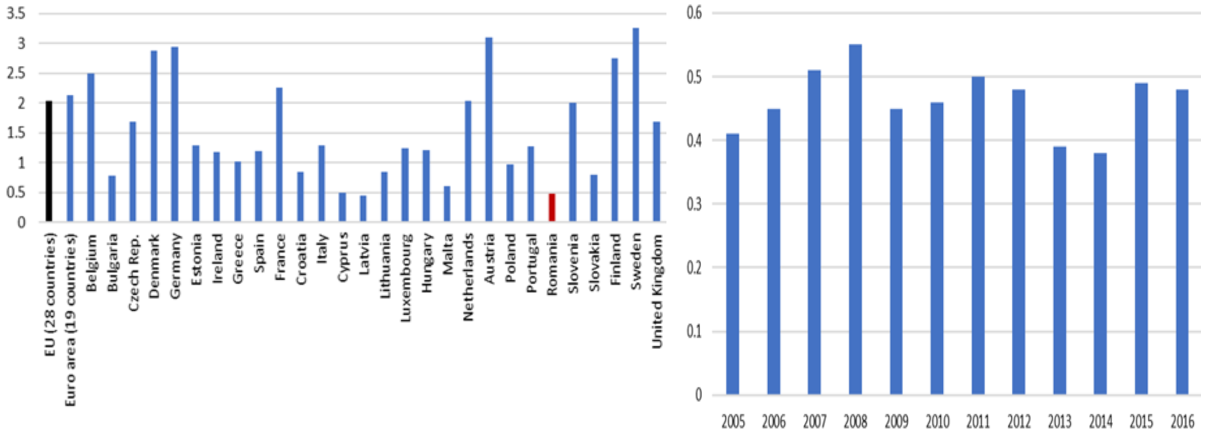
1. Introduction

A number of new Central and Eastern European (CEE) members have joined the European Union (EU) since 2004. These countries are mainly considered to be technology and Research and Development (R&D) users, and not necessarily innovators (Radosevic, 2017). These middle-income "catching-up" economies combine local and foreign knowledge to leverage their innovation capabilities (Radosevic and Stancova, 2015). This becomes a key challenge as new strategies in terms of growth, relying on R&D activities, prove to be necessary in Europe, particularly in the aftermath of the Global Financial Crisis (GFC) and the Eurozone crisis. In this context, it is interesting to study how the R&D sector in CEEs has evolved, in particular after the GFC, and what are the key factors that explain its dynamics. The macroeconomic evidence in this respect provides interesting answers (Radosevic and Yoruk, 2014): CEEs have been successful in R&D activities in relation to participation in the EU Framework Programmes but did not manage to generate „breakthrough innovations," or R&D that could lead to strong collaborations between the public and private sectors. We complement this literature by carrying out a microeconometric analysis that aims at explaining R&D firms' productivity from a new perspective. Indeed, our focus is to develop an original analysis drawing upon two strands of the literature: one documents a link between firm productivity and financial performance, and another analyzes the link between firm productivity and corporate governance. To do so, we focus on the Romanian case, for several reasons that are detailed below.

Romania's R&D sector has undergone profound changes since the end of Communist rule in 1989. The first years of the transition process towards a market economy brought the Romanian R&D sector close to collapse (Eisemon et al., 1996): prolonged subsidies were awarded to R&D institutes and there was a certain reluctance to privatize them (Radosevic, 1999). Things changed to some extent during the years preceding Romania's integration into the European Union in 2007 (Sandu, 2010): systemic reforms and new policies to guide R&D were introduced. However, neither state involvement nor private sector actions strengthened R&D expenditure in the country over the last decade. According to Eurostat, Romania lies at the bottom among EU countries' ranking in terms of R&D expenditure in 2016 (Fig. 1a): R&D expenditure in Romania in 2016 represented less than 25% of the EU average. Furthermore, although the Romanian national strategy foresaw a continuous increase of public funds invested in R&D activities and supported private actions in the R&D sector, overall (public and private) R&D expenditure continues to represent less than 0.5% of GDP and registered a decrease in the aftermath of the Global Financial Crisis (Fig. 1b).

Figure 1. R&D expenditure in Romania



(a) R&D expenditure in 2016 as % of GDP (b) R&D expenditure in Romania as % of GDP

Source: Eurostat

The Romanian R&D sector is still mostly publicly owned. R&D activity is performed by two different categories of institutions. On the one hand, scientific research is conducted by universities and research institutes of the Romanian Academy. On the other hand, applied R&D activity is undertaken by private firms or by public companies that act as independent research institutes. Our aim is to analyze the second category of R&D activities and institutions, namely the ones that perform applied research[1].

Romanian national R&D strategy[2] called the "National strategy for research, development and innovation 2014-2020" underlines the necessity to develop, through different measures, this sector, which is largely underfinanced (state involvement in the R&D industry represented 0.31% of GDP in 2011, and the target for 2020 was established at 1% of GDP). However, existing policies are overly focused on R&D in general, and do not search to identify the sources of productivity growth, such as management practices, skills, or financial performance (Radosevic, 2017).

Against this background, it is interesting to analyze how R&D efficiency has changed since 2007, when Romania became a member of the European Union[3], and in the aftermath of the GFC, as well as to identify the factors that could have affected it. To do this, a micro-level

[1] As argued, in this category, one can include private firms as well as public companies that are independent research institutes. These public companies are self-financing. In other words, their activity is not supported by the government budget.

[2] Romanian Government Decision no. 929 - October 21, 2014 regarding the "National strategy for research, development and innovation 2014-2020." The priority fields in terms of public R&D investment outlined in this document are defined along with EU strategy. They are the following: (i) bio-economy, (ii) ICT, (iii) energy, environment, and climate change; (iv) eco, nanotechnology, and advanced materials (v) health, (vi) patrimony and cultural identity and (vii) new and emerging technologies.

[3] Romania joined the European Union (EU) in 2007. In this paper, we analyze the period 2007-2016 (the choice of the time span is also constrained by data availability). Hence, over the investigated time span, there is no change of Romania's EU membership status.

approach is used, as it will enable us to consider a wide and detailed range of R&D firms and activities. One way to assess firms' overall efficiency is to compute Total Factor Productivity (TFP), considered as a key driver of economic growth in the long run (Easterly and Levine, 2001)[4]. We will assess TFP for companies active in the R&D sector in Romania, and study its determinants, with a focus on firms' financial performance and corporate governance. We develop our analysis for the period from 2007 to 2016. This line of analysis is associated with the literature on TFP and its determinants.

The first strand of this literature considers firms' financial performance, financial structure, and innovation capacity as key drivers of their productivity levels. Within this framework, three research avenues can be considered. First, the literature highlights the positive role of intangible assets (a *proxy* for R&D activities) in influencing the level of firms' productivity. Following the pioneering studies by Griliches (1958) and Minasian (1969), policymakers and researchers have showed an increased interest in R&D investment and its role in enhancing social returns and firms' efficiency (for a review of the literature, please refer to Ugur et al., 2016). Recent works on the topic investigate the nonlinear relation between R&D and productivity growth (e.g. Kancs and Siliverstovs, 2016). In this context, the role of ICT (Information and Communication Technology) capital is also underlined (Oliner and Sichel, 2003; Ilmakunnas and Miyakoshi, 2013; Venturini, 2015). Second, the corporate finance literature shows that there is an equilibrium between the level of intangible assets and firms' financial structure. In this line, empirical results show a negative relationship between leverage and productivity (Nucci et al., 2005). Third, both firms' financial performances in terms of profitability, and firms' size, are found to have direct positive effects on the productivity level (Yu et al., 2017). Finally, fiscal aspects are also used to explain the productivity at the firm level (Arnold et al., 2011; Bournakis and Mallick, 2018).

A second strand of the literature investigates the role of corporate governance in influencing firms' efficiency and productivity levels (Chiang and Lin, 2007; Gaitán et al., 2018). One line of analysis underlines the role of ownership diversification and examines its impact on productivity (Schoar, 2002; Dimelis and Papaioannou, 2016). Another line of research focuses on the role of gender diversity in the board, in influencing firms' efficiency (Bardasi et al., 2011; Marques, 2015). Finally, a vast literature in this area investigates the role of foreign ownership and foreign direct investment (FDI) on firms' productivity. This is

[4] Another competing measure of firms' efficiency is Tobin's q. However, compared with this ratio, the TFP measure of efficiency is relatively unaffected by the choice of accounting methods (Hill and Snell, 1989). Further, the TFP approach allows for different factor intensities in different firms and industries (Schoar, 2002).

done as foreign firms are strongly involved in the diffusion of new technologies and R&D spillovers (Savvides and Zachariadis, 2005; Coe et al., 2009; Liao et al., 2009; Kukulski and Ryan, 2011). At the same time, innovation in the sector and the geographical location of companies are also important in enhancing firms' productivity (Aiello et al., 2014, 2015).

We contribute to the existing literature in several ways. First, we complement the scarce literature on the R&D sector analysis in Romania. Romania is an interesting case study given its Communist past where the presence of state-owned companies in a poorly developed R&D sector was very strong. Moreover, during the transition period, as was the case in many Central and Eastern European countries, Romania faced major challenges in terms of the restructuring of R&D and innovation activities as the latter were not considered as being crucial. This was due to the fact that the R&D system was perceived as a tax burden, and not as an asset at the basis of economic recovery (Radosevic and Auriol, 1999).

Second, unlike previous studies, we compute TFP for the companies active in the scientific research and development sector (NACE code 72) in Romania. As far as we know, this is the first paper addressing firms' efficiency in terms of productivity, with a focus on the research and development sector. Consequently, our primary interest is to investigate the productivity determinants of R&D firms, and not R&D spillovers.

Third, we synthesize the bulk of literature exposed above and focus on two categories of productivity drivers, namely firms' financial performance and financial structure, as well as corporate governance. On the one hand, we empirically investigate the role of the intangible asset to total fixed asset ratio, the profit margin, and the taxation level on TFP while controlling for the firms' size effect. On the other hand, we assess the role of ownership structure, board gender diversity, shareholder-managers, and independence in making decisions on enhancing the productivity level. A special emphasis is put on the role of firm-level FDI in explaining TFP.

Fourth, we use different approaches to compute TFP, for the purposes on robustness. We adopt a classic approach and regress output (i.e. firms' added value) on the factors potentially linked to the changes in the productivity level (labor and capital). Likewise, we compute TFP using an Ordinary Least Squares (OLS) and a fixed effects (FE) model (similar to Liao et al., 2009). At the same time, like Boeing et al. (2016), we control for different productivity shocks across firms, and we resort to Levinsohn and Petrin's (2003) approach. Finally, we use contemporaneous and lagged state variables as instruments in a General Method of Moments (GMM) approach (following Wooldridge, 2009).

Fifth, our contribution is methodological. Unlike previous empirical studies relying on GMM models, we use bootstrap panel quantile regressions. The quantile regression, recently employed by Di Cintio et al. (2017), allows us to consider heterogeneity in terms of TFP levels. Firms' financial performance, and especially elements related to corporate governance, might have a different impact on low-productivity, compared with high-productivity, firms. However, assessing the precision of each quantile parametric regression estimate, and thus the identification of an adequate asymptotic variance-covariance matrix, is problematic. Therefore, we resort to a bootstrap resampling approach to compute the confidence intervals. At the same time, we use a different number of iterations for robustness purposes.

The rest of the paper is structured as follows. Section 2 presents the literature review on TFP determinants and the R&D sector in Romania. Section 3 describes the data and the methodology. In section 4 we report the empirical findings, and section 5 is dedicated to the robustness analysis. The last section concludes and draws the policy implications of our study.

2. Literature review

Within this general framework of TFP analysis, two strands of literature can be identified. The first considers that the drivers of TFP are related to R&D capital, ICT capital, human capital, and organizational capital (Van Ark, 2004). These inputs might be roughly associated with managerial performance, either reflected by firms' assets and their financial structure, or by the way the managers interact with firms' shareholders in the decision-making process.

Consequently, firms' financial performance and innovation capacity, as well as their financial structure, stand out as a distinctive category of efficiency drivers. Within this framework, several research avenues can be identified. A first and very interesting one can be developed in relation to R&D activities and their impact on productivity, in the spirit of Minasian (1969). In this line, Dabla-Norris et al. (2012) highlight the positive role of innovation in increasing productivity, the effect being larger in less developed countries and for high-tech firms. However, although the theoretical background describing the R&D-productivity nexus is well set up, the empirical results show that this relation is not straightforward. On the one hand, recent work by Kancs and Siliverstovs (2016), who employ firm-level data for OECD countries, shows that the relationship between R&D expenditures and productivity growth is nonlinear. On the other hand, the literature review by Ugur et al. (2016) shows that R&D's influence on firms' efficiency is rather small.

Second, and related to this first strand of literature, the level of intangible assets (a proxy for R&D investment), is connected to firms' financial structure, as more innovative firms tend to have a different capital structure compared with less innovative ones (Nucci et al., 2005). Apparently, firms' leverage is negatively correlated with their capacity to innovate; therefore, firms' leverage negatively impacts their productivity. Likewise, Ferrando and Ruggieri (2018) show, for a specific set of firms, that general financial constraints negatively impact TFP over the time span from 2005 to 2011. Similarly, Chen and Guariglia (2013) show that for a panel of 130,840 Chinese manufacturing firms over the period from 2001 to 2007, that financial constrains influence productivity, especially for foreign and private firms.

Third, a series of other elements affecting firms' performances are put forward in the empirical literature. On the one hand, for a set of Chinese manufacturing firms, over the period from 1998 to 2007, Yu et al. (2017) show that both firms' size and profitability are related to their productivity levels. Firms' size is also analyzed in relation to Italian and Norwegian companies' capacity to innovate especially if they have (or not) access to the public procurement market (Divella and Sterlacchini, 2020). On the other hand, fiscal aspects are found responsible for influencing corporate TFP. In this line, Bournakis and Mallick (2018) state that a higher level of profit tax distorts productivity growth, given its impact on R&D activities (Hall and Van Reenen, 2000) and on the cost of capital (Devereux and Griffith, 2003). Using an unbalanced panel data of 7,400 manufacturing firms in the UK from 2004 to 2011, the authors report that corporate taxes adversely affect TFP growth. Similarly, with a focus on 20 U.S. manufacturing industries, Minniti and Venturini (2017) find evidence that friendly tax treatment of R&D activities positively impacts the growth of TFP.

The second area of the literature is devoted to the relation between corporate governance and productivity (for a recent review of the literature, see Kong and Kong, 2017). In this context, several sets of studies have been developed.

A first series of papers analyze the role of board size, board gender diversity, and independence in the decision-making process, in enhancing TFP. Hence, Gaitán et al. (2018) find, for a sample of 670 firms over the time span from 2006 to 2014, that all these elements affect firms' productivity. They also show that the relationship between board size and productivity is nonlinear. Several studies (e.g. Schoar, 2002; Maeques, 2002) highlight the role of board gender diversity in increasing firms' efficiency (i.e. the level of productivity). The presence of women in the board's management can trigger an equilibrium in the decision-making process. In addition, independent directors can contribute to an increased productivity level in the case of effective corporate governance and in the absence of managerial myopia.

In this line, Jiraporn et al. (2018) show that board independence leads to significantly higher innovation productivity. Finally, in connection with the latter element, the role of Chief Executive Officer (CEO) is investigated in the literature. According to the agency cost theory (Jensen and Meckling, 1976), firms' performance may decrease if the CEO serves also as the chair of the board. Conversely, according to organization theory (Donaldson and Davis, 1991), a single command leads to unambiguous leadership, which increases firms' performances. Chiang and Lin (2007) test these opposite theories for a set of 232 Taiwanese manufacturing firms and show that CEO duality is able to improve productivity.

A second set of studies focuses on the role of ownership structure in enhancing firms' productivity. In this line, Chiang and Lin (2007) show that firms' ownership structure is a key element in explaining the differences in terms of TFP between various categories of firms. Using data for Chinese listed firms for the period from 2001 to 2011, Boeing et al. (2016) argue that privately owned firms obtain better performance and generate higher TFP. This result confirms the findings reported by Jefferson et al. (2000), who argue that TFP growth in the Chinese domestic non-state sector is above the national average. Similar findings are reported by Bastos et al. (2014) for Portuguese firms from 1991 to 2009, and by González-Páramo and Hernández De Cos (2005) for the Spanish case. However, based on an industry-level analysis of Southern European countries, Dimelis and Papaioannou (2016) report a nonsignificant role of the private ownership in enhancing TFP.

Special attention is paid to the role of foreign ownership and FDI in relation to TFP. Multinational enterprises can bring in know-how and world-wide reputation, and generate economies of scale. Several papers underline the positive impact of technology diffusion (Griffith et al., 2004; Savvides and Zachariadis, 2005) and FDI spillovers (Pfaffermayr, 1999; Xu, 2000) on TPF. Typically, the effects of FDI spillovers on TFP are analyzed by Liu et al. (2016) for 1,328 firms from China's electronic industry, over the period 2003 to 2008. They show that, on the one hand, the impact of FDI on TFP is influenced by the productivity gap and that, on the other hand, the foreign ownership enhances technology transfer, and thereforeTFP. Khachoo et al. (2018) analyze the Indian manufacturing sector and report similar findings. In this setting, however, firms' location matters: incumbents near the frontier receive higher benefits. Harris and Moffat (2015) conduct an analysis on the determinants of TFP in UK over the period 1997-2008. They show that firm age is negatively correlated with TFP. At the same time, in their study, foreign ownership is found to be the least important determinant. A different approach is taken by Ashraf et al. (2016), who investigate the effects of greenfield FDI on TFP at the macroeconomic level. The authors use a dynamic panel model and, unlike other papers, find that greenfield FDI has no significant effect on TFP.

To the best of our knowledge, none of the previous papers combines the two branches of the literature described above. We aim to fill in this gap and focus on both categories of TFP drivers. On the one hand, we consider firms' financial performance, size, and innovation capacity. On the other hand, we investigate the role of corporate governance in enhancing the TFP level. In addition, we put a specific focus on the R&D industry, while most previous studies analyze only the manufacturing sector. Moreover, our study brings in new evidence on the Romanian case which, to the best of our knowledge, has been quite unexplored so far. Only a few studies are strictly devoted to the Romanian R&D sector. They are rather descriptive, providing general conclusions: (i) adjustments in R&D and innovation activities (and hence in terms of ”stocks” of R&D spending), have been significant in Romania: nevertheless the country does not hold a top position, in this respect, in the OECD-EU economies ranking (Radosevic and Auriol, 1999); (ii) R&D expenditures have positively affected regional economic growth in Romania over the period from 1995 to 2010 (Goschin, 2014); (iii) the Romanian national research system has been strongly challenged in terms of research activities funding, especially during and after the GFC (Sandu, 2010).

3. Data and methodology

3.1. Data

Annual data on R&D is taken from the AMADEUS (Bureau van Dijk – BvB) database and covers the time span from 2006 to 2016. In this database, under the NACE code “72 - Scientific research and development,” there are 135 Romanian companies. However, the data is available for a sufficient time span only for 116 firms[5]. These companies perform R&D activities with applications in various economic fields, the most important being the medical industry (more than 20%), material science (18%), socio-economic research (16%) and the energy industry (12%). Out of these 116 companies, 47 represent national research institutes.

To calculate TFP, we start with the classic Cobb-Douglas production function, whose inputs are capital and labor:

[5] Only the firms for which observations are available for at least six out of the eleven years of the time span are retained in the analysis. None of the companies defaulted during the analyzed period. Out of 116 companies, about 65% are located in the Bucharest area. Overall, the companies in our sample perform R&D activities in various domains. Nevertheless, among the 47 public research institutes, those located in the capital area carry out very specialized activities.

$$Y_{it} = A_{it} K_{it}^{\alpha} L_{it}^{\beta}, \quad (1)$$

where Y_{it} is output (or the added value (AV)), K_{it} is the capital stock and L_{it} represents labor (the number of employees) of firm *i* at time *t*.

The stock of capital (K_{it}) for each firm *i* in each period *t* is calculated using the Perpetual Inventory Method as follows[6]:

$$K_{it} = K_{it}^{BV} - K_{it-1}^{BV} + DEPR^{BV} \quad , \quad (2)$$

where K_{t}^{BV} and K_{t-1}^{BV} represent the current and, respectively, the lagged book value of tangible fixed assets, while $DEPR^{BV}$ corresponds to depreciation and amortization.

Applying this method to compute the capital stock implies that we lose data for one year. Consequently, the final data sample covers the period from 2007 to 2016. Based on Equation (1), TFP is defined as the output unexplained by traditional inputs of labor and capital (Ilmakunnas and Miyakoshi, 2013):

$$\ln(A_{it}) = \ln(Y_{it}) - \alpha \ln(K_{it}) - \beta \ln(L_{it}), \quad (3)$$

where $\ln(A_{it})$ is equivalent to $\ln(TFP_{it})$.

Unfortunately, the added value (AV) data are scarce in the AMADEUS database, and we are forced to compute the series. Following the OECD recommendations (Gal, 2013), the internally computed added value becomes:

$$AV_{it} = L\_COSTS_{it} + EBITDA_{it}, \quad (4)$$

where L_COSTS_{it} is the labor cost related to the employees and $EBITDA_{it}$ (Earnings Before Interest Taxes Depreciation and Amortization) is a measure of profits, or a part of income oriented toward capital investment.

Our aim is to identify the drivers of TFP and to analyze the role of corporate governance and financial performance in enhancing TFP. To do this, we compute four metrics of TFP based on Wooldridge (2009) and Levinsohn and Petrin (2003), which are OLS residuals and fixed effects (FE) model residuals, respectively (they will be described in more detail in the next sections).

Further, in line with the existing literature, we identify possible determinants of TFP such as: firm size (represented by the natural log of total assets – $lnta$), taxation (measured as

[6] Calculated this way, the stock of capital might record negative values in specific periods, which renders impossible the use of the log form of Cobb-Douglas function. To overcome this, we first identify the minimum value of K for the entire sample (MIN_K). Second, we compute a modified capital stock series $K_{it} = Kinitial_{it} + MIN_K$. Another way to overcome the issue of negative values for the stock of capital is to exclude them from the sample. However, in this case our panel analysis may suffer from the broken panel bias. While in this paper we present the results using the first option for the capital stock series, we have also run all the regressions without negative values (these additional findings can be provided upon request). There are not important differences in terms of empirical results among the two series of findings. Hence, we further on present the coefficients of the estimations that avoid the broken panel problem.

the ratio of taxes to operational revenue – tor), intangible assets (the ratio of intangible fixed assets to total assets – $ifatr$) and profit margins (pm).

Moreover, in addition to the standard TFP determinants presented above, we consider some specific determinants related to shareholders' structure and to corporate governance. They are captured through a series of dummy variables. First, we consider the BvB independence indicators in order to capture the independence in making decisions at the firm level. These indicators capture different levels of independence and range from A (low independence, characterized by dispersed ownership, where each shareholder has less than 25% of the total capital) to D (high independence level in making decisions, with a recorded shareholder having a direct ownership of over 50%). U is attributed to an unknown level of independence. Based on this, we construct a dummy variable ($D1\_Indep$) that takes the value 1 if the level of independence is high (D) and zero otherwise. Second, we want to see to what extent the foreign ownership influences the R&D companies' performances in terms of TFP. To do this, we consider the presence of foreign direct investment (FDI) if the most recent owner is located outside Romania and owns more than 25% of the total capital ($D2\_FDI$ takes value 1 if FDI and 0 otherwise)[7]. Third, we construct a dummy variable ($D3\_MS$) which takes the value 1 if the directors/managers are also shareholders, and 0 otherwise. We aim to investigate to what extent the direct involvement of shareholders in the firm management influences overall productivity of the company[8]. Fourth, we have built a gender dummy variable ($D4\_Gender$), which takes the value 1 if the CEO is a man, and 0 if the CEO is a woman. If the CEO is a woman can generate, according to the corporate governance literature (i.e. Smith et al., 2006), a positive impact on company performance. In addition, the presence of women in the board (i.e. as a CEO) decreases the propensity for risk taking: in the same time, according to literature, this might also imply that the decision-making process might be longer (Smith et al., 2006). Finally, we analyze whether privately owned companies have better productivity performance compared to state-owned ones. Consequently, we construct a dummy variable ($D5\_Owner$) which takes the value 1 if the last owner is private, and 0 if it is

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[7] If we consider, for example, that the presence of FDI is captured by the fact that the last foreign shareholder owns at least 50% of the company capital -the company being thus a subsidiary-, the $D2\_FDI$ variable remains almost the same. However, in order to get closer to the definition of associates according to which 10% to 50% of the voting power is held by the FDI enterprise (OECD, 2008), we have kept the 25% threshold.

[8] In our sample, in general, the whole managerial team is, or is not, composed of shareholders, with the exception of five companies. For these five companies where only a part of the managerial team is also a shareholder, we consider that $D3\_MS$ takes the value 1. Overall, both $D3\_MS$ and $D1\_Indep$ variables describe the decision-making capacity. However, the independence indicator ($D1\_Indep$) shows the ownership dispersion, while $D3\_MS$ indicates the collaboration between managers and shareholders. Using these dummy variables does not generate any multicollinearity issues (Table A1 – Appendix shows that the correlation coefficient between $D3\_MS$ and $D1\_Indep$ variables is positive, but very small).

public. Table 1 centralizes the explanatory variables and presents their expected sign together with their definition and interpretation, according to the literature.

Table 1. Explanatory variables' description

Variable	Explanations	Expected sign
lnta	**Natural log of total assets**. Large companies are financially stable and have more development opportunities. They also benefit from economies of scale, which enhance the productivity level.	+
tor	**Taxes to operational revenue ratio**. A high taxation level negatively affects output, and therefore productivity. However, high taxes correspond to increased efforts to achieve the operational objectives of the firm, which may enhance the productivity level through cost control.	-/+
ifatr	**Intangible assets to total assets ratio.** For industrial firms, a high level of intangible assets is a sign of deeper involvement in R&D activities. Nevertheless, for R&D companies that are supposed to generate innovation, a high book value of intangible assets may show their dependence on other R&D companies, which, in turn, may negatively affect TFP.	+/-
pm	**Profit margin.** An increased profit margin is a sign of profitability and performing activities and is expected to increase the productivity level.	+
D1_Indep	**Independence level dummy** equals 1 if the independence is high and 0 otherwise. If the level of independence is high, the decision-making process becomes faster, which can increase productivity. At the same time, the level of risk may increase given that there might be a low level of cooperation in the decision-making process.	+/-
D2_FDI	**FDI presence dummy** equals 1 if FDI is present and 0 otherwise. The presence of foreign ownership can bring an increase in productivity given knowledge transfers.	+
D3_MS	**Manager-shareholder dummy** equals 1 if the manager is also a shareholder and 0 otherwise**.** If the managers are also shareholders, the level of decisional independence and the accountability in making decisions increase. At the same time, the lack of expertise and the failure to use a professional managerial team may have a negative effect on the level of productivity.	+/-
D4_Gender	**Gender diversity dummy** equals 1 if the manager is a man and 0 if the manager is a woman. Gender diversity contributes to more balanced decisions. However, the presence of women on the board reduces the propensity for risk-taking)	+/-
D5_Owner	**Privately or publicly owned company dummy** equals 1 if the company is private and 0 if it is public. The private sector is considered more productive compared with the public sector, especially in transition economies. At the same time, state-owned companies have better access to finance and can benefit more from public contracts.	+/-

3.2. Methodology

3.2.1. TFP calculation

A simple way to estimate TFP using firm-level data is to take the residuals from the OLS regression when estimating the production function (Gal, 2013). The obtained coefficients, may, however, be biased if higher productivity firms hire more workers. In other words, a positive correlation may exist between labor inputs and the error term (that is, TFP). The fixed-effects OLS model may partially correct this bias, as it considers time-invariant firm-specific productivity effects but cannot control for different productivity shocks across firms. Therefore, building upon the semi-parametric approach advanced by Olley and Pakes (1996), who use investment as a proxy variable for unobserved TFP, Levinsohn and Petrin (2003) employ intermediate inputs (m) as proxies. TFP is thus estimated in a panel framework using the log-linear specification of the production function:

$$Y_{it} = c + \alpha K_{it} + \beta L_{it} + \varepsilon_{it}, \quad (5)$$

where Y is the internally computed value added; K is the stock of capital; L is the number of employees; i = 1,…,116 firms; t = 2007,…,2016; c is a constant that measures the average performance of all firms throughout the considered period;The error term ε_{it} can be decomposed as follows:

$$\varepsilon_{it} = \omega_{it} + \delta_{it}, \quad (6)$$

with ω_{it} representing the productivity of firm i at time t, and δ_{it} being a stochastic error term that contains unobserved productivity shocks which are not correlated with the inputs.

Given that the productivity ω_{it} is known to the firm, and that the firm may decide to increase its inputs in the case of a positive productivity shock, a simultaneity problem may occur. This is treated by Levinsohn and Petrin (2003) by the identification of demand for intermediate goods and by the application of a two-step procedure (for a detailed discussion, see Aiello et al., 2015). In order to capture this, the authors include m_{it} in the estimated equation and assume that it depends on K_{it} and ω_{it}: $m_{it} = f(\omega_{it} + K_{it})$, a function that is invertible. Therefore, we can have $\omega_{it} = h(m_{it} + K_{it})$, and use this in Equation (5) as follows:

$$Y_{it} = c + \alpha K_{it} + \beta L_{it} + h(m_{it} + K_{it}) + \delta_{it}, t = 1 \ldots T. \quad (7)$$

However, Ackerberg et al. (2006) show that jointly considering the input variables' nonparametric polynomial terms and their structural coefficients in the production function makes the latter potentially unidentified. In addition, the assumptions made by Levinsohn and

Petrin (2003) to restrict the dynamics in the productivity process, namely $E(\omega_{it}|\omega_{it-1},\dots,\omega_{i1}) = E(\omega_{it}|\omega_{it-1})$, and $a_{it} = \omega_{it} - E(\omega_{it}|\omega_{it-1})$, which shows that K_{it} is uncorrelated with the innovation a_{it}, are not sufficient. Therefore, building upon Levinsohn and Petrin (2003), Wooldridge (2009) proposes a one-step General Method of Moments (GMM) procedure with consistent standard errors. Consequently, different instruments for different equations are specified while $\omega_{it} = f[h(m_{it-1} + K_{it-1})] + a_{it}$. Plugging ω_{it} into Equation (7) gives:

$$Y_{it} = c + \alpha K_{it} + \beta L_{it} + f[h(m_{it-1} + K_{it-1})] + a_{it} + \delta_{it}. \quad (8)$$

The two equations that allow the identification of α and β are Equation (7) and:

$$Y_{it} = c + \alpha K_{it} + \beta L_{it} + f[h(m_{it-1} + K_{it-1})] + u_{it}, \quad (9)$$

where $u_{it} \equiv a_{it} + \delta_{it}$ and $t = 2 \dots T$

Equations (7) and (9) show that the contemporaneous state variables K_{it}, lagged inputs, and the functions of these, which are considered as instrumental variables, are used in the estimation (Wooldridge, 2009).

3.2.2. Bootstrap panel quantile regression

We construct our empirical strategy based on the previous equations. After some simplifications and connections with the observables, we estimate the following general equation:

$$tfp_{it} = \alpha + \beta1_{it}\ln ta + \beta2_{it}tor + \beta3_{it}iftar + \beta4_{it}pm + \beta5_{it}D1\_Indep + \beta6_{it}D2\_FDI + \beta7_{it}D3\_MS + \beta8_{it}D4\_Gender + \beta9_{it}D5\_Owner + \varepsilon_{it}. \quad (10)$$

where tfp_{it} is the total factor productivity estimated through Wooldridge (2009), Levinsohn and Petrin (2003), α is the intercept, $\beta_{k=1..9}$ represent the coefficients of the TFP determinants, and ε_{it} is the error term.

As the variables may have different effects at different points in the conditional distribution of the dependent variable, the use of a quantile regression might be recommended. The quantile regression linear model advanced by Koenker and Bassett (1978) supposes a set of random variables $Y_1, Y_2, \dots$ generated by a linear regression (Hahn, 1995):

$$Y_i = \beta_0 + \beta X_i + \varepsilon_i, \quad (11)$$

where X_i are observed variables, β is an unknown coefficient, ε_i are the unobserved errors.

The quantile regression estimator $\hat{\beta}_\tau$ of β_i is defined by:

$$\hat{\beta}_N = \underset{\beta}{\operatorname{argmin}} \sum_{i=1}^{N} q_\tau(Y_i - \beta X_i), \quad (12)$$

where $q_\tau(u) = u(\tau \cdot 1_{|u\geq 0|} - (1-\tau) \cdot 1_{|u<0|})$.

In a panel framework, let $Q_Y(\tau \mid x) := \inf\{q : P(Y \leq q \mid X = x \ \geq \tau\}$ denote the τ^{th} conditional quantile of Y's response to a vector of covariates $X = x$, so as $0 \leq \tau \leq 1$. In this case, the linear quantile regression model of $Q_{y_{it}}(\tau \mid x_{it})$, at a given τ becomes:

$$Q_{y_{it}}(\tau \mid x_{it}) = \beta_0(\tau) + x'\beta(\tau), \tag{13}$$

where $\beta_0(\tau)$ is a scalar intercept, $\beta(\tau)$ represents a coefficient vector, and x' denotes the vector transpose of x.

The choice of τ allows us to focus on the tails of the conditional distribution. However, assessing the accuracy of the τ^{th} quantile parametric regression estimate requires reliable procedures to identify the asymptotic variance-covariance matrix, particularly for non-i.i.d. cases (Galvao and Montes-Rojas, 2015). Hence, the use of bootstrap resampling methods is recommended for the construction of confidence intervals based on quantile regressions.

This is a fully-nonparametric procedure based on the so-called (y_{it}, x_{it})-pairs bootstrap, which is supposed to be independent. Several possibilities exist for bootstrap resampling, while the cross-sectional and temporal resampling represent the simplest methods (Kapetanios, 2008). In the first case, a replacement from the cross-section dimension with probability $1/N$ is performed. For both vectors $Y^* = (y_{i1}, \dots, y_{is}, \dots, y_{iN})$ and $X^* = (x_{i1}, \dots, x_{is}, \dots, x_{iN})$, each element of the vector of indices $(i_1, \dots, i_N)$ is obtained by drawing with replacement from $(1, \dots, N)$, each element $y_{i_s} = (y_{i_s1}, \dots, y_{i_sT})$ and respectively $x_{i_s} = (x_{i_s1}, \dots, x_{i_sT})$, for $s \in (i_1, \dots, i_N)$. In the second case, for both Y and X a replacement is made with the temporal dimension for each individual, with a probability $1/T$. The implementation is constructed in the case of Y^*, for each $i \in (1, \dots, N)$, is $y_i^* = (y_{i_t1}, \dots, y_{i_tr}, \dots, y_{i_tT})$, where each element of $(t_1, \dots, t_T)$ is obtained by drawing with replacement from $(1, \dots, T)$. As a consequence, Y becomes $Y^* = (y_1^*, \dots, y_i^*, \dots, y_N^*)$, and the same vector of indices is used for obtaining X^*. A combination scheme between the two methods is used. Therefore, for a given τ-quantile of interest, the bootstrapped panel data estimator is:

$$\hat{\beta}_{NT}^* = \underset{\beta}{\operatorname{argmin}} \sum_{i=1}^{N} \sum_{t=1}^{T} q_\tau(y_{it}^* - \beta x_{it}^{*\prime}), \tag{14}$$

where (y_{it}^*, x_{it}^*) are the pairwise resampled data.

4. Results and Discussion

The panel quantile regressions that we run to uncover the link between productivity, financial performance, and corporate governance indicators require stationary series. Therefore, we start our empirical analysis by applying panel unit root tests. Given the fact that we have an unbalanced panel, we use Fisher-type panel unit root tests, proposed by Maddala and Wu (1999) and Choi (2001). The results are presented in Table A2 (Appendix) and show that our series are stationary.

We continue the empirical analysis with the bootstrap panel quantile regression (for 11 quantiles from 0.05 to 0.95). In the main analysis 200 iterations are performed. We obtain four sets of results, corresponding to the four approaches of computing TFP. Table 2 presents the results for the Wooldridge's (2009) TFP approach.

Table 2. TFP quantile regression – Wooldridge (2009) (200 bootstrap estimations)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Quantiles	**0.05**	**0.15**	**0.25**	**0.35**	**0.45**	**0.50**	**0.55**	**0.65**	**0.75**	**0.85**	**0.95**
lnta	0.055***	0.085***	0.115***	0.133***	0.147***	0.152***	0.156***	0.168***	0.187***	0.198***	0.208***
	(0.012)	(0.011)	(0.011)	(0.010)	(0.010)	(0.115)	(0.012)	(0.015)	(0.014)	(0.015)	(0.017)
tor	-0.022	-0.000	0.003	0.018*	0.009	0.006	0.001	-0.001	-0.010	-0.010	0.010
	(0.014)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.010)	(0.010)	(0.013)	(0.025)
ifatr	-0.000	-0.000	-0.000	-0.000	0.000	0.000	0.000	-0.000	-0.000	-0.001	-0.002*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
pm	0.007***	0.008***	0.008***	0.006***	0.007***	0.007***	0.007***	0.007***	0.008***	0.007***	0.002
	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.003)
D1_Indep	0.034	-0.066***	-0.110***	-0.130***	-0.120***	-0.122***	-0.114***	-0.108***	-0.161***	-0.162***	-0.093
	(0.040)	(0.023)	(0.017)	(0.021)	(0.022)	(0.021)	(0.021)	(0.024)	(0.035)	(0.042)	(0.077)
D2_FDI	0.133***	0.184***	0.192***	0.174***	0.160***	0.144***	0.154***	0.197***	0.358***	0.408***	0.650***
	(0.041)	(0.030)	(0.020)	(0.024)	(0.024)	(0.025)	(0.032)	(0.060)	(0.062)	(0.094)	(0.097)
D3_MS	-0.121***	-0.053**	-0.063**	-0.098***	-0.105***	-0.123***	-0.123***	-0.111***	-0.132***	-0.182***	-0.122
	(0.038)	(0.024)	(0.018)	(0.022)	(0.023)	(0.022)	(0.021)	(0.030)	(0.039)	(0.003)	(0.076)
D4_Gender	-0.090***	-0.077***	-0.061***	-0.056***	-0.037**	-0.025	-0.016	0.010	0.031	0.021	-0.006
	(0.028)	(0.020)	(0.019)	(0.020)	(0.018)	(0.018)	(0.018)	(0.027)	(0.028)	(0.038)	(0.048)
D5_Owner	-0.109***	-0.166***	-0.172***	-0.152***	-0.162***	-0.171***	-0.181***	-0.199***	-0.171***	-0.112	-0.297**
	(0.039)	(0.027)	(0.023)	(0.033)	(0.037)	(0.039)	(0.034)	(0.044)	(0.061)	(0.074)	(0.149)
Constant	5.763***	5.705***	5.574***	5.472***	5.425***	5.418***	5.413***	5.402***	5.400***	5.423***	5.704***
	(0.128)	(0.087)	(0.092)	(0.103)	(0.107)	(0.109)	(0.118)	(0.144)	(0.128)	(0.155)	(0.193)

*Notes: (i) Standard errors in parentheses; (ii) *** p<0.01, ** p<0.05, * p<0.1; (iii) Number of observations: 1,055; Pseudo R^2=0.441; (iv) For the definition of variables, please see Table 1.*

For all quantiles (that is, for all levels of productivity), the size of the companies has a positive impact on productivity. The economies of scale and the stability of financing sources recorded by larger companies in the R&D sector, lead, therefore, to an increase in productivity levels. A similar effect is found in the case of the profit margin, supporting the idea that an increased profitability enhances TFP. However, no significant impact is reported in the case of taxation, and in the case of intangible assets. These results might be explained as follows. On the one hand, Romania had, over the analyzed period, a fiscal system relying on a flat tax rate. Although large fiscal incertitude is recorded during the most recent years (generated by numerous annual changes of the fiscal code), this has a minor effect on companies' activity, namely on their performance in terms of productivity, as they have already anticipated this. On the other hand, for R&D companies, higher investment in intangible assets (considered as R&D products), does not lead to an increase in TFP. In fact, for the R&D companies, the ratio of intangible assets to total assets is smaller compared to manufacturing firms. Several interesting findings are obtained when we assess the influence of corporate governance on TFP. First, for all quantiles the $D1\_Indep$ variable has a negative impact on TFP, meaning that a larger independence in making decisions negatively affects TFP. This result suggests that collaboration in decision-making might be beneficial: hence, a dispersed ownership, having different ideas and approaches, could strengthen the productivity of R&D companies in Romania. Second, foreign-owned R&D firms register better productivity performance compared with their counterparts held by national investors. Thus, the international knowledge transfer and management skills improve the economic performances of these companies. Third, if the manager of a company is also a shareholder ($D3\_MS$), this has a negative impact on the firm's performance, regardless of its level of productivity. This finding matches the first one, showing that, if there is no control by the owner of the company, managers tend to make risky decisions with a negative impact on TFP. The coefficient of $D4\_Gender$ shows that the absence of women as CEO hampers TFP. This result confirms the theory underlying that board gender diversity has a positive influence on firms' performances. However, the result is significant for the lower quantiles only, that is, for companies with a low level of productivity. For higher productivity levels, women's presence as CEO does not necessarily lead to increased productivity; this represents an original result of our study. Finally, state-owned companies record higher productivity. This result does not corroborate the one showing a positive role of FDI. However, it might be explained by the fact that the privately owned national companies are young firms in the R&D industry and record a lower level of productivity. At the same time, the 47 national research institutes that are mainly held by the state benefit from state contracts and have more experience in the field, which positively impact their TFP. Furthermore, this result is not that surprising: the fact that private companies are more efficient in general, is constantly supported neither by economic theory, nor by empirical evidence (González-Páramo and Hernández De Cos, 2005). In addition, our results confirm several conclusions already put forward in the literature. While Dimelis and Papaioannou (2016) do not report a significant impact of public ownership on TFP for the Southern European economies, Gaitán et al. (2018) show that public companies perform better in terms of productivity in Latin America.

The second set of results, based on Levinsohn and Petrin's (2003) approach for the TFP, reveals slightly different results (Table 3).

Table 3. TFP quantile regression – Levinsohn and Petrin (2003) (200 bootstrap estimations)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Quantiles	0.05	0.15	0.25	0.35	0.45	0.50	0.55	0.65	0.75	0.85	0.95
lnta	-0.062***	-0.042***	-0.028***	-0.013**	0.000	0.004	0.009**	0.017***	0.025***	0.035***	0.042***
	(0.012)	(0.007)	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)	(0.003)	(0.005)	(0.010)
tor	0.001	0.025**	0.023***	0.015**	0.015**	0.019**	0.020**	0.017***	0.019***	0.021***	0.020***
	(0.027)	(0.012)	(0.007)	(0.006)	(0.008)	(0.008)	(0.008)	(0.006)	(0.006)	(0.007)	(0.007)
ifatr	-0.001**	-0.001***	-0.001***	-0.001***	-0.000***	-0.000***	-0.000**	-0.000**	-0.000**	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
pm	0.007**	0.005***	0.005***	0.006***	0.005***	0.005***	0.004***	0.004***	0.004***	0.004***	0.003***
	(0.003)	(0.001)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.001)
D1_Indep	-0.074	-0.076***	-0.083***	-0.093***	-0.078***	-0.078***	-0.074***	-0.063***	-0.064***	-0.038	-0.051
	(0.049)	(0.025)	(0.014)	(0.015)	(0.013)	(0.012)	(0.013)	(0.012)	(0.016)	(0.024)	(0.031)
D2_FDI	0.006	0.027	0.067**	0.073**	0.075***	0.091***	0.100***	0.091***	0.092***	0.126***	0.247***
	(0.067)	(0.036)	(0.030)	(0.033)	(0.025)	(0.022)	(0.018)	(0.019)	(0.024)	(0.032)	(0.049)
D3_MS	-0.132**	-0.038	-0.042**	-0.070***	-0.072***	-0.064***	-0.059***	-0.059***	-0.082***	-0.059**	-0.011
	(0.055)	(0.026)	(0.020)	(0.025)	(0.020)	(0.018)	(0.017)	(0.015)	(0.016)	(0.024)	(0.032)
D4_Gender	0.041	0.015	-0.007	-0.027**	-0.020*	-0.032**	-0.038***	-0.043***	-0.060***	-0.063***	-0.076***
	(0.049)	(0.028)	(0.015)	(0.012)	(0.011)	(0.012)	(0.013)	(0.014)	(0.016)	(0.019)	(0.024)
D5_Owner	-0.088	-0.097***	-0.105***	-0.083***	-0.069***	-0.068***	-0.063***	-0.061***	-0.047**	-0.071***	-0.075
	(0.068)	(0.037)	(0.023)	(0.021)	(0.016)	(0.012)	(0.014)	(0.019)	(0.019)	(0.027)	(0.048)
Constant	0.293**	0.293**	0.255***	0.198***	0.091*	0.085**	0.055	0.040	0.029	0.029	0.091
	(0.126)	(0.076)	(0.044)	(0.049)	(0.049)	(0.040)	(0.041)	(0.055)	(0.039)	(0.058)	(0.096)

*Notes: (i) Standard errors in parentheses; (ii) *** p<0.01, ** p<0.05, * p<0.1; (iii) Number of observations: 1,055 and Pseudo R^2=0.220; (iv) For the definition of variables see Table 1.*

On the one hand, the positive impact of firms' size on TFP is recorded for the upper quantiles only, while for the lower quantiles, the impact is negative. On the other hand, while the influence of profitability remains the same for all quantiles, the taxation level seems to have a significant and positive impact on productivity, showing that in reaction to increased taxation, companies look for strategies that allow them to preserve their profits, and become more productive (and conversely, if the level of taxation decreases, funds might be spent carelessly and productivity decreases).

However, in terms of shareholders' structure and governance role in enhancing productivity, the results are quite similar with the previous findings. The degree of independence, and the involvement of shareholders in firms' management, have a negative impact on TFP, while FDI has a positive influence. In addition, the absence of women as CEO, and therefore a certain lack of board gender diversity, negatively affects TFP, although this finding is documented for the middle- and upper quantiles only. Finally, private ownership negatively influences R&D firms' productivity.

Tables 4 and 5 present the results of estimations based on the OLS residuals and FE model residuals, respectively, in computing TFP.

Table 4. TFP quantile regression – OLS residuals (200 bootstrap estimations)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Quantiles	0.05	0.15	0.25	0.35	0.45	0.50	0.55	0.65	0.75	0.85	0.95
lnta	0.117***	0.154***	0.182***	0.193***	0.198***	0.190***	0.188***	0.183***	0.196***	0.211***	0.230***
	(0.020)	(0.015)	(0.013)	(0.011)	(0.008)	(0.007)	(0.007)	(0.007)	(0.011)	(0.012)	(0.016)
tor	0.003	0.002	-0.007	-0.002	-0.009	-0.015	-0.019**	-0.016**	-0.006	-0.012	-0.019
	(0.024)	(0.014)	(0.013)	(0.012)	(0.010)	(0.010)	(0.009)	(0.007)	(0.013)	(0.011)	(0.016)
ifatr	-0.000	-0.001**	-0.000	0.000	0.000*	0.000**	0.001***	0.001***	0.001***	0.002***	0.004***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
pm	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.001)	(0.002)
D1_Indep	-0.267***	-0.227***	-0.165***	-0.126***	-0.102***	-0.086***	-0.072***	-0.052**	-0.005	0.004	0.132**
	(0.051)	(0.062)	(0.060)	(0.041)	(0.021)	(0.019)	(0.020)	(0.021)	(0.034)	(0.030)	(0.061)
D2_FDI	0.594***	0.215*	0.143**	0.067	0.094***	0.082***	0.078**	0.096***	0.087**	0.087*	0.013
	(0.094)	(0.117)	(0.062)	(0.048)	(0.035)	(0.030)	(0.032)	(0.029)	(0.038)	(0.050)	(0.066)
D3_MS	0.069	-0.060	-0.083	-0.080	-0.060*	-0.061**	-0.062**	-0.084***	-0.034	-0.035	-0.111*
	(0.123)	(0.117)	(0.062)	(0.054)	(0.034)	(0.026)	(0.027)	(0.025)	(0.047)	(0.042)	(0.065)
D4_Gender	-0.158***	-0.048*	0.016	0.029	0.036	0.036*	0.036*	0.063***	0.083***	0.083***	0.071
	(0.045)	(0.025)	(0.031)	(0.026)	(0.022)	(0.021)	(0.020)	(0.018)	(0.029)	(0.027)	(0.057)
D5_Owner	-0.731***	-0.318**	-0.228***	-0.210***	-0.218***	-0.245***	-0.263***	-0.271***	-0.288***	-0.285***	-0.314***
	(0.091)	(0.0141)	(0.062)	(0.053)	(0.035)	(0.030)	(0.028)	(0.030)	(0.038)	(0.031)	(0.073)
Constant	6.717***	6.476***	6.264***	6.199***	6.185***	6.290***	6.331***	6.386***	6.311***	6.250***	6.149***
	(0.202)	(0.146)	(0.132)	(0.110)	(0.081)	(0.070)	(0.069)	(0.067)	(0.109)	(0.110)	(0.153)

*Notes: (i) Standard errors in parentheses; (ii) *** p<0.01, ** p<0.05, * p<0.1; (iii) Number of observations: 1,055 and Pseudo R^2=0.425; (iv) For the definition of variables see Table 1.*

Several conclusions can be drawn. First, the results of these two estimations are convergent, which confirms the findings reported by Gal (2013). Second, the results reported in Tables 4 and 5 corroborate our initial findings relying on Wooldridge (2009), thus proving their robustness (a small exception appears in the case of pm, whose influence on TFP is not significant). More precisely, firms' size matters at all levels of productivity. Although marginal, the effect of $ifatr$ becomes positive: this was not the case in the results reported in

Table 3. In addition, the impact of the degree of independence in making decisions, and the involvement of shareholders in the companies' management, negatively impacts TFP. As in the previous cases, FDI increases the productivity level. Moreover, state-owned companies record, in general, better performance compared to privately-owned firms. Mixed findings are obtained when we assess the presence of women on companies' boards. While the women involvement in firms' management has a positive impact on productivity for the lower quantiles, it has a negative impact for highly productive firms. All in all, gender diversity on the boards of the analyzed companies leads to mixed findings across the four sets of analyses.

Table 5. TFP quantile regression – OLS with FE residuals (200 bootstrap estimations)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Quantiles	0.05	0.15	0.25	0.35	0.45	0.50	0.55	0.65	0.75	0.85	0.95
lnta	0.076***	0.086***	0.103***	0.114***	0.113***	0.110***	0.106***	0.104***	0.102***	0.115***	0.128***
	(0.011)	(0.009)	(0.009)	(0.008)	(0.006)	(0.005)	(0.004)	(0.004)	(0.007)	(0.007)	(0.010)
tor	0.004	0.001	-0.003	-0.005	-0.006	-0.007	-0.007	-0.008	-0.002	-0.003	-0.011
	(0.014)	(0.008)	(0.007)	(0.007)	(0.006)	(0.006)	(0.005)	(0.005)	(0.008)	(0.007)	(0.009)
ifatr	-0.000	-0.000*	-0.000	0.000	0.000**	0.000**	0.000***	0.000***	0.000**	0.001***	0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
pm	-0.000	-0.000	0.000	0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
D1_Indep	-0.151***	-0.137***	-0.097**	-0.080***	-0.056***	-0.052***	-0.039***	-0.031***	-0.008	-0.005	0.069**
	(0.029)	(0.040)	(0.040)	(0.026)	(0.013)	(0.011)	(0.012)	(0.011)	(0.020)	(0.014)	(0.029)
D2_FDI	0.322***	0.135**	0.077**	0.043	0.052**	0.043**	0.052**	0.055***	0.065***	0.056**	0.026
	(0.043)	(0.067)	(0.039)	(0.028)	(0.021)	(0.019)	(0.022)	(0.016)	(0.023)	(0.027)	(0.038)
D3_MS	0.002	-0.020	-0.049	-0.052	-0.035	-0.037**	-0.041**	-0.050***	-0.034	-0.037*	-0.080**
	(0.072)	(0.073)	(0.039)	(0.033)	(0.022)	(0.018)	(0.016)	(0.014)	(0.026)	(0.022)	(0.034)
D4_Gender	-0.080***	-0.022	0.007	0.022	0.021	0.021**	0.029**	0.035***	0.041***	0.046***	0.042
	(0.027)	(0.015)	(0.019)	(0.017)	(0.013)	(0.012)	(0.012)	(0.011)	(0.015)	(0.015)	(0.028)
D5_Owner	-0.418***	-0.195**	-0.127***	-0.114***	-0.124***	-0.129***	-0.143***	-0.156***	-0.177***	-0.155***	-0.172***
	(0.045)	(0.087)	(0.046)	(0.035)	(0.025)	(0.051)	(0.018)	(0.016)	(0.021)	(0.017)	(0.035)
Constant	6.995***	6.971***	6.832***	6.756***	6.779***	6.821***	6.865***	6.904***	6.955***	6.857***	6.793**
	(0.118)	(0.096)	(0.095)	(0.073)	(0.056)	(0.051)	(0.045)	(0.045)	(0.065)	(0.071)	(0.088)

*Notes: (i) Standard errors in parentheses; (ii) *** $p<0.01$, ** $p<0.05$, * $p<0.1$; (iii) Number of observations: 1,055 and Pseudo R^2=0.401; (iv) For the definition of variables see Table 1.*

Even if our four sets of results are rather convergent, there are mixed findings regarding the role of the profit margin, intangible assets, and gender diversity of companies' boards in enhancing TFP. The number of iterations used for computing the confidence intervals might influence the results. Therefore, we perform a robustness analysis by increasing the number of iterations.

5. Robustness analysis

For our robustness checks, we use 500 bootstraps. Table 6 presents the new set of findings using the Wooldridge's (2009) approach of TFP, while Tables A3-A5 (Appendix) present the results obtained using the other methodologies to compute TFP. As we can notice, the results presented in Table 6 are very close to the ones reported in Table 2, confirming thus their robustness.

Firm size is a key driver of productivity, and its role increases for the upper-quantiles, that is, for highly productive firms. Thus, productivity is correlated with firms' size (Marques, 2015). The profit margin has a positive but rather minor influence on TFP. In the set of results obtained following Wooldridge's (2009) method, we find that taxation and intangible assets do not affect TFP. At the same time, the degree of decisions' independence and owners acting as managers negatively influence productivity. While FDI stimulates TFP across all quantiles, the presence of women on boards is important only for low-productivity firms. Finally, in general, our results suggest that the public R&D companies in Romania register a higher total productivity.

Table 6. TFP quantile regression – Wooldridge (2009) (500 bootstrap estimations)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Quantiles	0.05	0.15	0.25	0.35	0.45	0.50	0.55	0.65	0.75	0.85	0.95
lnta	0.055***	0.085***	0.115***	0.133***	0.141***	0.152***	0.156***	0.168***	0.187***	0.198***	0.208***
	(0.012)	(0.009)	(0.009)	(0.010)	(0.010)	(0.011)	(0.012)	(0.015)	(0.014)	(0.016)	(0.016)
tor	-0.022	-0.000	0.003	0.018*	0.009	0.006	0.001	-0.001	-0.010	-0.001	0.010
	(0.014)	(0.009)	(0.010)	(0.010)	(0.009)	(0.009)	(0.008)	(0.009)	(0.010)	(0.014)	(0.024)
ifatr	-0.000	-0.000	-0.000	-0.000	0.000	0.000	0.000	-0.000	-0.000	-0.000	-0.000**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
pm	0.007***	0.008***	0.008***	0.006***	0.007***	0.007***	0.007***	0.007***	0.008***	0.007***	0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.003)
D1_Indep	0.034	-0.066***	-0.110***	-0.130***	-0.120***	-0.122***	-0.114***	-0.108***	-0.161***	-0.162***	-0.093
	(0.037)	(0.023)	(0.018)	(0.021)	(0.023)	(0.023)	(0.022)	(0.027)	(0.038)	(0.045)	(0.071)
D2_FDI	0.133***	0.184***	0.192***	0.174***	0.160***	0.144***	0.154***	0.197***	0.358***	0.408***	0.650***
	(0.047)	(0.028)	(0.021)	(0.025)	(0.026)	(0.028)	(0.035)	(0.063)	(0.068)	(0.089)	(0.109)
D3_MS	-0.121***	-0.053**	-0.063***	-0.098***	-0.105***	-0.123***	-0.123***	-0.111***	-0.132***	-0.182***	-0.122
	(0.039)	(0.026)	(0.020)	(0.022)	(0.024)	(0.023)	(0.022)	(0.029)	(0.041)	(0.059)	(0.075)
D4_Gender	-0.090***	-0.077***	-0.061***	-0.056***	-0.037**	-0.025	-0.016	0.010	0.031	0.021	-0.006
	(0.027)	(0.018)	(0.017)	(0.019)	(0.018)	(0.018)	(0.019)	(0.024)	(0.029)	(0.037)	(0.049)
D5_Owner	-0.109**	-0.166***	-0.172***	-0.152***	-0.162***	-0.171***	-0.181***	-0.199***	-0.171***	-0.112	-0.297**
	(0.044)	(0.029)	(0.022)	(0.033)	(0.037)	(0.038)	(0.037)	(0.044)	(0.061)	(0.071)	(0.134)
Constant	5.763***	5.705***	5.574***	5.472***	5.425***	5.418***	5.413***	5.402***	5.400***	5.423***	5.704***
	(0.123)	(0.077)	(0.081)	(0.100)	(0.104)	(0.108)	(0.115)	(0.141)	(0.136)	(0.164)	(0.184)

*Notes: (i) Standard errors in parentheses; (ii) *** p<0.01, ** p<0.05, * p<0.1; (iii) Number of observations: 1,055 and Pseudo* R^2*=0.441; (iv) For the definition of variables see Table 1.*

6. Conclusions

We compute the productivity of Romanian R&D firms and investigate its key drivers. Using firm-level data for the period from 2007 to 2016 and different approaches to calculate productivity (TFP), we rely on two main categories of productivity determinants, namely firm financial performance and innovation capacity, as well as internal corporate governance measures.

Our bootstrap panel quantile regressions show that firm size and profitability margins are important drivers of TFP for R&D companies. At the same time, taxation and intangible assets of the R&D companies do not significantly lead to higher productivity.

The corporate governance drivers show that the presence of women on boards is important, but only for low-productivity firms. In addition, the independence of the decision-making process and CEO duality negatively impact TFP for all categories of firms, regardless of their level of productivity. This result is consistent with agency cost theory. Further, as expected, foreign ownership has a positive and significant influence on the productivity level, but curiously, state-owned applied research institutes are found to perform better than privately owned ones. These rather opposite findings may be explained by the fact that FDI is important for private firms: private foreign-owned firms might perform better compared with private domestically-owned companies. However, public institutes may record better performances as they do not face specific financial constraints (i.e. no obligation of profit) and have access to public contracts.

Our results are robust to different measures of productivity (four TFP calculations) and to a different number of iterations used for computing the confidence intervals. At the same time, several policy implications can be driven based on our findings. Higher productivity in the R&D sector in Romania can be reached if authorities encourage FDI in the private R&D sector, on the one hand, and consolidate highly performing public research institutes, on the other hand. Regardless of the ownership structure and origin, board gender diversity (i.e. the presence of women as CEO) is important in enhancing the TFP level especially for low-productivity firms. Moreover, separation between firms' management and ownership is necessary to increase productivity. Finally, our results suggest that: (i) if foreign owned firms focus on niche R&D activities, they are able to improve their productivity; and (ii) in general, firms' financial performance and size are effective in increasing overall TFP.

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Appendix

Table A1. Correlation matrix

	lnta	tor	ifatr	pm	D1_Indep	D2_FDI	D3_MS	D4_Gender	D5_Owner
lnta	1.000								
tor	-0.308	1.000							
ifatr	-0.414	0.255	1.000						
pm	-0.189	0.719	0.255	1.000					
D1_Indep	-0.305	0.243	0.236	0.133	1.000				
D2_FDI	-0.196	0.097	0.307	0.066	0.305	1.000			
D3_MS	-0.314	0.250	0.229	0.178	0.008	-0.135	1.000		
D4_Gender	0.024	-0.008	-0.110	-0.015	-0.098	0.074	0.068	1.000	
D5_Owner	-0.544	0.331	0.448	0.251	0.507	0.366	0.473	0.004	1.000

Table A2. Panel unit root tests (Fisher-type tests)

Tests \ Variables	tfp1	tfp2	tfp3	tfp4	lnta	tor	iftar	pm
Inverse chi-squared (P)	743.4***	738.5***	899.5***	832.6***	525.2***	957.8***	635.4***	789.3***
Inverse normal (Z)	-8.946***	-10.32***	-7.754***	-5.498***	-3.665***	-14.77***	-5.696***	-11.70***
Inverse logit t (L*)	-14.53***	-15.22***	-16.34***	-14.24***	-7.639***	-22.41***	-11.03***	-17.21***
Modified inverse chi-squared (Pm)	24.13***	23.90***	31.44***	28.31***	13.92***	34.17***	19.07***	26.28***

*Notes: (i) H0 = all panels contain unit roots; (ii) *** p<0.01, ** p<0.05, * p<0.1; (iii) tfp1 = Wooldridge (2009) measure of TFP, tfp2 = Levinsohn and Petrin (2003) measure of TFP, tfp3 = OLS based measure of TFP, tfp4 = OLS with fixed effects measure of TFP, lnta = total assets (natural log), tor = taxes to operational revenue ratio, iftar = intangible assets to total assets ratio, pm = profit margin.*

Table A3. TFP quantile regression – Levinsohn and Petrin (2003) (500 bootstrap estimations)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Quantiles	0.05	0.15	0.25	0.35	0.45	0.50	0.55	0.65	0.75	0.85	0.95
lnta	-0.062***	-0.042***	-0.028***	-0.013***	0.000	0.004	0.009**	0.017***	0.025***	0.035***	0.042***
	(0.011)	(0.007)	(0.004)	(0.004)	(0.004)	(0.003)	(0.004)	(0.004)	(0.003)	(0.004)	(0.009)
tor	0.001	0.025**	0.023***	0.015**	0.015**	0.019**	0.020**	0.017**	0.019***	0.021***	0.020**
	(0.027)	(0.012)	(0.007)	(0.007)	(0.007)	(0.008)	(0.008)	(0.006)	(0.006)	(0.007)	(0.007)
ifatr	-0.001**	-0.001***	-0.001***	-0.001***	-0.000***	-0.000***	-0.000***	-0.001**	-0.000**	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
pm	0.007**	0.005***	0.005***	0.006***	0.005***	0.005***	0.004***	0.004***	0.004***	0.004***	0.003***
	(0.003)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	(0.001)
D1_Indep	-0.074	-0.076***	-0.084***	-0.093***	-0.078***	-0.078***	-0.074***	-0.063***	-0.064***	-0.038	-0.051
	(0.052)	(0.028)	(0.014)	(0.016)	(0.012)	(0.013)	(0.013)	(0.014)	(0.016)	(0.023)	(0.031)
D2_FDI	0.006	0.027	0.067**	0.073**	0.075***	0.091***	0.100***	0.091***	0.092***	0.126***	0.247***
	(0.061)	(0.034)	(0.030)	(0.035)	(0.025)	(0.021)	(0.017)	(0.018)	(0.023)	(0.033)	(0.047)
D3_MS	-0.132**	-0.038	-0.042**	-0.070***	-0.072***	-0.064	-0.059***	-0.059***	-0.082***	-0.059**	-0.011
	(0.058)	(0.030)	(0.021)	(0.025)	(0.020)	(0.018)	(0.017)	(0.016)	(0.161)	(0.023)	(0.032)
D4_Gender	0.041	0.015	-0.007	-0.027**	-0.020*	-0.032**	-0.038***	-0.043***	-0.060***	-0.063***	-0.076***
	(0.047)	(0.027)	(0.016)	(0.013)	(0.012)	(0.012)	(0.012)	(0.014)	(0.016)	(0.018)	(0.023)
D5_Owner	-0.088	-0.097**	-0.105***	-0.083***	-0.069***	-0.068***	-0.063***	-0.061***	-0.047**	-0.071***	-0.075
	(0.071)	(0.039)	(0.024)	(0.022)	(0.016)	(0.014)	(0.015)	(0.020)	(0.019)	(0.026)	(0.047)
Constant	0.293**	0.293**	0.255***	0.198***	0.091**	0.085**	0.055	0.040	0.029	0.029	0.091
	(0.120)	(0.072)	(0.041)	(0.045)	(0.044)	(0.035)	(0.037)	(0.048)	(0.037)	(0.050)	(0.093)

*Notes: (i) Standard errors in parentheses; (ii) *** p<0.01, ** p<0.05, * p<0.1; (iii) Number of observations: 1,055 observations and Pseudo R^2=0.220; (iv) For the definition of variables, please see Table 1*

Table A4. TFP quantile regression – OLS residuals (500 bootstrap estimations)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Quantiles	0.05	0.15	0.25	0.35	0.45	0.50	0.55	0.65	0.75	0.85	0.95
lnta	0.117***	0.154***	0.182***	0.193***	0.198***	0.190***	0.188***	0.183***	0.196***	0.211***	0.230***
	(0.021)	(0.017)	(0.014)	(0.013)	(0.010)	(0.008)	(0.008)	(0.007)	(0.011)	(0.012)	(0.016)
tor	0.003	0.002	-0.007	-0.002	-0.009	-0.015	-0.019**	-0.016*	-0.006	-0.012	-0.019
	(0.024)	(0.014)	(0.012)	(0.012)	(0.010)	(0.009)	(0.009)	(0.008)	(0.014)	(0.010)	(0.014)
ifatr	-0.000	-0.001**	-0.000	0.000	0.000*	0.000**	0.001***	0.001***	0.001***	0.002***	0.004***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
pm	-0.000	-0.000	0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)
D1_Indep	-0.265***	-0.227***	-0.165**	-0.126***	-0.102***	-0.086***	-0.072***	-0.052**	-0.005	0.004	0.132**
	(0.050)	(0.067)	(0.066)	(0.042)	(0.024)	(0.021)	(0.021)	(0.021)	(0.032)	(0.026)	(0.053)
D2_FDI	0.594***	0.215*	0.143**	0.067	0.094***	0.082***	0.078**	0.096***	0.087**	0.087*	0.013
	(0.095)	(0.116)	(0.062)	(0.049)	(0.036)	(0.031)	(0.033)	(0.029)	(0.041)	(0.046)	(0.067)
D3_MS	0.069	-0.060	-0.083	-0.080	-0.060	-0.061**	-0.062**	-0.084***	-0.034	-0.035	-0.111*
	(0.122)	(0.120)	(0.064)	(0.056)	(0.038)	(0.027)	(0.026)	(0.024)	(0.045)	(0.040)	(0.062)
D4_Gender	-0.158***	-0.048*	0.016	0.029	0.036	0.036	0.036*	0.063***	0.083***	0.083***	0.071
	(0.047)	(0.028)	(0.033)	(0.027)	(0.024)	(0.022)	(0.022)	(0.017)	(0.028)	(0.027)	(0.050)
D5_Owner	-0.731***	-0.318**	-0.228***	-0.210***	-0.218***	-0.245***	-0.263***	-0.271***	-0.288***	-0.283***	-0.314***
	(0.082)	(0.142)	(0.069)	(0.054)	(0.035)	(0.030)	(0.028)	(0.029)	(0.037)	(0.031)	(0.071)
Constant	6.717***	6.476***	6.264***	6.199***	6.185***	6.290***	6.331***	6.386***	6.311***	6.250***	6.149***
	(0.208)	(0.162)	(0.143)	(0.127)	(0.100)	(0.081)	(0.079)	(0.072)	(0.107)	(0.111)	(0.150)

*Note: (i) Standard errors in parentheses; (ii) *** p<0.01, ** p<0.05, * p<0.1; (iii) Number of observations:1,055 observations and pseudo R^2=0.425; (iv) For the definition of variables, please see Table 1*

Table A5. TFP quantile regression – OLS with FE residuals (500 bootstrap estimations)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
quantiles	0.05	0.15	0.25	0.35	0.45	0.50	0.55	0.65	0.75	0.85	0.95
lnta	0.076***	0.086***	0.103***	0.114***	0.113***	0.110***	0.106***	0.104***	0.102***	0.115***	0.128***
	(0.011)	(0.009)	(0.008)	(0.007)	(0.005)	(0.004)	(0.004)	(0.004)	(0.006)	(0.007)	(0.010)
tor	0.004	0.001	-0.003	-0.005	-0.006	-0.007	-0.007	-0.008*	-0.002	-0.003	-0.011
	(0.015)	(0.008)	(0.007)	(0.007)	(0.006)	(0.006)	(0.005)	(0.005)	(0.008)	(0.006)	(0.008)
ifatr	-0.000	-0.000**	-0.000	0.000	0.000**	0.000***	0.000***	0.000***	0.000***	0.001***	0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
pm	-0.000	-0.000	0.000	0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
D1_Indep	-0.151***	-0.137***	-0.097**	-0.080***	-0.056***	-0.052***	-0.039***	-0.031***	-0.008	-0.005	0.069**
	(0.031)	(0.041)	(0.038)	(0.025)	(0.013)	(0.012)	(0.011)	(0.011)	(0.020)	(0.016)	(0.030)
D2_FDI	0.322***	0.135**	0.077*	0.043	0.052**	0.043**	0.052***	0.055***	0.065***	0.056**	0.026
	(0.049)	(0.068)	(0.041)	(0.031)	(0.022)	(0.019)	(0.019)	(0.016)	(0.022)	(0.025)	(0.035)
D3_MS	0.002	-0.020	-0.049	-0.052*	-0.035*	-0.037**	-0.041***	-0.050***	-0.034	-0.037*	-0.080**
	(0.071)	(0.070)	(0.038)	(0.031)	(0.208)	(0.017)	(0.015)	(0.011)	(0.024)	(0.021)	(0.034)
D4_Gender	-0.080***	-0.022	0.007	0.022	0.021	0.021*	0.029**	0.035***	0.041***	0.046***	0.042
	(0.027)	(0.015)	(0.018)	(0.016)	(0.013)	(0.012)	(0.012)	(0.011)	(0.015)	(0.015)	(0.031)
D5_Owner	-0.418***	-0.195**	-0.127***	-0.114***	-0.124***	-0.129***	-0.143***	-0.156***	-0.177***	-0.155***	-0.172***
	(0.047)	(0.080)	(0.040)	(0.033)	(0.021)	(0.019)	(0.016)	(0.016)	(0.022)	(0.016)	(0.037)
Constant	6.995***	6.971***	6.832***	6.756***	6.779***	6.821***	6.864***	6.904***	6.955***	6.857***	6.793***
	(0.119)	(0.088)	(0.086)	(0.067)	(0.050)	(0.045)	(0.040)	(0.039)	(0.062)	(0.064)	(0.088)

*Note: (i) Standard errors in parentheses; (ii) *** p<0.01, ** p<0.05, * p<0.1; (iii) Number of observations:1,055 and Pseudo R^2=0.40; (iv) For the definition of the variables, please see Table .*