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"Agency Costs in Small Firms"

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Agency Costs in Small Firms*

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Abstract

We explore how the separation between ownership and control affects firm productivity. Using administrative panel data on the universe of limited liability firms in Finland, we document a substantial increase in productivity when the CEO obtains majority ownership or when the majority owner becomes the CEO. We exploit plausibly exogenous variations to CEO turnover, induced by shocks to the CEO spouse's health. Extending the analysis beyond typical samples of large public firms, we show that our effects are stronger in medium-sized private firms. We also investigate possible mechanisms and provide suggestive evidence that increased ownership boosts CEO's effort at work.

Keywords: agency costs, firm productivity, CEO ownership.
JEL codes: G30, M12, D24, E23, L25.

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1 Introduction

Policymakers around the world devote considerable resources to promote the development of small and medium-sized enterprises (SMEs), with targeted policies including easier access to credit, advantageous tax treatments, lighter regulatory burdens.[1] SME-specific policies have also been a common response to the Covid crisis.[2] One rationale behind those measures is that SMEs are key for job creation, innovation, and growth.[3] At the same time, often because of data limitations, it is not clear how efficiently those firms allocate their resources.

A particularly important source of inefficiency could come from agency conflicts. The separation between ownership and control, and its consequences in terms of firms' investment and financing decisions, have been at the heart of much of the corporate finance literature, starting at least with Berle and Means (1932) and Jensen and Meckling (1976). At the same time, direct measures of agency costs are difficult to obtain, particularly so for privately owned SMEs. An open question is whether in these firms agency costs could be even more important than in large public firms, since for example SMEs face less stringent regulatory constraints and weaker outside markets for corporate control, as argued for example in Bitler, Moskowitz and Vissing-Jørgensen (2005).

In this paper, we aim at estimating agency costs on a large sample of firms, including privately owned SMEs. From an empirical viewpoint, the exercise requires confronting (at least) two major obstacles. The first is data availability. Ideally, the question requires having detailed information on the firms' operations and outcomes, on their employees and on their ownership structure. While both firm micro data and matched employer–employee data are increasingly available, firm ownership structure is typically observed only for listed firms. These are a tiny and not necessarily representative minority of the population of firms. Moreover, in these firms there is basically always separation between ownership and control, which makes it difficult to define a clear benchmark in which agency costs are minimized.

A second key challenge is that ownership and control are not randomly as-

[1] See for example the Small Business Jobs Act in the US or the SME Strategy for a sustainable and digital Europe in the EU.

[2] See e.g. OECD's report on *Policy Responses to Coronavirus (COVID-19)*, July 2020.

[3] See e.g. Ayyagari, Demirguc-Kunt and Maksimovic (2011), Li and Rama (2015), Martin, Nataraj and Harrison (2017) for recent discussions.

signed, they may themselves be determined by firm outcomes or by possibly unobserved factors affecting also firm outcomes. This makes it hard to interpret these relations as causal, and to provide clear guidance to the corporate governance policy debate.

We address these issues by exploiting administrative panel data covering the universe of limited liability firms in Finland. We have access to a rich set of information on the firm's balance sheet, on its employees and, importantly, on its ownership structure in terms of holdings and identity of ultimate shareholders. This offers the unique opportunity to investigate the effects of ownership and control in the entire population of firms, and to uncover whether agency conflicts can be even costlier outside typical samples of listed firms. The exceptional richness of these data will also allow to address in a novel way some issues related to the endogeneity of ownership and control, as we detail below.

Our setting is also interesting in terms of external validity. Finland as a country scores very highly in terms of corporate governance; for example, it was ranked first in the world by the World Bank's Corporate Governance Index (Kaufmann (2004)). As we will see, we obtain large estimates of agency costs, and this is remarkable especially in a setting in which, under this perspective, those costs should be minimal.

The logic of our empirical exercise is straightforward. We design a procedure (explained below) to identify the CEO among the firm's employees, and assume that the firm's operations are under the *effective* control of the CEO.[4] We define our baseline treatment variable in a simple way: we say that there is no separation between ownership and control when the CEO is the majority shareholder (in robustness checks, we consider other thresholds of CEO ownership). We then compare firm productivity, defined in our baseline specification as value added per worker, when ownership and control are in the same hands relative to when they are separated.

We start with fixed-effects regressions in which we exploit variations in CEO ownership within the same firm with the same CEO. That is, we compare firm productivity within the same firm-CEO pair in years in which the CEO is the majority owner vs. years in which ownership and controls are separated. In addition to any common time trend, this specification allows to capture any time-invariant characteristic of the firm, of the CEO, and of the firm-CEO match. In

[4]Using the terminology in Burkart, Gromb and Panunzi (1997), we say that the CEO has effective control, irrespective of whether or not she has formal control in the firm. Aghion and Tirole (1997) make a similar distinction between formal and real authority.

a similar way, we also define pairs in terms of a firm and its largest owner, and estimate changes in firm productivity, within the same firm-owner pair, in years in which the largest owner is the CEO vs. years in which the two are separated. These specifications consistently show that firm productivity is significantly larger when the CEO is also the majority owner. In our preferred specification, having the CEO owner is associated with an increase of $1,000$ euros in the output per worker, which corresponds to a 1.9% increase in labor productivity. The effect is large, as compared for example to an average productivity growth in our sample of 0.7%.

We show that the effect is driven by changes in CEO ownership and not by any change in the ownership structure or by any CEO change. Moreover, the effect is robust to alternative definitions of treatment and to alternative measures of productivity and profitability as well as to several specification tests.

A causal interpretation of these results requires that unobserved heterogeneity is time invariant within a given firm-CEO or a given firm-owner pair. This assumption may be violated if unobserved pair-specific shocks induce a change in CEO ownership and at the same time affect future firm productivity. For example, the CEO may decide to change her ownership shares in response to her private information about the firm's prospects. An ideal setting to address these concerns would be one in which the CEO has majority ownership and for exogenous reasons she has to step down as CEO while at the same time keeping her shares (this would induce a separation between ownership and control) or symmetrically a situation in which the CEO is not the owner and, as result of an exogenous shock, she gets replaced by the owner (this would bring together ownership and control). Our IV procedure attempts to mimic such ideal situations by exploiting shocks to CEO ownership induced by CEO's retirement, by worsened health conditions of the CEO, and of the CEO spouse. These shocks may induce the CEO to leave, without necessarily affecting her ownership shares. Depending on whether the CEO is also the owner, these shocks may induce a positive or a negative change to our treatment variable.

The CEO retirement decision may be useful as it is partly driven by reasons that are orthogonal to the future productivity of the firm (see Weisbach (1995) and Denis and Denis (1995) for studies employing this instrument). At the same time, the decision is voluntary and as such it may be related to unobservable confounding factors. We then look at CEO changes induced by shocks to CEO's health. We can construct for each CEO the amount of health benefits paid out from the Finnish health insurance scheme. Increased health benefits are associated

to worsened health conditions. In a similar and somewhat more extreme way, CEO's health shocks have been exploited also in the literature using CEO death (e.g. Johnson, Magee, Nagarajan and Newman (1985), Jenter, Matveyev and Roth (2018), Becker and Hvide (2019)) and CEO hospitalization (Bennedsen, Pérez-González and Wolfenzon (2012)).

When exploiting CEO's health shocks, we can allow for direct contemporaneous effects of CEO's health on firm productivity as well as for the possibility that past firm performance affects current CEO's health. We need however that current CEO's health is not directly associated to future firm productivity. In order to relax this assumption, one would like to exploit shocks that induce the CEO to resign but are orthogonal to any dynamics occurring within the firm. A key aspect of our data is that they allow us to recover the amount of health benefits paid out to the CEO spouse, and so consider shocks to the CEO spouse's health. In order to make the test even sharper, we restrict to CEO spouses who are not working in the firm and have no direct effect on the firm operations.

The IV estimates confirm our results, showing that firm productivity is significantly larger when ownership and control are in the same hands. Estimated coefficients are similar across specifications, and in fact larger than the OLS counterpart. Having the CEO owner induces an increase of about $1,500$ euros in the output per worker, which corresponds to a 2.8% increase in labor productivity. This is confirmed in various robustness checks.

The validity of our instruments requires that their effect is only mediated by the change in the treatment, i.e., by CEO changes associated to ownership changes, as opposed to CEO changes *per se*. This assumption can be questioned in light of studies (reviewed below) showing that CEO's departures may directly affect firm value. We perform a series of placebo regressions in which our shocks are used to induce changes in CEOs not associated to changes in ownership. While indeed our instruments are strongly related to CEO departures, we show that it is not a change in CEO per se that drives our effects, but CEO changes associated to ownership changes.

A key question for our investigation, as mentioned, is how our results compare to estimates obtained in typical sample of large or listed firms, and in particular whether agency conflicts could be significant even in SMEs. We start by replicating some existing results showing that in listed firms the effect of CEO ownership on productivity is inverted U-shaped, and in fact overall it is negative. We show however that these effects cannot be found outside the sample of listed firms. Rather, we show that agency costs are larger in medium-sized private firms,

those with 51-250 employees. As we discuss below, this result does not seem an artifact of our statistical tests; rather, as in Bitler et al. (2005), it suggests that medium-sized private firms can be more exposed to agency costs as they may face larger managerial discretion and larger monitoring costs than small firms, while at the same time being less constrained by regulation or market pressures than large public firms. These results are confirmed when employing the same IV specifications described above, interacting our treatment indicator with firm size. They highlight the importance of exploring agency costs outside typical samples. The estimates one gets in our broader sample are richer, and they suggest that agency costs may be particularly severe in firms that, due to data limitations, are often excluded from corporate governance studies.

Our last set of results aims at investigating what are plausible mechanisms through which agency costs affect firm productivity in our setting.

We show that our effects are larger in industries where productivity dispersion is larger, which can be interpreted as industries with potentially larger scope for inefficiencies. We also show that, while we have no direct way to identify family firms in our setting, our effects are significantly larger in firms run by professional managers. We then try to further distinguish between explanations based on empire building vs. quiet life motives (see Stein (2003) for a review). We consider several variables often associated to empire building such as investments, capex, acquisition activities, cash holdings, leverage, dividends, and find no significant changes in these variables in relation to our treatment. Related to quiet life, ideally we would like to measure CEO's effort at work, which is not directly observable. Our data however provide some useful proxies. We observe the number of employment relations the CEO has in other firms and the number of days the CEO has been absent from work. We show both in OLS and in IV regressions that our treatment induces the CEO to take fewer external engagements and fewer days off. These results are suggestive that the quiet life hypothesis is a plausible mechanism behind our treatment effects. When the CEO is also the owner, she exerts more effort at work.

This paper contributes to the literature on CEO ownership and firm performance. As mentioned, often due to data limitations, this literature has typically focused on listed or very large firms.[5] Ang, Cole and Lin (2000) is one of the few

[5]Morck, Shleifer and Vishny (1988) document an inverted U-shaped relation between CEO ownership and Tobin's Q on Fortune500 firms; a similar relation is found in McConnell and Servaes (1990) on a sample of listed firms. Lilienfeld-Toal and Ruenzi (2014) show that firms with larger CEO ownership provide larger stock market returns and suggest this is due to reduced agency conflicts. Fabisik, Fahlenbrach, Stulz and Taillard (2018) expand the sample to about

studies investigating small private firms. They define the Jensen and Meckling's zero agency costs benchmark as a situation in which the CEO is the only owner and show that firms further away from this benchmark are less efficient. Similarly, Bitler et al. (2005) show a positive relation between ownership share and firm performance in a cross-section of U.S. entrepreneurs. Most of these studies rely on cross-sectional comparisons, while effects are hardly significant when adding firm fixed effects, possibly due to limited time-series variation (Himmelberg, Hubbard and Palia (1999), Zhou (2001)). Instead, our data cover the universe of limited liability firms over a relatively long panel, that allows exploiting significant time-series variations. We estimate our effects not only within firms, but within firms with the same CEO or the same largest owner.

Our results are also related to the literature on family firms, and in particular to studies investigating how having a member of the family as CEO affects firm value. Pérez-González (2006), Bennedsen, Nielsen, Pérez-González and Wolfenzon (2007), Bandiera, Lemos, Prat and Sadun (2017) for example show detrimental effects of family CEOs, while Anderson and Reeb (2003) and Villalonga and Amit (2006) provide a less negative view. Our focus is on agency issues within firm-CEO pairs, hence controlling for the quality of the CEO and of the firm-CEO match. We also discuss whether our effects are different in firms which are more likely to be run by family members.

More broadly, our work provides distinct and complementary insights to several themes in corporate governance. Relative to studies looking at how firm value is affected by CEO characteristics (e.g. Bertrand and Schoar (2003)) or by the firm-CEO match (Bandiera, Guiso, Prat and Sadun (2015); Bandiera, Prat, Hansen and Sadun (2020)), we focus on the effects of varying the CEO's ownership share within a given firm-CEO pair. Relative to studies on how ownership structure affects firm value (e.g. Edmans and Holderness (2017)), our focus is on CEO ownership, keeping other characteristics of the ownership structure fixed. In particular, we abstract from how the firm's ownership structure affects the degree of effective control over the firm's operations, which we assume is fully in CEO's hands. Lastly, differently from the literature on majority vs. minority shareholders (Shleifer and Vishny (1997)), we focus on the possibility of agency conflicts between the CEO and the majority owner.

1,800 firms in the US and show that the relation between CEO ownership and Tobin's Q is negative.

2 Data

We exploit the Finnish Longitudinal Owner-Employer-Employee database (FLOWN) constructed by Statistics Finland, which we match with balance sheet information from the business register. We obtain a yearly panel from 2006 to 2014 covering the universe of limited companies (*osakeyhtiö*) in the private sector. Our data have three main features. First, we have a rich set of information on firms' characteristics, operations and performance given by their balance sheet. Second, the matched employer-employee structure allows to have information on the employees of the firm, and in particular, as we explain below, to identify its CEO. Third, and most distinctively, we have detailed information on the firms' ownership structure. The Finnish tax authority requires that firms report the identity of the 10 largest shareholders or, if there are more than 10 shareholders, of any shareholder with more than 10% of firm shares. Statistics Finland builds on this information to identify the ultimate individual shareholders of each firm.[6]

We exclude one-man companies and holding companies (tpically financial firms) with no proper business activity, and we are left with around 110,000 firms. In our sample, the median firm has 4 employees, 78% of firms are micro firms with less than 10 employees, 18% of firms are small (10-50 employees), 3% are medium (51-250 employees), and 0.8% are large (>250 employees). Manufacturing firms are 36% of the sample (including construction) while the rest are services (including trade).

CEO We are interested in identifying the CEO in each firm, interpreted as the person who has control on the firm's operations. We follow a sequential procedure, similar to the one employed e.g. in Queiró (2016). First, we identify a person as the CEO if he or she is explicitly defined as such among the list of employees. This is the case for 7% of the firms. For the remaining firms, we consider those employees identified as having managerial responsibilities, and say that the CEO is the manager with the highest salary. This identifies an additional 30% of the CEOs. For the remaining firms, we look at whether an active entrepreneur (as classified by the tax administration) appears in the list of employees, in which case

[6]Identifying the ultimate owners is complicated also by the possibility of linkages of firms and business owners via holding companies and enterprise groups. Statistics Finland has implemented a procedure to track down the individual owners behind each firm along the ownership chains. Maliranta and Nurmi (2019) provide a detailed presentation of the data, whose closest counterpart are the Norwegian data used in Berglann, Moen, Røed and Skogstrøm (2011).

the person is identified as the CEO.[7] This is the case for 23% of our CEOs. The remaining 41% of the CEOs are defined as the highest paid worker in the firm. As a validation test, we notice that 86% of the CEOs explicitly defined as such (our first criterion) also have the highest salary in the firm.

Ownership We observe some ownership information for 92% of the firms in our sample; on average, we observe 82% of the firm ownership. Ownership tends to be rather concentrated: 39.5% of our firms have one shareholder, the median number of shareholders is 2, and 29.9% of the firms have more than 2 shareholders. In firms with more than one shareholder, the average ownership share of the largest shareholder is 41%.

We are interested in comparing situations in which, within a given firm and for plausibly exogenous reasons, the CEO becomes the owner or the owner becomes the CEO, in which case we say that ownership and control are in the same hands, relative to situations in which the two are separated. This requires extending the Jensen-Meckling's zero agency costs benchmark mentioned above and define the firm's owner when the firm has multiple shareholders. In our baseline analysis, we focus on the majority owner and accordingly we define our treatment variable as the dummy *CEO Owner*, which equals one when the majority owner is also the CEO.

While our empirical strategy requires defining a dichotomous measure of treatment, we attach no specific value to the 50% threshold in terms of CEO ownership. In fact, as detailed below, changes in our treatment variable are typically associated to large changes in CEO ownership, as opposed to local changes around the 50% threshold. We will show the robustness of our results when considering alternative thresholds.

In our sample, the CEO is also the majority owner in 29% of the firms, and 10.5% of the firms experience a change in the treatment, in 5.6% of the cases the CEO obtains majority, and in the remaining 4.9% the CEO loses majority. As intuitive, these changes are more likely to occur in micro and small firms. We observe large variations in CEO ownership. Conditional on observing a positive change, the average ownership change is 50%; conditional on a negative change, the average is -43%.[8] Out of these changes, 26% are associated to a change in

[7] The tax administration identifies an active entrepreneur in a firm if a person owns at least 30% of the shares and receives a significant income from the firm (at least 9,663 euros in 2006).

[8] In fact, these figures are similar to observed changes in ownership of the largest shareholder (whether or not she is the CEO) for which, conditional on a positive change, the average is 43% and, conditional on a negative change, the average is -38%.

the majority owner and so in our treatment *CEO Owner*. Conditional on having a change in the treatment, the average ownership change is 73% for positive changes and −76% for negative changes.

Productivity Our main interest is to investigate how our treatment affects firm's productivity. In most of our analysis, we define productivity as value added (in real terms) over full time equivalent units of labor.[9] The measure is constructed directly by Statistics Finland in a way that is comparable across firms and over time. It measures the value of the output generated by a worker in the firm without having to estimate the value of capital in the firm, which may be problematic for some firms in our sample (e.g. micro service firms). It does not measure profit and it does not serve as a tax base, so it may be less subject to discretionary accounting practices.[10]

We will check the robustness of our results when employing other efficiency and profitability measures (described in more details below). We will also consider productivity measures based on standard TFP estimates, and we will account for possible biases induced by the inability to observe firm level prices.

We winsorize all financial variables, including productivity measures, at the 0.25th and the 99.75th percentiles. Descriptive statistics of our variables appear in Table 1.

3 Baseline Results

3.1 OLS estimates

The first set of results are based on fixed-effects OLS regressions in which we exploit variations in CEO ownership within the same firm with the same CEO. Our basic specification is

$$y_{j,t} = \alpha_j + \beta T_{j,t} + X'_{j,t}\gamma + \mu_t + \varepsilon_{j,t}, \tag{1}$$

where j denotes a firm-CEO pair, $y_{j,t}$ is the productivity of firm-CEO j in year t, α_j and μ_t are respectively firm-CEO and year fixed effects, and $T_{j,t}$, is a dummy equal to one when the CEO owns more than 50% of the firm shares. Our baseline set of

[9] Value added is defined as the value of sales minus the value of purchases, accounting for changes in stocks, other operating incomes and product taxes. An industry specific index based on 2010 prices is used to deflate the nominal value added.

[10] We consider productivity in levels, considering its log would give similar results.

controls $X'_{j,t}$ includes industry fixed effect (2 digits), firm's age, leverage, a dummy indicating if the firm is part of a business group, the number of workers by level of education and occupation (white vs. blue collar), the HHI index of ownership concentration and characteristics of the firm's board of directors (total number of members, number of members working in the firm, total fraction of shares held by board members).[11] In specifications without CEO fixed effects, we also include CEO's education, age, tenure and experience. We cluster standard errors at the firm level. Our coefficient of interest is β, which measures productivity differences within the same firm-CEO pair in years in which the CEO is the majority owner vs. years in which ownership and controls are separated.

Table 2 reports our estimates. In column 1, we include no control and no fixed effects and observe a negative relation between *CEO Owner* and firm productivity. Once we include our set of controls (column 2) and firm fixed effects (column 3), the relation turns positive. Our preferred specification is reported in column 4, which corresponds to equation (1) and includes firm-CEO fixed effects.[12] According to these estimates, *CEO Owner* is associated to around $1,000$ euros larger output per worker, that corresponds to a 1.9% increase relative to the unconditional mean. This effect is large. As comparison, the average productivity growth of private sector Finnish firms in our sample period is 0.7% per year.[13]

The estimated impact in column 4 includes cases in which the CEO becomes the majority shareholder ($T_{j,t} - T_{j,t-1} = 1$) and cases in which the CEO loses the status of majority shareholder ($T_{j,t} - T_{j,t-1} = -1$). One may ask whether, in absolute value, the effects associated to the two variations are different. In column 5, we investigate whether the estimated effects of *CEO Owner* are heterogenous with respect to its lagged value $T_{j,t-1}$ and observe that the interaction term $T_{j,t} * T_{j,t-1}$ is not statistically significant. This suggests no significant asymmetries between the two effects, an observation we will use again in our IV estimates.

In order to support our interpretation, we wish to make sure that our estimates capture the specific effect of changes in CEO ownership, as opposed to any change in the ownership structure. In column 6, we consider the dummy *Owner Change,* which equals one when the majority owner changes from period $t-1$ to t and in any subsequent period, irrespective of whether or not this is associated to a

[11] Omitting firms that are part of a business group would not change our results.

[12] As we include firm-CEO fixed effects, we do not include controls for CEO's education, age, experience; hence the higher number of observations relative to column 3. Including those controls would not change our results. Moreover, if we restrict the regression in column 4 to the same sample as in column 3, the estimated coefficient is very similar (equal to 1087).

[13] The corresponding figure for EU countries is 0.9% and for the US is 1.13%, see the OECD's website at data.oecd.org.

change in CEO ownership. We show no significant impact on productivity in this case, suggesting that our effects are related to changes in CEO ownership and not to any change in ownership.

3.2 IV estimates

A causal interpretation of our OLS estimates may be challenged for example on the basis that the CEO has private information on the future firm productivity and decides to acquire majority shares in anticipation of a productivity increase. More generally, changes in ownership and control may be correlated to unobserved pair-specific shocks that may also be correlated to future productivity. Ideally, one would like to exploit purely random changes on whether the main owner is also the CEO. For example, one would like to observe a firm in which the CEO has majority ownership and for exogenous reasons she has to step down as CEO while at the same time keeping her shares, which would induce a separation between ownership and control within the same firm and with the same ownership structure. Symmetrically, one can consider a firm in which the CEO is not the owner, she is induced to leave, and she is replaced by the owner, so that ownership and control end up being in the same hands. In the next analysis, we attempt to get as close as possible to such ideal situations. We define pairs in terms of firm and largest owner and exploit shocks induced by CEO's retirement, by worsened health conditions of the CEO, and of the CEO spouse.

3.2.1 Instruments

Our first instrument exploits changes in the CEO due to retirement. The retirement decision is partly driven by reasons that are orthogonal to the future productivity of the firm and, in fact, it has been used by the literature to investigate the effects of CEOs on firm value (Weisbach (1995), Denis and Denis (1995)). We define the dummy *CEO Retire* that equals one if the CEO is older than the legal retirement age (63 years old) or receives pension benefits at t.

A potential issue with retirement is that its decision is voluntary and as such may be related to unobservable confounding factors. For example, a CEO may decide to retire when she expects a decline in firm productivity. We address this concern by considering a second instrument, based on shocks to the CEO's health. For each CEO, we obtain the amount of health benefits paid out from the Finnish health insurance scheme. The scheme is mandatory, universal, and it compensates the beneficiary for income losses related to health issues. An increase in health

benefit is due to worsened health conditions. Relative to CEO changes induced by retirement, health shocks are less likely to be driven by expected productivity shocks. The logic of the instrument generalizes, in a somewhat less extreme way, a classic approach of using CEO death as a shock (Johnson et al. (1985), Jenter et al. (2018), Becker and Hvide (2019)) and the approach by Bennedsen et al. (2012), who use CEO hospitalization events in Danish firms.

We use CEO's health at $t-1$ as an instrument for changes in the CEO from $t-1$ to t. The validity of our instrument does *not* rely on excluding direct effects of CEO's health at t on firm productivity at t, we use past health shocks to induce changes in the CEO. One may also conjecture that past firm performance may affect current CEO's health. If the CEO changes associated to our health shocks were driven by past firm productivity, however, we would observe a violation of parallel trends, which is not the case. A remaining issue may be that current CEO's health is directly associated to future firm productivity.

In order to take this possibility into account, one should consider health shocks that induce the CEO to resign but are orthogonal to any dynamics occurring within the firm. One such case is a shock to the CEO spouse's health. The exceptional richness of the data allows us to recover the amount of health benefit paid to the CEO spouse, again by the national health insurance scheme. In fact, to make this test even sharper, we can restrict to CEO spouses who are not working in the firm and so have no direct effect on the firm operations. To our knowledge, this instrument is novel and, in our view, considerably less exposed to the above-mentioned concerns.

In order to appreciate our identification assumption, notice that health shocks induce plausibly exogenous variations in CEO turnover, but they do not necessarily affect her ownership shares. Their validity as instruments requires that their effect on future firm's productivity is only mediated by the change in the treatment. We then distinguish shocks to productivity that are driven purely by the change of the CEO from those driven by the change in the treatment, i.e. by CEO changes associated to ownership changes, as we explain below.

3.2.2 Specifications

Before turning to our IV estimates, we start with an OLS estimate of

$$y_{i,t} = \alpha_i + \beta T_{i,t} + X_{i,t}^{'}\gamma + \mu_t + \varepsilon_{i,t}, \tag{2}$$

in which all terms are as in equation (1) except that we define a pair i in terms of a firm and its largest owner. In equation (2), the coefficient β describes what happens to firm productivity, within a given firm-owner pair, in years in which the owner is also the CEO vs. years in which the two are separated. While equation (1) exploits variations associated to the CEO becoming (or stopping being) the owner, equation (2) exploits variations associated to the owner becoming (or stopping being) the CEO. For the purpose of estimating agency costs, both variations should lead to similar insights. There are two reasons for focusing on specification (2) for the next analysis. First, as further discussed below, it helps addressing the above-mentioned concerns about the CEO having private information about the future profitability of the firm. Second, we view our instruments as shocks that may force the CEO to leave the firm, and so induce variations within a given firm-owner pair.

In order to implement our IV approach, we consider two specific features of our setting. First, our variable of interest $T_{i,t}$ is a dummy. In fact, we are not instrumenting CEO ownership share *per se*, but rather whether or not the main owner is also the CEO. For this reason, we first estimate a probit regression in which $T_{i,t}$ is regressed over a given instrument $Z_{i,t-1}$ and a set of controls. Then, we use the predicted $\hat{T}_{i,t}$ as an *instrument* in a standard 2SLS regression. As shown in Wooldridge (2010), this allows improving the efficiency of our estimator and obtaining an estimate of the *average* treatment effect, which is easier to compare to OLS estimates. Moreover, the procedure is robust to possible misspecifications in the probit equation and it does not require considering generated regressor issues.[14]

A second observation is that the effect of a given instrument $Z_{i,t-1}$ on our treatment $T_{i,t}$ depends on $T_{i,t-1}$. When the CEO is the owner at $t-1$, the instrument (say, a shock to CEO's health) may induce the CEO to leave and so possibly a negative change to the treatment, from $T_{i,t-1}=1$ to $T_{i,t}=0$. When the CEO is not the owner at $t-1$, the instrument may induce a positive change in the treatment, from $T_{i,t-1}=0$ to $T_{i,t}=1$.

Accordingly, our IV estimates are based on the following procedure. First, we estimate the probit regression

$$T_{i,t} = \Phi(\alpha + \beta_1 Z_{i,t-1} + \beta_2 Z_{i,t-1}(1 - T_{i,t-1}) + \beta_3(1 - T_{i,t-1}) + X_{i,t}^{'}\gamma), \qquad (3)$$

[14] See Wooldridge (2010) also for a discussion of why the probit regression cannot be used directly as the first stage.

in which $Z_{i,t-1}$ is one of the above mentioned instrument and in which β_1 measures the effect of the instrument on $T_{i,t}$ when $T_{i,t-1} = 1$. This case is of particular interest, as the instrument induces a plausibly exogenous separation between ownership and control. As mentioned, we then use the predicted $\hat{T}_{i,t}$ as instrument in a 2SLS in which the first stage is a standard OLS.

3.2.3 Results

We present our results in Table 3. In column 1, we report OLS estimates of equation (2), showing that, in the same firm with the same owner, firm productivity is larger when the owner is also the CEO. As mentioned, the result is useful to address the concern with specification (1) that the CEO may decide to acquire ownership as she expects an increase in future profitability. In equation (2), instead, it is the owner who decides to become the CEO and the variation is less likely to be driven by the CEO's private information.[15] This result also confirms our estimates in Table 2 and it serves as a useful benchmark for the next IV estimates.

The results of our IV procedure are reported in columns 2-5. The bottom part of the table reports the probit estimates of equation (3), not the first stage of the 2SLS. The coefficient on $Z_{i,t-1}$ is negative, showing that our instruments have a significant impact on the treatment. If the CEO is the owner at $t-1$ and, for example, she becomes sick, she is more likely to leave and so induce a negative shock to the treatment. In column 2, the instrument is a dummy equal to one if the CEO has retired. In column 3, the instrument is the amount of health benefits received by the CEO at $t-1$ (in 10,000 euros). In column 4, the instrument is the amount of health benefits received by the CEO spouse.[16] In column 5 the sample is restricted to cases where the CEO spouse is not an employee of the firm. Results in columns 2-5 reveal a robust effect. Exploiting plausibly exogenous shocks, we show that firm productivity is significantly larger when ownership and control are in the same hands. Estimated coefficients are similar across specifications, and if anything, larger than the OLS counterpart. IV estimates show that our treatment *CEO Owner* induces an increase of about $1,500$ euros in the output per worker, which corresponds to a 2.8% increase in labor productivity.

[15] The CEO may decide to leave as he expects future productivity to decrease, but this would go against our results.

[16] In order to keep the same sample throughout columns 2-4, we set health benefit to zero when the CEO has no spouse (that is, we make no distinction between having a spouse with no health benefits and having no spouse). Restricting our sample to CEOs with a spouse would give very similar estimates in terms both of magnitude and of standard errors.

The validity of our instrument requires that our shocks affect firm productivity at t only thought the induced change in the treatment. This is not an obvious assumption. For example, the CEO's departure may directly affect firm productivity, say because she has specific skills or knowledge of the firm. As mentioned above, several studies have identified an effect of CEO characteristics on firm's performance (including Bertrand and Schoar (2003), Anderson and Reeb (2003), Pérez-González (2006), Villalonga and Amit (2006) , Bennedsen et al. (2007), Bandiera et al. (2017)). Moreover, the effect of the CEO's departure may be particularly large when the departure is unexpected (Smith, Yagan, Zidar and Zwick (2019)). In order to investigate this further, we check whether any change in CEOs induced by our instruments has a similar effect on firm productivity, irrespective of whether or not it is associated to an ownership change. If this were the case, the validity of our instrument would be questioned.

We report our results in Table 4, which replicates the structure of Table 3 but looks instead to the effect of *CEO Change*, that is a dummy equal to one if the CEO changes from $t-1$ to t and in any subsequent period. In column 1, we report OLS estimates and show no significant effect. Compared to the estimate in column 1 of Table 3, this shows that it is not a change in CEO *per se* that drives our effects on firm productivity, but CEO changes associated to ownership changes.

This is confirmed in IV estimates in columns 2-5. The estimation procedure is the same as in Table 3, except that there is no need to consider the interaction between $Z_{i,t-1}$ and *CEO Change* at $t-1$ in the probit. In fact, in this case, the effect of our instrument on the probability to have a change of CEO at t need not depend on whether the CEO has changed at $t-1$. The probit coefficient on $Z_{i,t-1}$ is positive, showing that our instruments indeed significantly increase the probability of having a change in the CEO. Importantly, however, these changes have very different effects on firm productivity from those which we capture with our treatment (i.e., those associated to changes in ownership).[17] We view this as an important finding in support of the validity of our instruments.

4 Small and Large Firms

As mentioned, most of the literature on CEO ownership focuses on samples of very large and/or listed firms. A question is whether the effects identified on those firms

[17] The difference in the coefficients is statistically different from zero.

are representative of the population and, specifically, whether small and medium sized firms may also face significant agency costs.

We explore this issue in Table 5. In column 1, we check whether our estimates of agency costs vary with the size of the firm. We interact our treatment indicator with the dummies Small, Medium, and Large, indicating respectively that the firm has 10-50 employees, 51-250 employees, or more than 250 employees. The omitted category are micro firms with less than 10 employees. Estimated agency costs appear largest for firms with 51-250 employees.

In column 2, we interact our treatment with a dummy indicating whether the firm is in the service (as opposed to the manufacturing) sector, and we observe that agency costs are significantly larger in manufacturing firms. In column 3, we show that our effects are stronger in industries where the potential scope for inefficiencies is larger, as measured by a larger dispersion in the industry's productivity.

In order to highlight the effects on listed firms, in columns 4-6, we consider the continuous measure *CEO share*, that is the fraction of shares held by the CEO, instead of *CEO Owner*. In listed firms, it is hardly the case that the CEO is the majority shareholder. As shown in column 5, the effect on non-listed firm is positive, while the effect on listed firm is negative. That is, differently than in most firms, larger CEO ownership is associated to lower productivity in listed firms. The result is consistent with Fabisik et al. (2018) who focus on listed firms.

It has also been shown that, in listed US firms, the relation between CEO ownership and firm value is inverted U-shaped (Morck et al. (1988), McConnell and Servaes (1990)). Indeed, if we restrict to listed firms, this is the case in our sample as well (column 6). However, such non-linearity is not so strong (in fact, the squared term is not significantly different from zero) in the broader sample including non-listed firms.

We further explore how agency costs vary with the size of the firm using the same IV specifications as in Section 3.2. We interact each instrument with a dummy indicating whether the firm is micro, small, medium or large. Results are reported in Table 6. While some of these estimates are less precise, they confirm the view that agency costs are important also outside typical samples of large firms. In fact, agency costs appear particuraly significant in medium-sized private firms. This is unlikely to be an artifact of our statistical tests.[18] A possible interpretation of our finding is that, relative to small and micro firms, there is larger scope for

[18] As mentioned, changes in our treatment variable are more likely to occur in small and micro firms, where they also tend to be associated to larger changes in CEO ownership. Hence, from a statistical viewpoint, one may expect our effects to be larger and more precisely estimated in those firms.

managerial discretion and it is harder to monitor the CEO in medium-sized firms. At the same time, relative to large public firms, medium-sized firms face less stringent regulatory constraints and weaker outside markets for corporate control (see Bitler et al. (2005) for a similar argument). While further evidence is needed to shed light on these mechanisms, a key implication of our analysis is that agency costs may be particularly severe in those firms that, due to data limitations, are often excluded from corporate governance studies.

5 Interpretation

We further discuss our results by focusing on two questions. First, what is the role of family firms in driving our results; and second, which are the mechanisms linking agency costs to firm productivity in our setting.

5.1 Family Firms and Founder Effect

As mentioned, a large literature on family firms explores how firm value is affected when members of the family or external professionals are appointed as CEOs. Similar issues arise when the founder of the firm, who typically holds specific and possibly essential assets, is replaced. A natural question is whether our results are different in family firms and whether they are driven by the departure of the founder.

While we have no direct way to identify family firms in our sample, we can employ two proxies. We define family firms as those in which the CEO spouse appears in the list of employees or those in which the CEO spouse owns some share in the firm. In columns 1-3 of Table 7, we see that our effects do not vary significantly between family vs. non-family firms.

Similarly, we have no direct way to identify firms run by the founder for all firms our sample. As an approximation, we define founder firms as those which are created during our sample (i.e., after 2006) and in which the CEO has not changed. In column 4 of Table 7, we see that our effects are stronger in firms which are not run by the founder. As shown in column 5, however, we cannot rule out that this differential effect is driven by firm age, i.e., by the fact that our effects are stronger in older firms (those created before 2006). When we restrict to firms created during the sample, the treatment effect is not statistically different in founder firms.

A related question is whether CEOs in our sample are professional managers,

and whether CEO ownership changes are truly about agency costs, as opposed to dynamics occurring among family or friends. We proxy firms managed by professionals as those with at least two different CEOs or as those in which the current CEO has worked in at least two different firms during our sample. We observe in column 6 that our effects are significantly larger in firms run by professional managers, supporting the interpretation that these effects are driven by agency costs.

5.2 Mechanisms

We investigate some possible mechanisms through which agency costs affect firm productivity. Indirectly, this can also shed light on which types of agency costs matter the most in our setting (see e.g. Stein (2003) for a review). We distinguish in particular between empire building, according to which agency costs are driven by the manager's tendency to undertake inefficient projects (Jensen (1986)), and quiet life, according to which agency costs are driven by the manager's tendency to put low effort at work (Bertrand and Mullainathan (2003), Giroud and Mueller (2010), Bandiera et al. (2017)).

We first consider variables associated to empire building. Specifically, we test whether *CEO Owner* is associated to changes in investments, assets, capex, acquisition activities, cash holdings, leverage, dividends. None of these variables appear significantly related to our treatment.

We then consider variables associated to quiet life. While direct measures of CEO's effort are hard to find, we can observe the number of employment relations the CEO has in other firms (e.g. a second job, board membership, or consultancy). We can also observe the number of days the CEO has been absent from work, typically due to sick leave or for study reasons. In Table 8, we report our estimates fixing the firm-CEO (columns 1 and 4), fixing the firm-owner (columns 2-3 and 5-6), and the IV as in Table 3 with CEO spouse's health as instrument, restricting to CEO spouses not working in the firm (columns 5-6). We observe that our treatment induces the CEO to take fewer engagements outside the firm and fewer days of absence from work, which is suggestive of increased effort in the firm.

The result is consistent with Bitler et al. (2005), who find a positive relation between ownership shares and hours worked in a sample of U.S. entrepreneurs and small firms. Bitler et al. (2005) also suggest that hours worked only captures one aspect of increased incentives, and increased ownership may induce many other managerial actions that increase firm value. Many of those actions are

difficult to observe, hence conclusions can only be tentative. Yet, these results are strongly suggestive that the quiet life hypothesis is a plausible mechanism behind our treatment effects. When the CEO is also the owner, she exerts more effort at work.

6 Robustness

6.1 Treatment Definition

We perform a series of robustness checks, starting by alternative definitions of our treatment. As mentioned, we attach no specific value to the 50% threshold in terms of CEO ownership, and we now consider alternative thresholds. In column 1 of Table 9, we consider *CEO 100*, a dummy equal to one if the CEO is the only owner. In column 2, we consider *CEO 0*, a dummy equal to one if the CEO holds any positive fraction of firm's shares. In column 3, we focus on *CEO Largest*, that is a dummy indicating that the CEO is the largest (though not necessarily the majority) shareholder. In column 4, we consider the continuous variable *CEO shares*. In all these cases, the effect on firm productivity is similar to our main estimates.

In particular, in column 4, we estimate that productivity increases by $1,098$ euros following an increase of CEO ownership by 100%. The effect is 8% larger than the coefficient on *CEO Owner* in Table 2, which as mentioned corresponds to an average change in CEO ownership of about 74%. This may suggest some concavity in the effect of CEO ownership, but not strong enough to reject linearity.[19] We explore more explicitly non-linear effects of *CEO Shares* in column 5 and find no significant effect. As shown, these patterns are different in listed firms.

6.2 Productivity Measure

In Table 10, we report a set of robustness checks concerning our productivity measure. In column 1, we consider gross operating surplus (GOS), defined as value added minus personnel costs per unit of labor. In column 2, we consider net profit margin, defined as net profit (value added minus personnel cost, overheads and other costs, interest and taxes) over revenues. In column 3, we consider returns

[19] A similar picture emerges from the estimates in columns 1 and 2. The average change in CEO ownership associated to a positive change in *CEO 100* is 78% and it is -75% for a negative change. The average change in CEO ownership associated to a positive change in *CEO 0* is 63% and it is -62% for a negative change. Out of all changes in CEO ownership, 20% of them are associated to a change in *CEO 100* and 64% are associated to a change in *CEO 0*.

on assets, defined as net income over total assets. These regressions confirm that *CEO Owner* is associated to higher operating efficiency and profitability.

In column 4, we consider a standard estimate of TFP, obtained as the residual of a Cobb-Douglas in which value added is regressed over capital and labor for each 2-digit industry. In column 5, we estimate TFP by adding the firm's market share and fixed effects at the industry-year level. Controlling for industry-specific time trends is a simple way to account for possible biases due to inability to observe firm prices (see Van Beveren (2012) and De Loecker and Goldberg (2014)). In addition, in column 6, we exclude multiproduct firms that may be subject to price shocks in different industries. Again, we observe a positive relation between *CEO Owner* and firm productivity, and our coefficient of interest barely changes across these specifications.[20]

6.3 Sample Selection

In Table 11, we consider possible biases due to sample selection. Importantly, our sample is not selected in the sense that at each point in time we consider the universe of firms, we do not restrict to survivors. Our fixed effects specifications in equation (1) may also mitigate sample selection biases (Verbeek and Nijman (1992)). As additional checks, we repeat our regressions in equation (1) on various *selected* samples. In column 1, we restrict the sample to *No Exit* firms, these are firms that do not die in our sample. In column 2, we consider *Persistent* firms, defined as those firms with number of observations above the median, that is equal to 8 (that is, half of our firms are in the sample for 8 years). We repeat the same procedure in terms of firm-CEO pairs, considering in a similar way *No Exit* firm-CEOs (column 3) and *Persistent* firm-CEOs, where the median number of observations for firm-CEOs is 4 (column 4). The estimated impact of *CEO Owner* is similar across the various specifications, and not statistically different from our baseline estimates on the entire population. This limits the concerns that our effects are biased due to sample selection.

6.4 Other specification tests

In columns 5 and 6 of Table 11, we consider specifications in which, instead of firm-CEO fixed effects, we control for lagged values of the dependent variable (one lag in column 5, and three lags in column 6). These specifications are more

[20] Similarly, controlling for industry-years fixed effects and market share in our baseline regressions on labor productivity has no effect on our coefficient of interest.

appropriate if unobserved characteristics are not time invariant within a given firm-CEO pair, but they are instead better captured by time-varying individual-specific past productivity patterns. Estimated effects are still positive and (not significantly) smaller in size.[21]

In Table 12, we discuss the role of our control variables. We show that, while in general our results change very little by changing the set of controls $X'_{j,t}$ or by considering predetermined values $X'_{j,t-1}$, controlling for ownership concentration has an important effect. In column 1, to easen comparison, we report our baseline specification (as in Table 2, column 4) as well as the coefficients associated to the various control variables. In column 2, we include no controls, and we observe that our treatment effects are smaller (in fact, they are almost half) relative to the baseline estimates. As we show, our key control variable is the HHI index of ownership concentration. In column 3, we include only the HHI index as control, and observe that estimates are very similar to the baseline. If instead we include all our controls except for the HHI index (column 4), estimates are very similar to those without any control. In column 5, we use the lagged values $X'_{j,t-1}$, and observe similar results to those with no controls. This is again driven by ownership concentration. Once we add the contemporaneous HHI index to the specification (column 6), results are as in the baseline. Positive changes in our treatment are typically associated to an increase in ownership concentration, and ownership concentration is in itself negatively correlated to firm productivity, so omitting it would push our OLS estimates downward.

6.5 IV specification

As mentioned, our health instruments do not rely on excluding direct effects of CEO's health at t on firm productivity at t. In columns 1-2 of Table 13, we add health at t (that is, $Z_{i,t}$) as control in our 2SLS estimates. In column 1, we see that CEO's health at t has a negative impact on firm productivity at t, while in column 2 the impact of CEO spouse's health is not significant. Irrespective of these effects, our estimated impact of *CEO Owner* is not affected. In our specifications, we fix the firm's largest owner, and any variation to the treatment $T_{i,t}$ is due to changes in the identity of the CEO. In this case, CEO's health at time $t-1$ is not correlated to health at t, precisely because the CEO is not the same.[22]

[21] See e.g. Guryan (2004) for a discussion on how fixed effects and lagged dependent variable specifications provide bounds for the estimated causal effect.

[22] If this were not the case, we could have for example cases in which the CEO gets sick at $t-1$, she does not step down, but she rather sells her majority shares. We would observe a

We also consider alternative definitions of our treatment *CEO 100* and *CEO 0*, as defined in Section 3.2. Columns 3-4 present OLS estimates with firm-owner fixed effects, columns 5-6 present IV estimates employing CEO spouse's health as instrument and restricting to CEO spouses not working in the firm. Results are robust and consistent in all these specifications.

Finally, we consider alternative IV specifications. In columns 1-3 of in Table 14, we consider standard 2SLS estimates in which each instrument $Z_{i,t-1}$ is directly used in the first stage. In columns 4-6, we use probit regressions and the predicted $\hat{T}_{i,t}$ as instrument, but differently from equation (3) we include no interactions with $T_{i,t-1}$. As instruments, we consider CEO retire, CEO's health, and CEO spouse's health when the spouse is not employed in the firm. Estimated impacts of *CEO Owner* are still positive and significant, confirming the robustness of our findings. In Table 15, we replicate the specifications in Table 3 without our set of controls $X'_{i,t}$. We observe that, differently from the OLS estimates reported in Table 12, results are very similar when omitting control variables and in particular when omitting the HHI index of ownership concentration. The result is intuitive since we now keep the identity of the main owner fixed (while in Table 12 we fix the identity of the CEO), and it also useful to confirm the robustness of our IV estimates to the possibility of omitted variables.

7 Conclusion

We have shown that agency costs are an important determinant of firm productivity. This result has been established both in OLS regressions with firm-CEO or firm-owner fixed effects and in IV regressions in which we exploit health shocks of the CEO and of the CEO spouse as a source of exogenous variation in ownership and control. We believe these results are important as they establish in a direct way the magnitude and scope of agency costs.

The possibility to exploit ownership data on the universe of limited liability firms has allowed us to estimate agency costs also in samples which had not been investigated in the previous literature. We have found agency costs to be particularly relevant in medium-sized private firms, which are usually not the main focus of corporate governance regulation. This finding can also have implications at the macro level, since as mentioned in the introduction those firms have often been

change in the treatment, but not a change in the CEO, which may be problematic since for a given CEO health at $t-1$ is likely to be correlated to health at t and CEO health at t may in turn affect firm productivity at t.

cosidered key for economic growth and job creation.

Additional research is needed to better uncover the mechanisms behind agency costs. An interesting next step would be to investigate more broadly how the firm's ownership structure affects its productivity. Beyond CEO ownership, one can look at the distribution of ownership between large and small shareholders, or between board members, employees and external investors.[23] Another interesting direction is to analyze how increased CEO effort improves firm value, the form of this mapping has important implications for agency theory.[24] Our analysis is only a first step, we hope it can motivate further investigations and similar data collection efforts in other countries.

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[23] See e.g. Becht, Bolton and Röell (2003) and Edmans and Holderness (2017) on the role of blockholders, and Jones and Kato (1995) and Kim and Ouimet (2014) on employee stock ownership.

[24] See e.g. Baker and Hall (2004), Edmans, Gabaix and Landier (2008), and the survey by Edmans, Gabaix and Jenter (2017).

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Table 1: Descriptive Statistics

Variable	Obs.	Mean	Std. Dev.
LP	566,266	53,695	41,844
CEO Owner	566,266	0.29	41.18
CEO 100	566,266	0.18	0.39
CEO 0	566,266	0.57	0.5
CEO Largest	566,266	0.39	0.49
CEO Share	566,266	0.36	0.39
CEO Share Value (10k)	566,266	19.97	101.06
GOS	565,526	13,571	24,995
Profit	565,302	-0.018	0.341
ROA	564,847	2.284	28.94
TFP	519,316	0.0009	0.52
TFP2	519,309	0.0009	0.52
CEO changes	566,266	0.36	0.47
Owner changes	566,266	0.08	0.28
Dependent	566,266	0.12	0.33
HHI ownership	566,266	5,484	3,656
Workers w/ Bac	566,266	10.88	94.1
Workers w/Master	566,266	1.37	24.82
Workers w/ PhD	566,266	0.07	1.74
White Collars	566,266	5.05	62.04
Blue Collars	566,266	11.09	117.91
CEO tenure	555,431	7.04	6.74
CEO age	566,266	44.68	10.33
CEO experience	536,651	19.46	5.31
CEO w/ Bac	566,266	0.12	0.33
CEO w/Master	566,266	0.11	0.31
CEO w/ PhD	566,266	0.01	0.08
Board size	566,266	4	3.1
Board shares	566,266	0.7	0.4
Board employees	566,266	1.6	1.6
CEO retires	566,266	0.04	0.197
CEO health benefits	566,266	98.83	978.19
Spouse health benefits	566,266	94.52	890.12
Micro	566,266	0.78	0.42
Small	566,266	0.18	0.39
Medium	566,266	0.03	0.18
Large	566,266	0.008	0.09
Services	566,266	0.64	0.48
Listed	566,266	0.001	0.038
SD(LP)	566,266	35,707	15,154
Free cash flow (1000)	566,266	121	274
Capex (1000)	566,266	64	221
Dividends	566,264	32,076	214,335
Leverage (D/E)	566,260	77,016	471,247
Investments	566,266	87,693	546,818
Acquisition activities	566,266	0.008	0.43
Assets (1000)	566,260	5,132	151,000
Spouse Works	566,266	0.127	0.333
Spouse Owns	566,266	0.331	0.471
Family	566,266	0.405	0.491
Founder	566,266	0.324	0.468
Professional CEO	566,266	0.031	0.173
CEO Engagement	555,688	1.241	0.739
CEO days leave	561,715	7.60	36.31

NOTE: This table reports summary statistics of all the variables used in our analysis. Minimal and maximal values cannot be reported due to confidentiality.

Table 2: Main Result

Dep Variable	Labor Productivity					
	(1)	(2)	(3)	(4)	(5)	(6)
CEO Owner	-3,556	827.80	861.95	1,010	1,318	
	(-33.75)***	(7.22)***	(5.86)***	(3.34)***	(3.89)***	
CEO Owner * Lagged CEO Owner					-638.97	
					(-1.09)	
Lagged CEO Owner					1,082	
					(2.13)**	
Owner changes						277.38
						(1.14)
Controls	No	Yes	Yes	Yes	Yes	Yes
Fixed Effects	No	No	Firm		Firm-CEO	
Number of Obs	566,266	555,406	555,406	566,260	313,789	566,260
Number of Groups			109,502	214,077	112,875	214,077
R-squared	0.001	0.173	0.015	0.013	0.019	0.013

NOTE: This table reports the results of OLS regressions. The dependent variable is labor productivity. CEO Owner is a dummy equal to one if the CEO has majority ownership in the firm. Lagged CEO Owner is the value of CEO Owner in the previous year. Owner changes is a dummy equal to one if the majority owner in the firm changes in any previous period. In column 3, regressions include firm and year fixed effects. In columns 4-6, regressions include firm-CEO and year fixed effects. In columns 4-6, controls include industry fixed effect (2 digits), firm's age, leverage, a dummy indicating if the firm is part of a business group, the number of workers by level of education and occupation (white vs. blue collar), the HHI index of ownership concentration and board characteristics. In addition, in column 3, controls include CEO's education, age, years of experience within the firm and in total. Standard errors are clustered by firm, t-statistics are in parentheses. *, ** and *** denotes significance at 10%, 5% and 1% level, respectively.

Table 3: Exogenous Variations

Dep Variable	Labor Productivity				
	(1)	(2)	(3)	(4)	(5)
CEO Owner	784.18	1,632	1,519	1,508	1,554
	(4.87)***	(2.75)**	(2.52)**	(2.50)**	(2.09)**
			Probit		
Z(t-1)		-0.797	-0.510	-0.134	-0.196
		(-36.05)***	(-11.96)***	(-2.40)**	(-3.05)***
Z(t-1)*(1-T(t-1))		0.783	0.674	-0.050	0.063
		(24.72)***	(9.17)***	(-0.65)	(0.67)
Instrument		Retire	CEO Health (10k)	Spouse Health (10k)	Spouse Health (not working)
Fixed Effects			Firm-Owner		
Number of Obs	555,406	367,895	367,895	367,895	289,991
Number of Groups	145,578	74,640	74,640	74,640	63,001
R-squared	0.01	0.02	0.02	0.02	0.02

NOTE: This table reports results of OLS regressions (column 1) and of Probit and IV regressions (columns 2-5). The dependent variable is labor productivity. CEO Owner is a dummy equal to one if the CEO has majority ownership in the firm. The bottom panel of columns 2-5 report probit regressions of equation (4). In column 2, the instrument is a dummy equal to one if the CEO is classified as retired in the previous period. In column 3, the instrument is the amount of health benefits received by the CEO in the previous period (in 10,000 euros). In columns 4-5, the instrument is the amount of health benefits received by the CEO spouse in the previous period (in 10,000 euros). In column 5, the sample is restricted to cases where the CEO spouse is not an employee of the firm. All regressions include firm-owner and year fixed effects. Controls include industry fixed effect (2 digits), firm's age, leverage, a dummy indicating if the firm is part of a business group, the number of workers by level of education and occupation (white vs. blue collar), the HHI index of ownership concentration and board characteristics. Standard errors are clustered by firm, t-statistics are in parentheses. *, ** and *** denotes significance at 10%, 5% and 1% level, respectively.

Table 4: Exogenous Variations: Placebo

Dep Variable	Labor Productivity				
	(1)	(2)	(3)	(4)	(5)
CEO Change	188.04	-5,524	-2,836	1,587	-2,848
	(1.22)	(-1.27)	(-0.58)	(0.33)	(-0.55)
			Probit		
Z(t-1)		0.317	0.155	0.103	0.065
		(26.71)***	(5.75)***	(4.27)***	(2.24)**
Instrument		Retire	CEO Health (10k)	Spouse Health (10k)	Spouse Health (not working)
Fixed Effects			Firm-Owner		
Number of Obs	555,406	367,905	367,905	367,905	290,001
Number of Groups	145,578	74,641	74,641	74,641	63,002
R-squared	0.01	0.02	0.02	0.02	0.02

NOTE: This table reports results of OLS regressions (column 1) and of Probit and IV regressions (columns 2-5). The dependent variable is labor productivity. CEO Change is a dummy equal to one if the CEO has changed in any previous period. The bottom panel of columns 2-5 report probit regressions as in equation (4) without interactions with T(t-1). In column 2, the instrument is a dummy equal to one if the CEO is classified as retired in the previous period. In column 3, the instrument is the amount of health benefits received by the CEO in the previous period (in 10,000 euros). In columns 4-5, the instrument is the amount of health benefits received by the CEO spouse in the previous period (in 10,000 euros). In column 5, the sample is restricted to cases where the CEO spouse is not an employee of the firm. All regressions include firm-owner and year fixed effects. Controls include industry fixed effect (2 digits), firm's age, leverage, a dummy indicating if the firm is part of a business group, the number of workers by level of education and occupation (white vs. blue collar), the HHI index of ownership concentration and board characteristics. Standard errors are clustered by firm, t-statistics are in parentheses. *, ** and *** denotes significance at 10%, 5% and 1% level, respectively.

Table 5: Effects by Size and Industry

Dep Variable	Labor Productivity					
	(1)	(2)	(3)	(4)	(5)	(6)
Treat	892.87	1,970		649.08	1,005	441,434
	(2.11)**	(3.47)***		(1.62)	(2.63)***	(1.85)*
Treat*Small	1,373			1,962		
	(2.54)***			(2.98)***		
Treat*Medium	6,696			5,701		
	(3.28)***			(2.35)**		
Treat*Large	1,723			8,265		
	(0.25)			(0.54)		
Treat*Services		-1226.23				
		(-1.95)*				
Treat*SD(LP)			0.06			
			(2.22)**			
Treat*Listed					-197,202	
					(-1.70)*	
Treat*Treat						-1,727,481
						(-2.00)**
Treat		CEO Owner			CEO Shares	
Sample			All			Listed
Number of Obs	313,789	313,789	313,785	313,789	313,789	839
Number of Groups	112,875	112,875	112,874	112,875	112,875	308
R-squared	0.019	0.018	0.021	0.019	0.018	0.098

NOTE: This table reports the results of OLS regressions. The dependent variable is labor productivity. In columns 1-3, Treat is CEO Owner, that is a dummy equal to one if the CEO has majority ownership in the firm. In columns 4-6, Treat is CEO Shares, that is the fraction of CEO ownership in the firm. Small is a dummy equal to one if the firm has 10-50 employees, Medium is a dummy equal to one if the firm has 51-250 employees, Large is a dummy equal to one if the firm has more than 250 employees. Services is a dummy equal to one if the firm is in the service sector. SD(LP) is the standard deviation of labor productivity within the firm's industry. Listed is a dummy equal to one if the firm is listed. In column 6, the sample is restricted to listed firms. All regressions include firm-CEO and year fixed effects. Controls include industry fixed effect (2 digits), firm's age, leverage, a dummy indicating if the firm is part of a business group, the number of workers by level of education and occupation (white vs. blue collar), the HHI index of ownership concentration and board characteristics. Standard errors are clustered by firm, t-statistics are in parentheses. *, ** and *** denotes significance at 10%, 5% and 1% level, respectively.

Table 6: Exogenous Variations and Firm Size

Dep Variable	Labor Productivity			
	(1)	(2)	(3)	(4)
CEO Owner*Micro	948.39	812.05	620.41	1,336.48
	(1.50)	(1.27)	(0.82)	(1.17)
CEO Owner*Small	3,869.44***	3,807.34***	3,869.91***	4,745.94***
	(5.49)	(5.36)	(4.92)	(3.93)
CEO Owner*Medium	5,658.67*	5,746.73*	6,067.31*	6,453.84
	(1.87)	(1.88)	(1.93)	(1.39)
CEO Owner*Large	-88,763.47	-87,303.74	-110,919.38	47,120.85
	(-0.51)	(-0.50)	(-0.65)	(0.49)
Instrument	Retire	CEO Health (10k)	Spouse Health (10k)	Spouse Health (not working)
Fixed Effects	Firm-Owner			
Number of Obs	368,724	368,724	368,734	211,084
Number of Groups	74,697	74,697	74,698	49,824
R-squared	0.02	0.02	0.02	0.02

NOTE: This table reports results of Probit and IV regressions. The dependent variable is labor productivity. CEO Owner is a dummy equal to one if the CEO has majority ownership in the firm, Micro is a dummy equal to one if the firm has less than 10 employees, Small is a dummy equal to one if the firm has 10-50 employees, Medium is a dummy equal to one if the firm has 51-250 employees, Large is a dummy equal to one if the firm has more than 250 employees. In column 1, the instrument is a dummy equal to one if the CEO is classified as retired in the previous period. In column 2, the instrument is the amount of health benefits received by the CEO in the previous period (in 10,000 euros). In columns 3-4, the instrument is the amount of health benefits received by the CEO spouse in the previous period (in 10,000 euros). In column 4, the sample is restricted to cases where the CEO spouse is not an employee of the firm. All regressions include firm-owner and year fixed effects. Controls include industry fixed effect (2 digits), firm's age, leverage, a dummy indicating if the firm is part of a business group, the number of workers by level of education and occupation (white vs. blue collar), the HHI index of ownership concentration and board characteristics. Standard errors are clustered by firm, t-statistics are in parentheses. *, ** and *** denotes significance at 10%, 5% and 1% level, respectively.

Table 7: Family Firms and Founder Effect

Dep Variable	Labor Productivity					
	(1)	(2)	(3)	(4)	(5)	(6)
CEO Owner	1,320	1,106	1,286	1,529	547.68	1,009
	(3.14)***	(2.57)**	(2.85)***	(3.61)***	(0.40)	(2.41)**
CEO Owner*Spouse Works	-571.93					
	(-1.12)					
CEO Owner*Spouse Owns		313.28				
		(0.76)				
CEO Owner*Family			-166.10			
			(-0.42)			
CEO Owner*Founder				-1,763	-315.32	
				(-2.23)**	(-0.23)	
CEO Owner*Professional CEO						791.93
						(2.05)**
Number of Obs	313,789	313,789	313,789	313,789	84,105	313,789
Number of Groups	112,875	112,875	112,875	112,875	39,219	112,875
R-squared	0.019	0.019	0.019	0.019	0.019	0.019

NOTE: This table reports the results of OLS regressions. The dependent variable is labor productivity. CEO Owner is a dummy equal to one if the CEO has majority ownership in the firm. Spouse Works is a dummy equal to one if the CEO spouse is an employee in the firm. Spouse Owns is a dummy equal to one if the CEO spouse holds some share in the firm. Family is a dummy equal to one if the CEO spouse is an employee or holds some share in the firm. Founder is a dummy equal to one if the firm was created during our sample and it has not changed the CEO. In column 5, the sample is restricted to firms created during our sample. Professional CEO is a dummy equal to one if the firm has at least two different CEOs or if the current CEO has worked in at least two different firms during our sample. All regressions include firm-CEO and year fixed effects. Controls include industry fixed effect (2 digits), firm's age, leverage, a dummy indicating if the firm is part of a business group, the number of workers by level of education and occupation (white vs. blue collar), the HHI index of ownership concentration and board characteristics. Standard errors are clustered by firm, t-statistics are in parentheses. *, ** and *** denotes significance at 10%, 5% and 1% level, respectively.

Table 8: Mechanisms

Dep Variable	CEO Engagements			CEO Days Off		
	(1)	(2)	(3)	(4)	(5)	(6)
CEO Owner	-0.01	-0.18	-0.07	-1.41	-10.64	-4.65
	(-1.75)*	(-32.37)***	(-4.41)***	(-3.73)***	(-37.77)***	(-5.75)***
Fixed Effects	Firm-CEO	Firm-Owner		Firm-CEO	Firm-Owner	
Estimates	OLS		IV	OLS		IV
Number of Obs	555,682	555,280	389,588	561,709	551,844	387,663
Number of Groups	209,292	145,561	96,391	212,669	144,798	96,109
R-squared	0.012	0.120	0.113	0.003	0.027	0.019

NOTE: This table reports results of OLS regressions (columns 1,2,4,5) and of IV regressions (columns 3 and 6). In columns 1-3, the dependent variable is the number of employment relations of the CEO in other firms. In columns 4-6, the dependent variable is the number of days of leave of the CEO. In columns 3 and 6, the instrument is the amount of health benefits received by the CEO spouse in the previous period (in 10,000 euros) and the sample is restricted to cases where the CEO spouse is not an employee of the firm. In columns 1 and 4, regressions include firm-CEO and year fixed effects. In columns 2,3,5 and 6, regressions include firm-owner and year fixed effects. Controls include industry fixed effect (2 digits), firm's age, leverage, a dummy indicating if the firm is part of a business group, the number of workers by level of education and occupation (white vs. blue collar), the HHI index of ownership concentration and board characteristics. Standard errors are clustered by firm, t-statistics are in parentheses. *, ** and *** denotes significance at 10%, 5% and 1% level, respectively.

Table 9: Robustness

Dep Variable	Labor Productivity				
	(1)	(2)	(3)	(4)	(5)
CEO 100	913.80				
	(2.70)***				
CEO 0		626.45			
		(2,96)***			
CEO Largest			1,414		
			(5.21)***		
CEO Shares				1,098	1,748
				(4.17)***	(1.79)*
CEO Shares squared					-715.46
					(-0.71)
Number of Obs	566,260	566,260	566,260	566,260	566,260
Number of Groups	214,077	214,077	214,077	214,077	214,077
R-squared	0.013	0.013	0.013	0.013	0.012

NOTE: This table reports the results of OLS regressions. The dependent variable is labor productivity. CEO 100 is a dummy equal to one if the CEO has 100% ownership in the firm. CEO 100 is a dummy equal to one if the CEO has some ownership in the firm. CEO Largest is a dummy equal to one if the CEO is the largest shareholder in the firm. CEO Share is the fraction of CEO ownership in the firm. All regressions include firm-CEO and year fixed effects. Controls include industry fixed effect (2 digits), firm's age, leverage, a dummy indicating if the firm is part of a business group, the number of workers by level of education and occupation (white vs. blue collar), the HHI index of ownership concentration and board characteristics. Standard errors are clustered by firm, t-statistics are in parentheses. *, ** and *** denotes significance at 10%, 5% and 1% level, respectively.

Table 10: Robustness (2)

Dep Variable	GOS	Profit	ROA	TFP	TFP2	
	(1)	(2)	(3)	(4)	(5)	(6)
CEO Owner	1,020	0.006	1.274	0.014	0.015	0.018
	(4.16)***	(1.88)**	(2.76)***	(2.79)***	(2.87)***	(3.38)***
Mean Dep Var	13,571	-0.018	2.28	0.001	0.0009	
Number of Obs	565,526	565,768	556,007	564,847	556,000	513,033
Number of Groups	213,692	213,839	209,853	213,422	209,848	197,448
R-squared	0.017	0.009	0.024	0.007	0.007	0.007

NOTE: This table reports the results of OLS regressions. In column 1, the dependent variable is Gross Operating Surplus. In column 2, the dependent variable is net profit margin. In column 3, the dependent variable is Returns on Assets. In column 4, the dependent variable is TFP, obtained as the residual of a Cobb-Douglas in which value added is regressed over capital and labor for each 2 digit industry. In column 5, TFP is estimated by adding firm's market share and fixed effects for industry-years. In column 6, TFP is estimated as in column 5 but multiproduct firms are excluded. CEO Owner is a dummy equal to one if the CEO has majority ownership in the firm. All regressions include firm-CEO and year fixed effects. Controls include industry fixed effect (2 digits), firm's age, leverage, a dummy indicating if the firm is part of a business group, the number of workers by level of education and occupation (white vs. blue collar), the HHI index of ownership concentration and board characteristics. Standard errors are clustered by firm, t-statistics are in parentheses. *, ** and *** denotes significance at 10%, 5% and 1% level, respectively.

Table 11: Robustness (3)

Dep Variable	Labor Productivity					
	(1)	(2)	(3)	(4)	(5)	(6)
CEO Owner	1,056	956.48	1,197	1,177	556.28	687.80
	(3.05)***	(2.70)***	(2.94)***	(3.29)***	(4.45)***	(3.81)***
LP(t-1)					0.71	0.51
					(571.81)***	(178.11)***
LP(t-2)						0.19
						(60.45)***
LP(t-3)						0.14
						(51.45)***
Sample	Firm		Firm-CEO			
	No Exit	Persistent	No Exit	Persistent		
Fixed Effects	Firm-CEO				No	
Number of Obs	418,856	318,219	256,232	313,962	308,546	121,616
Number of Groups	140,475	91,737	66,618	53,669		
R-squared	0.012	0.016	0.012	0.015	0.609	0.693

NOTE: This table reports the results of OLS regressions. The dependent variable is labor productivity. CEO Owner is a dummy equal to one if the CEO has majority ownership in the firm. In column 1, we restrict the sample to firms that do not die in our sample. In column 2, we restrict the sample to firms with number of observations above the median (equal to 9). In column 3, we restrict the sample to firm-CEO pairs that do not die in our sample. In column 2, we restrict the sample to firm-CEO pairs with number of observations above the median (equal to 4). In columns 5 and 6, LP(t-1)-LP(t-3) are lagged values of labor productivity with 1-3 lags. Regressions in columns 1-4 include firm-CEO and year fixed effects, regressions in column 5-6 include year fixed effects. Controls include industry fixed effect (2 digits), firm's age, leverage, a dummy indicating if the firm is part of a business group, the number of workers by level of education and occupation (white vs. blue collar), the HHI index of ownership concentration and board characteristics. Standard errors are clustered by firm, t-statistics are in parentheses. *, ** and *** denotes significance at 10%, 5% and 1% level, respectively.

Table 12: Robustness (4)

Dep Variable	Labor Productivity					
CEO Owner	1,010	515.99	1,006	590.92	655.60	1,210
	(3.34)***	(2.11)**	(3.31)***	(2.2)**	(2.13)**	(2.98)***
HHI Ownership	-0.11		-0.08			-0.10
	(-2.71)***		(-2.78)***			(2.19)**
Business Group	1,562.41			1579.41		
	(2.27)**			(2.3)**		
Leverage	-0.005			-0.005		
	(-13.23)***			(-13.24)***		
Firm Age	237.78			230.79		
	(1.50)			(1.46)		
Firm Age-sq	-2.66			-2.59		
	(-2.30)**			(-2.24)**		
Board Size	-167.57			-162.57		
	(-4.13)***			(-4.03)***		
Board Ownership	255.79			-201.06		
	(0.77)			(0.79)		
Workers in Board	-61.95			-50.60		
	(-0.92)			(-0.76)		
Employees Bac	-83.34			-83.33		
	(-2.88)***			(-2.88)***		
Employees Master	103.62			103.52		
	(2.10)**			(2.10)**		
Employees PhD	-572.65			-572.78		
	(-1.47)			(-1.47)		
White Collars	-14.85			-14.82		
	(-0.72)			(-0.72)		
Blue Collars	48.34			48.33		
	(2.53)**			(2.52)**		
Business Group (lag)					361.70	343.81
					(0.40)	(0.38)
Leverage (lag)					0.002	0.002
					(3.40)***	(3.40)***
Firm Age (lag)					-3.99	-6.09
					(-0.02)	(-0.03)
Firm Age-sq (lag)					0.02	0.00
					(0.01)	(0.01)
Board Size (lag)					0.36	-0.38
					(0.01)	(-0.01)
Board Ownership (lag)					1,058.12	1,000.20
					(2.80)***	(3.67)***
Workers in Board (lag)					-0.86	-2.04
					(-0.01)	(-0.02)
HHI Ownership (lag)					-0.01	-0.10
					(-0.15)	(-2.19)**
Employees Bac (lag)					-32.62	-32.61
					(-1.48)	(-1.48)
Employees Master (lag)					245.77	245.86
					(3.42)***	(3.42)***
Employees PhD (lag)					-1,256.28	-1,255.97
					(-2.54)**	(-2.54)**
White Collars (lag)					-51.66	-51.70
					(-1.84)*	(-1.84)*
Blue Collars (lag)					-15.03	-15.08
					(-0.69)	(-0.69)
Number of Obs	566,260	566,266	566,266	566,266	313,789	313,789
Number of Groups	214,076	214,078	214,078	214,078	112,875	112,875
R-squared	0.01	0.01	0.01	0.01	0.01	0.01

NOTE: This table reports the results of OLS regressions with firm-CEO and year fixed effects. Standard errors are clustered by firm, t-statistics are in parentheses.

Table 13: Exogenous Variations: Robustness

Dep Variable	Labor Productivity					
	(1)	(2)	(3)	(4)	(5)	(6)
CEO Owner	1,536	1,555				
	(2.54)**	(2.09)**				
Z(t)	-836.91	-479.89				
	(-1.66)*	(-0.78)				
CEO 100			720.71		1,146	
			(3.57)***		(2.13)**	
CEO 0				636.46		4,406
				(4.25)***		(2.26)**
	Probit				Probit	
Z(t-1)	-0.510	-0.196			-0.111	-0.218
	(-11.96)***	(-3.05)***			(-1.28)	(-4.72)***
Z(t-1)*(1-T(t-1))	0.67	0.06			-0.027	0.13
	(9.17)***	(0.67)			(-0.21)	(1.77)*
Instrument	CEO Health (10k)	Spouse Health (not working)			Spouse Health (not working)	
Fixed Effects			Firm-Owner			
Number of Obs	367,895	289,991	555,406	555,406	289,880	289,997
Number of Groups	74,640	63,001	145,578	145,578	62,982	63,002
R-squared	0.02	0.02	0.01	0.01	0.02	0.02

NOTE: This table reports results of OLS regressions (columns 3-4) and of Probit and IV regressions (columns 1-2 and 5-6). The dependent variable is labor productivity. CEO Owner is a dummy equal to one if the CEO has majority ownership in the firm. CEO 100 is a dummy equal to one if the CEO has 100% ownership in the firm. CEO 100 is a dummy equal to one if the CEO has some ownership in the firm. The bottom panel of columns 1-2 and 5-6 report probit regressions of equation (4). In column 1, the instrument is the amount of health benefits received by the CEO in the previous period (in 10,000 euros). In columns 2,5,6, the instrument is the amount of health benefits received by the CEO spouse in the previous period (in 10,000 euros) and the sample is restricted to cases where the CEO spouse is not an employee of the firm. In columns 1 and 2, Z(t) correspond to the amount of health benefits received the current period. All regressions include firm-owner and year fixed effects. Controls include industry fixed effect (2 digits), firm's age, leverage, a dummy indicating if the firm is part of a business group, the number of workers by level of education and occupation (white vs. blue collar), the HHI index of ownership concentration and board characteristics. Standard errors are clustered by firm, t-statistics are in parentheses. *, ** and *** denotes significance at 10%, 5% and 1% level, respectively.

Table 14: Exogenous Variations: Robustness (2)

Dep Variable	Labor Productivity					
	(1)	(2)	(3)	(4)	(5)	(6)
CEO Owner	1,727	1,486	1,449	3,644	3,084	3,274
	(2.31)**	(1.92)*	(1.87)*	(3.84)***	(3.23)**	(3.44)***
		First Stage			Probit	
Z(t-1)	-0.146	-0.077	-0.007	-0.25	0.28	-0.198
	(-16.70)***	(-5.8)***	(-0.55)	(-17.36)***	(9.14)***	(-6.69)***
Z(t-1)*(1-T(t-1))	0 .158	0.1	0.008			
	(16.70)***	(6.3)***	(0.57)			
Instrument	Retire	CEO Health	Spouse	Retire	CEO Health	Spouse
Fixed Effects			Firm-Owner			
Number of Obs	367,905	367,905	367,905	367,895	367,895	367,895
Number of Groups	74,641	74,641	74,641	74,640	74,640	74,640
R-squared	0.02	0.02	0.02	0.02	0.02	0.02

NOTE: This table reports results of IV and Probit regressions. The dependent variable is labor productivity. CEO Owner is a dummy equal to one if the CEO has majority ownership in the firm. The bottom panel of columns 1-3 report first stage OLS regressions. The bottom panel of columns 4-6 report probit regressions as in equation (4) without interactions with T(t-1). In columns 1 and 4, the instrument is a dummy equal to one if the CEO is classified as retired in the previous period. In column 2 and 5, the instrument is the amount of health benefits received by the CEO in the previous period (in 10,000 euros). In columns 3 and 6, the instrument is the amount of health benefits received by the CEO spouse in the previous period (in 10,000 euros) and the sample is restricted to cases where the CEO spouse is not an employee of the firm. All regressions include firm-owner and year fixed effects. Controls include industry fixed effect (2 digits), firm's age, leverage, a dummy indicating if the firm is part of a business group, the number of workers by level of education and occupation (white vs. blue collar), the HHI index of ownership concentration and board characteristics. Standard errors are clustered by firm, t-statistics are in parentheses. *, ** and *** denotes significance at 10%, 5% and 1% level, respectively.

Table 15: Exogenous Variations: Robustness (3)

Dep Variable	Labor Productivity				
	(1)	(2)	(3)	(4)	(5)
CEO Owner	970.55	1,651	1,537	1,515	2,041
	(6.62)***	(2.46)**	(2.26)**	(2.23)**	(2.38)**
			Probit		
Z(t-1)		-0.774	-0.438	-0.13	-0.14
		(-39.43)***	(-11.23)***	(-2.52)**	(-2.49)**
Z(t-1)*(1-T(t-1))		0.765	0.524	0.13	0.08
		(27.29)***	(10.54)***	(1.94)*	(1.00)
Instrument		Retire	CEO Health (10k)	Spouse Health (10k)	Spouse Health (not working)
Fixed Effects			Firm-Owner		
Number of Obs	566,260	396,983	396,983	396,983	341,762
Number of Groups	146,799	97,261	97,262	97,263	91,045
R-squared	0.01	0.02	0.02	0.02	0.02

NOTE: This table reports results of OLS regressions (column 1) and of Probit and IV regressions (columns 2-5). The dependent variable is labor productivity. CEO Owner is a dummy equal to one if the CEO has majority ownership in the firm. The bottom panel of columns 2-5 report probit regressions of equation (4). In column 2, the instrument is a dummy equal to one if the CEO is classified as retired in the previous period. In column 3, the instrument is the amount of health benefits received by the CEO in the previous period (in 10,000 euros). In columns 4-5, the instrument is the amount of health benefits received by the CEO spouse in the previous period (in 10,000 euros). In column 5, the sample is restricted to cases where the CEO spouse is not an employee of the firm. All regressions include firm-owner and year fixed effects. Standard errors are clustered by firm, t-statistics are in parentheses. *, ** and *** denotes significance at 10%, 5% and 1% level, respectively.