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Centre for Economic Policy Research
33 Great Sutton Street, London EC1V 0DX, UK
Tel: +44 (0)20 7183 8801
www.cepr.org

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JEL Classification: J24, M51, R11

Keywords: Executives supply, firm performance, local growth

Fabiano Schivardi - fschivardi@luiss.it
LUISS University and EIEF and CEPR

Julien Sauvagnat - julien.sauvagnat@unibocconi.it
Bocconi University and CEPR

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Are Executives in Short Supply? Evidence from Deaths' Events[†]

Julien Sauvagnat
Bocconi University and CEPR

Fabiano Schivardi
Luiss University, EIEF and CEPR

January 15, 2020

Abstract

Using exhaustive administrative data on Italian social security records, we construct measures of local labor market tightness for executives that vary by industry and location. We then show that firm performance is negatively affected by executives death, but only in thin local labor markets. Death events are followed by an increase in the separation rate for the other executives of the firm, in particular for those with a college degree. Consistent with the hypothesis that the drop in performance is due to the fact that executives are in short supply, we find that after a death event executives wages in other firms increase, but only in thin markets. This indicates that local policies aiming at boosting the supply of managerial skills might be effective at increasing firm performance.

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Email: julien.sauvagnato@unibocconi.it, fschivardi@luiss.it.

1 Introduction

Recent research shows that differences in performance between firms are substantial, persistent over time and largely unexplained (Syverson, 2011). As a potential explanation, a growing body of work highlights the role of management quality in shaping firms' outcomes. (Bertrand and Schoar, 2003; Bloom and Van Reenen, 2007, 2010). However, we still have a poor understanding of the factors that determine the differences in managerial quality across firms. In particular, what are the frictions that account for the fact that some firms allocate control to inferior managerial talent, hurting firm performance and, through this, aggregate productivity?

This paper focuses on the role of the local supply of managerial skills, and provides evidence on the causal role that the density of local markets for skilled labor plays in contributing to firm performance.[1] Empirically, the main challenge is to set up an identification strategy that addresses the joint endogeneity of firm productivity and labor market thickness to unobserved features of localities. One also needs rich micro data on both firms and workers in order to understand empirically the mechanism through which the supply of executives in a given labor market affects firm performance. Our approach satisfies both requirements and allows us to isolate the causal effect of the local supply of executives on firm performance.

We use employer-employee administrative data from the Italian social security records covering the entire population of Italian workers in the private sector over the period 2005-2015, matched with firms' balance sheet and income statement information. We first document that executives direct disproportionately their job searches toward firms within the same industry and geographical area, arguably due to mobility costs and industry-specific human capital. We therefore define the relevant market for executives at the industry-location level and construct measures of local labor market tightness for executives that vary by industry and location.

Our empirical design exploits negative exogenous shocks to the executives' team and trace their impact on firm performance in respectively thin and thick local labor markets. This allows us to isolate causal mechanisms through which the local density of executives has an impact on firm performance. As the main source of shocks to the executives' team, we exploit executives' death, thus circumventing the endogeneity of executives' exits. We focus on deaths that are arguably unexpected, and check that this set of sudden death events are random to firm characteristics. Deaths are rare events: the probability of a death for an executive below 60 years old is 0.10% per year. Despite this, the size of Italian labor market

[1] The existing literature generally considers the workforce as a whole rather than the workers in top positions within firms – the executives. A recent body of work suggests that the local supply of executives might play a key role (Gennaioli et al., 2013; Bloom et al., 2019).

(around 14 million workers and 123,000 executives in 2015) generates a number of executive deaths sufficiently large to allow for reliable inference. To provide evidence on the mechanism through which a low local density of executives makes firms' performance vulnerable to insiders' exit, we study the associated impact of the death shocks on the executives of the other firms in the same local labor market, as well as on the other executives of the affected firms.

Death events have a substantial negative and long-lasting impact on firm performance. Using returns on assets (ROA) as our preferred measure, we find that it drops by around -0.8 percentage points in the three years following an executive's death. Given the sample mean of 2%, the estimate is economically large. This estimate remains virtually the same when we control for industry and geographical dummies interacted with year fixed effects, and when we control for heterogeneous trends across firms with few or many executives.

The estimated decline in firm performance following executives' death is not per se evidence that the local supply of executives matters. After all, executives are likely to have accumulated a certain level of firm-specific or team-specific capital, which gets destroyed when the executive dies, possibly inducing a deterioration in performance, irrespective of the external supply of executives. To estimate whether local supply matters, we leverage the research design and estimate heterogeneity in firms' response to executives' death events depending on the thickness of local labor markets for executives. We hypothesize that firms are more likely to find a good match with another executive if the local pool of executives working for other firms in the same area and industry is large (referred to as a thick local labor market in the rest of the paper). Consistent with this idea, we find that firms' performance drops significantly after the death of one of their executives only in thin markets, in which case the effect is twice as large (-1.8 percentage points). We show that our results are robust to both changes in the specification setting – using a continuous rather than dichotomous indicator of density – and in the measure of performance – using productivity instead of ROA.

Other mechanisms could give rise to stronger effects of deaths' events in thin markets. Executive deaths could for example more severely disrupt local input-output relationships when the market is thin. In order to nail down search frictions for finding replacement executives as the economic mechanism through which executive-specific shocks affect firm performance, we look at the elasticity of peers wages to executives' deaths in the same market. If firms hit by deaths' events search for a replacement locally, their demand for executives will generate an upward pressure on executives pay, whose intensity depends on the thickness of executives supply. In line with our results on firms, we find evidence of spillovers on the compensation of existing executives in other firms in the same market, but only in thin local labor markets.

Finally, we exploit the richness of our micro data to investigate the specific channels though which the effects of executives deaths are magnified in thin markets. We show that executives' deaths in thin local markets are associated with an increase in other executives' separation rates in the following years. Strikingly, the effect on separation rates is heterogeneous across education levels: in thin local markets, executives' exit is followed with a disproportionate increase in the separation rate of executives with a college degree, arguably those who are more likely to have better outside options. Moreover, firms are also less likely to hire executives with a college degree. The combined effect is a deterioration of the average quality of the executives' team, which explains the relatively long-lasting effects of executives' exit on firm performance.

Overall, our findings highlight that the local supply of executives is an important driver of firm performance. Our work has important implications for the design of location-based policies to foster growth (see e.g. Glaeser and Gottlieb, 2008; Kline, 2010). In particular, the results suggest that local policies aiming at boosting the training/supply of executives might be effective at increasing firm performance and aggregate productivity.

Our work relates to several strands of literature. We first contribute to the literature on the consequences of frictional workers' mobility and the associated agglomeration effects. Our analysis rests on Marshall's 1890 idea that firms and workers in thicker labor markets face fewer frictions in finding a suitable match, and particularly for skilled workers (Abowd and Kramarz, 2003; Blatter and Schenker, 2012). Better worker-firm matches resulting from larger labor pools increase firms productivity (Diamond and Simon, 1990; Helsley and Strange, 1990; Combes and Duranton, 2006; Serafinelli, 2019). Compared to this literature, we focus on a particular category of workers – the executives. Local labor markets matter because workers' mobility is costly (Artuç et al., 2010; Dix-Carneiro, 2014). Consistently, Marinescu and Rathelot (2018) and Manning and Petrongolo (2017) find that job search behavior is quite local. There is also evidence that labor mobility has declined significantly in the U.S. (Moretti, 2011; Molloy and Wozniak, 2016, 2011, 2017; Kaplan and Schulhofer-Wohl, 2017). We show that, despite substantially higher wages, mobility is low for executives too.

Our results also relate to the body of work in management economics that emphasize the key role of top executives in shaping firms outcomes (Bertrand and Schoar, 2003; Bloom and Van Reenen, 2007, 2010; Bender et al., 2018; Schivardi and Schmitz, 2020). Bertrand and Schoar (2003) find that executive fixed effects matter for a wide range of corporate decisions. Bloom and Van Reenen (2007, 2010) focus on measurable management practices, and find a strong association between these practices and firm productivity. Bender et al. (2018)

use matched employer-employee data to show that firm performance is disproportionately dependent on the human capital of the executives, rather than of the average worker. More directly related to our work, a few studies rely on the occurrence of exogenous events such as CEO deaths or hospitalizations to shed light on the importance of executives for firms' outcomes (see e.g. Johnson et al., 1985; Bennedsen et al., 2007, 2008; Becker and Hvide, 2013; Holland and Lel, 2015; Smith et al., Forthcoming; Choi et al., 2019). Compared to these papers, we estimate the causal impact of the thickness of local labor markets for executives on firm performance. Our work isolates a supply-side friction that can explain why some firms allocate control to inferior managerial talent, hurting their performance and, through this, aggregate productivity. In doing so, our results speak to previous work in corporate finance on the performance effects of managerial turnover (see for instance Denis and Denis, 1995; Huson et al., 2004), and to recent research showing that differences in productivity between firms are substantial, persistent over time and remain large even after controlling for differences in the quality of production inputs (Syverson, 2004; Foster et al., 2008).

Finally, our work adds to the literature on the effect of labor supply shocks on employees' compensation. Prior work focuses on large, market-wide labor supply shocks, e.g., due to immigration or changes in the college graduation rate (Katz and Murphy, 1992; Card, 2009; Dustmann et al., 2009). More recent studies zoom in on the effect of employees' exit on co-workers hours worked and compensation within firms. Jager (2017) shows that workers' exits on average raise co-workers' wages and retention probabilities. We instead focus on spillover effects of death events hitting executives on peers working in *other* firms in the same local labor markets. Differently from executives, we find no effect on lower-ranked white-collars, which indicates that the tightness of external labor markets is more important for skilled human capital. Our work also relates to the literature in labor on peer effects and wage spillovers among workers, see, in particular, Cornelissen and Schönberg (2017) on the presence of complementarities between top executives. We document large heterogeneity across commuting zones and industries in the elasticity of executives' pay to local demand shocks for managerial inputs. The analysis also adds to previous studies on peer effects that have so far either examined workers realizing routine tasks (e.g. Falk and Ichino, 2006) or focused on specific occupations in which knowledge spillovers are expected to be large, such as scientists, academics, and physicians (see e.g. Waldinger, 2010, 2011; Azoulay et al., 2010). Consistent with the results of this literature, we find that executives' exits in thin markets have negative effects on peers retention, particularly for the high skilled ones.

The remainder of the paper is organized as follows. Section 2 presents our empirical strategy. Section 3 presents the data and some motivating evidence. Section 4 describes the results on firm performance, Section 5 describes the results on outcomes at the executive level. Section 7 concludes.

2 Identification strategy

Our goal is to determine if the supply of top managerial skills is a determinant of firm performance. The main source of identification is the occurrence of deceased executives. Specifically, our identification strategy rests on three building blocks. First, we show that executives mobility across industries and space is limited. We therefore define the commuting zone-industry as the relevant labor market for executives ("the market" in what follows), and the executives working in other firms in such market as the pool from which each firm is likely to hire executives. Second, we use sudden death as a random shock to executives' exit at the firm level and check if it affects firm performance. Of course, the death of an executive can cause disruption in a firm's operations independently from the supply of executives in the local market. In fact, an executive might have accumulated firm specific human capital that takes time to be reconstructed by a replacement, even when replacements are easy to find. The third element of our identification strategy is to distinguish the effect of an executive's death on firm performance according to the thickness of the local market for executives. Finding that the effects of executives death are stronger in thin markets indicates that the local supply of executives matters for firm performance.

Our identification strategy closely approximates the following example. Assume that an executive dies unexpectedly in, say, a textile firm located in Prato, a large textile cluster. We will estimate the impact on firm performance in several years surrounding the event. We will then contrast the magnitude and duration of this impact with death events of executives occurring instead at firms located in thin local labor markets, such as for instance another firm in Prato that would operate in the Chemicals industry, for which the local pool of replacement executives is thin. If the probability of finding good executives is lower in this case, we might expect a large negative effect of executives' exit on performance. We measure thickness at the 2-digit industry $\times$ commuting zone level as the total number of executives in the same industry and commuting zone, and classify thin versus thick labor markets based on a median split. When saturated with industry $\times$ year fixed effects and commuting $\times$ year effects, our identification strategy boils down to comparing performance of treated and control firms *within* the same industry and commuting zone separately in thin versus thick labor markets. This largely addresses the concern that our measures of local labor market thickness could spuriously correlate with industry or regional characteristics driving the differential firms' response to executives' exit.

To implement our identification strategy, we leverage a matched and exhaustive employee-firm panel, which provides us with precise information on the working address of all executives, as well as the industry of the firms they work for. Specifically, we run the following OLS regression at the firm-year level in our sample of firms:

$$\text{ROA}_{i,j,t} = \alpha_1 \text{DecEx}_{i,\tau} + \alpha_2 X_{i,t} + f_i + d_{cz,t} + d_{s,t} + \epsilon_{i,j,t}, \tag{2.1}$$

where $\text{ROA}_{i,j,t}$ is return on assets of firm i in market j at time t and the market is defined as the combination of the commuting zone cz and the sector s in which the firm operates. $\text{DecEx}_{i,\tau}$ is a dummy taking the value of one if at least one of the firm's executives die in period τ, where τ can be a single year or, in our preferred specification, the years from $t-3$ to t. All regressions include year, and firm fixed effects f_i. In some specifications, we include commuting zones×year fixed effects, $d_{cz,t}$, industry×year fixed effects $d_{s,t}$. We also introduce lagged controls for size, age, and profitability, interacted with year fixed effects. Including these controls ensures that the estimates are not driven by heterogeneous trends among large, old, or profitable firms. We build these controls by interacting year dummies with terciles of firms' assets, age, and return on assets three years prior to date t. We also augment some specifications with dummies indicating terciles of the number of firms' executives interacted with year dummies, in order to make sure that the results are driven by the treatment - the death of an executive - rather than indirectly by the number of firms' executives. Standard errors are clustered at the firm level to account for serial correlation of the error term within firms. The coefficient of interest is α_1, which measures the effect on ROA associated to the death of at least one of its executives.

For our strategy to consistently estimate the effect of executives' exit on firm performance, we need to assume that firm performance would have been flat in the absence of treatment (parallel trends assumption). For this, we check whether we find any effect in the year prior to the death of an executive. Second $\text{DecEx}_{i,t}$ should be orthogonal to any other potential determinant of performance that we do not control for. This assumption will be violated if for instance negative local or industry shocks simultaneously affect firm performance and individuals' health. The inclusion of respectively commuting zones×year $d_{cz,t}$ and industry×year $d_{s,t}$ fixed effects largely mitigates this concern.

Equation 2.1 allows us to determine if firms hit by an executive death record a drop in performance. While this is a necessary condition to claim that executives supply matters, it is not sufficient. It might in fact be that performance drops independently from executives supply, due to firm-specific human capital that gets lost with death. To assess if supply matters, we allow the effects to differ according to the density of the local market for executives by estimating an extended version of Equation 2.1 as follows:

$$\text{ROA}_{i,j,t} = (\beta_{\text{tn}}\text{Thin}_{jt} + \beta_{\text{tk}}\text{Thick}_{jt}) \times \text{DecEx}_{i,\tau} + \beta_2 X_{i,t} + f_i + d_{cz,t} + d_{s,t} + \eta_{i,j,t} \qquad (2.2)$$

where Thin is a dummy for thin executives markets and Thick for thick markets. If the local supply of executives matters, then we expect β_{tn} to be larger than β_{tk} in absolute value: the effect of executives death is stronger in thin markets, when the firm faces relatively large costs of searching for and switching to alternative executives. Conversely, we hypothesize that firms are more likely to find a good match if they are located in a market with many executives.

One could still argue that a stronger effect of an executive's death in thin markets is related to factors different from executive market density. For example, suppose that the death of an executive disrupts firms' relationships with their suppliers and customers, which could have a significant effect on firm performance (see e.g. Barrot and Sauvagnat, 2016). If executives' relationships with their local suppliers and customers are more valuable in thin markets – maybe because these are also markets with sparse local production networks in which existing relationships are less substitutable – we would still get a stronger effect of deaths in thin markets, but for a different reason. To obtain more direct evidence of the channel we underlie we look at spillovers on executives working at other firms in the same market, and focus on their wages. If firms' searches for new executives are mainly local, theory predicts that we could gauge the tightness of local labor markets for executives with the elasticity of other executives' wages in the same market. Specifically, we estimate the following (executive level) equation:

$$\text{Ln(Wage)}_{k,-i,j,t} = \gamma_{cz,t} + \pi_{s,t} + (\gamma_{\text{tn}}\text{Thin}_{jt} + \gamma_{\text{tk}}\text{Thick}_{jt}) \times \text{DecEx}_{j,\tau} + \gamma_2 X_{-ik,t} + f_{-i} + f_k + u_{k,t} \qquad (2.3)$$

where $\text{Ln(Wage)}_{k,-i,j,t}$ is the logarithm of the wage of executive k working in firm $-i \neq i$ in the same market as firm i hit by a death event, $\text{DecEx}_{j,t-1}$ is a dummy taking the value of one if at least one executive died in the previous year in the same market. Firms ever hit by an executive death are excluded from the sample. All regressions include year, firm, and we then progressively add executive fixed effects, commuting zones×year and industry×year fixed effects, as well as controls for executives' gender, age, and tenure, interacted with year fixed effects. We build the age and tenure controls by interacting year dummies with terciles of executives' age and tenure, in year t. In all regressions, standard errors are clustered at the Industry × CZ level to account for serial correlation of the error term within executives in the same market. We expect that γ_{tn} is larger than γ_{tk}: the pressure exerted on executives wages by the extra demand from the affected firm shows up more in terms of executive wages the thinner the market for executives.

Yet another concern is that executives' deaths disrupt firms, which might benefit executives employed at other firms in the same executive market if they are competitors in local product markets. If workers wages share to a certain degree firms shocks, as shown for example by Guiso et al. (2005), the improvement in firm performance would explain the increase in the wage, without resorting to equilibrium response of wages due to changes in local demand for executives. To address this concern, we will run a version of Equation 2.3 in which we exclude executives' wages of firms operating in non-tradable industries, for which product market competition is local, and check whether we find the same findings.

Finally, one might worry that firms endogenously select their location by taking into account the fact that executive turnover might have a negative impact on performance, especially in thin labor markets. This is not a threat to the identification strategy: if anything, this should bias the results against finding larger effects in thin labor markets, given that the most vulnerable firms to executive exits are likely to endogeneously select their location in thick labor markets. However, it might affect the external validity of these estimates, a point that we discuss in the last section of the article.

3 Data

In this section we describe our data sources, provide summary statistics, and establish some facts about executives mobility that motivate our definition of local markets for executives.

3.1 Data description and summary statistics

We leverage restricted-access administrative data available at the Italian Social Security Institute (INPS, Istituto Nazionale Previdenza Sociale). We have access to matched employer-employee records for all private firms with at least one employee. The dataset contains longitudinal information on all workers' job position, compensation, and employer since they joined the labor force. The data start in 1984, but the information on the municipality in which each firm is located is available only from 2005. We therefore focus on the period 2005-2015 (in 2015 constant euros). We also exclude financial firms from the sample.

The INPS data allow us to precisely identify firms' *executives*. The job title of executives ("dirigente" in Italian) applies only to the set of workers that have an executive collective contract, a fact that is recorded by social security data as the job title matters to determine pension contributions and entitlements. Legally, executives are defined as employees that manage a firm or a part of it and exert their role with some discretionary decision power. Executives therefore constitute the workers that take the strategic decisions within the firm: in fact, they represent around 1% of the Italian workforce. The next category in the firm hierarchy is that of "managers" ("quadro" in Italian), who are hierarchically below executives and have limited or no autonomous decision power, followed by "clericals" ("impiegati" in Italian). We refer to the superset of "managers" and "clericals" as *white-collars*.[2] The hierarchical structure is clearly reflected in compensation: The average (median) executive gross wage in 2015 is 135,000 euros (111,000 euros), against 61,000 euros for managers and 28,000 for clericals.

Information on the year of death is known from Social security records. The cause of death is unknown. As in Jaravel et al. (2018), in order to reduce the likelihood that death results from a lingering health condition, we consider executives passing away before or at the age of 60.[3] We identify 1,077 such events. Figure 1 shows the set of Italian CZs for which we observe at least one death of an executive over our sample period. As expected, we are more likely to observe death events in northern CZs, given that on average these local markets are larger. Note however that the set of death events spans the entire Italian territory and, importantly for us, we do observe death events both in thin and thick markets.

The Italian economy features large heterogeneity in the thickness of labor markets across areas. We will consider Commuting Zones (hereafter CZ) – around 600 – defined by the Italian National Institute of Statistics (Istat) as the relevant geographical unit for computing measures of labor market thickness. These areas are aggregated as clusters of municipalities that are characterized by strong within-cluster and weak between-cluster commuting ties. We then measure thickness at the (2-digit) industry× CZ level with the total number of executives in a given industry× CZ.[4] As a result, a given labor market can be described as thick in one set of industries, and thin in others.

The INPS has some information on firms (location, sector, and all the information on employees), but no information on their economic and financial performance. We therefore match the INPS records with a firm database (referred to as CERVED, the data provider) that contains balance sheet information of all incorporated companies in Italy. These companies account for approximately two thirds of private sector GDP. The matched executive-firm dataset provides us with a large sample of events hitting executives, allowing for precise es-

[2]The last category is that of blue collar workers ("operai" in Italian), which we do not use in our analysis.

[3]In robustness checks, we repeat the analysis by excluding deceased executives with claims to the administration for paid-sick leave in any prior year.

[4]The 19 2-digit industries are Agriculture Fishing, Mining, Wood Furniture, Food Tobacco, Basic Metals, Mechanics, Textile, Chemicals, Shoes, Non Metallic Minerals, Paper and Publishing, Construction, Utilities, Transport, Personal Services, Trade, Real Estate, Hotel Restaurant, and Professional Services.

timates.

Our preferred measure of performance is ROA, defined as EBIT (Earnings Before Interest and Taxes) over total assets. ROA measures the average return on the capital immobilized by the firm, without distinguishing between its sources (debt vs. equity). As such, it is a measure of profitability of the overall capital stock. If a firm suffers from the death of one of its executives, we expect this to show up in terms of ROA. An alternative would be to consider ROE, that more directly reflects returns to equity holders. The problem with ROE it is that it depends on the firm's financial structure and it is more volatile than ROA.

Table 1 presents summary statistics for our sample.[5] Panel A describes the firm sample, which consists of 321,804 firm-year observations between 2005 and 2015. A firm is included in our sample if it appears as having at least one executive in the INPS files in any year over the sample period. ROA for the average (median) firm is around 2.1% (3.6%),[6] and firms' value-added is equal to €80,383 per worker on average. The average firm in our sample has 3.17 executives.

The second part of Panel A compares the size, age, and return on assets of firms in thin versus thick local labor markets for executives. Firms in thick local labor markets tend to be on average more profitable, and slightly smaller and younger. The last part of Panel A compares instead the size, age, and return on assets of eventually treated and never treated firms. Eventually treated firms – those hit by the death of one of their executives at least once during the sample period – are larger and more profitable than never treated firms. This makes it all the more important to ensure in the empirical analysis that firm-level characteristics are not driving the results.

Panel B presents the executive-level sample, separately for deceased executives, taken in the year of death, and non-deceased executives. Executives' characteristics are fairly similar across both samples, even though the average deceased executive tends to be older - 52.8 years old compared to 48.5 for non-deceased executives -, has worked slightly more in the same firm - her/his tenure is 11.9 at the time of the death versus 9.8 years for non-deceased executives, and is slightly less likely to be a woman (9.7% versus 13.2% for non-deceased executives). Note however that wages in the year preceding the death event are virtually identical to the average wage in the sample of non-deceased executives. This is consistent with the notion that the death events that we observe in the data are fairly unexpected, as we would expect the compensation to be lower in the year prior to the death if the executive had some health conditions that impaired her ability to work.

[5]To account for outliers, we winsorize all continuous variables below the 1st and above the 99th percentile to value of the 1st and of the 99th percentile respectively.

[6]The low value of the average ROA is explained by the fact that the sample period includes the great recession, that was particularly severe in Italy.

Since 2010, firms are required to report to the ministry of labor the educational attainment of new hires. We use the INPS codification in order to construct three dummies corresponding to the executive having less than a high school degree,[7] high school and a college degree. Even though reporting education attainment of all new hires is a legal obligation since 2010, firms have the possibility to report "not known". The consequence for our analysis is that we observe information on education for around 65% of the executives who changed job after 2010. In the sample of executives changing firms after 2010, 5% have no high school degree, 21% have a high school degree, and 73% have a college degree.

3.2 Stylized facts on executives' mobility

In this section we present stylized facts on the mobility of executives to support our assumption that employees' sector specific human capital and geographical mobility costs direct their job searches toward firms within the same industry and geographical area.

We first describe in Table 2, Panel A, transitions between executives and white-collars occupations. A very large fraction of workers remains in the same layer of the hierarchy over time, even when they move from a firm to another: the unconditional probability that an executive in year t is also an executive in year $t + 1$ is 99.5%, and remains at a high 95.2% for executives moving from a firm to another. These numbers are similar for white-collars. Similarly, the probability of moving up the hierarchy (to the position of executive) for managers and clericals is small: respectively 0.3%, and 1.3% in a given year (conditional on remaining within a given firm or moving to another). Not surprisingly, executives demotions tend to occur almost exclusively with firm-to-firm mobility. These numbers provide strong support for our working hypothesis that executives employed at other firms represent the relevant labor market for firms when hiring a new executive.

In Panel B, we report the fraction of executive moves that are within the same commuting zone, and within the same 2-digit industry. Importantly for our identification strategy presented below, we find that a large fraction of executive moves in our sample tend to occur within the same commuting zones, and the same industries. We find that 65% percent of executive moves are within the same commuting zones, whereas 55% percent occurs within the same 2-digit industry. For the sake of comparison, we also report what would be the associated fraction of executive moves within the same commuting zone and 2-digit industry assuming instead that executive moves between two firms are random. Assuming executive moves as being random, we would have observed instead 13% percent of executive moves

[7] Note that in Italy compulsory schooling age is 16, while high school requires three more years of education. Differently from the US, therefore, a large part of the population does not hold a high school degree.

within the same commuting zones, and 12% within the same 2-digit industry. When considered jointly, we find that 39% percent of executive moves are within the same commuting zones $\times$ industry, while this number would be 1.7% under random moves. These patterns suggest that executives in our sample deploy significant industry specific knowledge, and face significant costs for moving from one area to the other.

One may wonder whether the Italian economy is an outlier in terms of executives mobility. As a first comparison, we reproduce in Panel C the same computations for the French economy, for which we have similar matched employer-employee records from a random sample of 1/12th of the French workforce (provided by the French statistical office, INSEE). We use an industry classification with a similar granularity (17 industries instead of 19), and the list of Commuting Zones as defined by the French statistical office. The pattern of executive moves within industry and commuting zone is remarkably similar to the one in Italy: 71% percent of French executive moves are within the same commuting zones, 66% percent within the same industry, and 50% percent within the same CZ $\times$ industry, against respectively 15%, 13%, and 3% in counterfactuals with random moves. We do not have similar matched employer-employee data for the United States. However, the same computations using alternatively Execucomp data which covers the top five highest-paid executives of a large sample of U.S. listed firms also indicate that even (the tail of) U.S. listed firms' top executives tend to move disproportionately more within the same area and industry.

Finally, we confirm in the data that there is a positive correlation between market density and the probability of hiring external executives from the same local market. We measure market density of market j with the log of 1+the number of executives working in firms belonging to such market. A first implication of the fact that a denser local supply of executives is more likely to satisfy a firm's managerial needs is that, when a firm hires an executive, the probability of hiring locally should be higher the denser the market. To test this simple implication, we run a regression of the share of local hires over total hires for market j at t over market j density at $t-1$. The results, reported in Table 3, confirm this implication: the share of local hires increases with density. Results are robust to controlling for industry$\times$year and CZ$\times$year fixed effects, which take care of any local or industry time-varying shocks. In the most saturated regression, the coefficient is equal to 0.052 (and highly statistically significant) which implies that doubling the number of executives goes together with an increase in the share of locally hired executives of approximately 5%. Given that the average share of locally hired executives is 39% (see Table 2), this represents an increase of 13% over such average share.

Next, we check in Panel B whether the "quality" of executives hired is also correlated with market density. For this, we exploit the education data, available for a majority of executives who changed job from 2010. Table 3, Panel B, shows that the denser the market the less likely it is that a newly hired executives has a high-school degree and the more likely that she is a college graduate. One may argue that this is not driven per-se by the local density of the executive market, but instead simply indicates that denser executive markets turn out to be markets in which the education level of the overall workforce is higher. To determine whether this is the case, we run the same regressions in Panel C for the sample of white-collars changing jobs from 2010. We do not find evidence that denser executive markets are markets in which the education attainments of other white-collars are higher.[8]

These exercises are consistent with the idea that the density of the local executive market has a positive impact on the quality of new executive hires. Of course, this correlation cannot be interpreted in a causal sense. In particular, it might be that firms located in denser markets are "better" firms, that is, more productive, more innovative or export oriented, and therefore they might express a demand for executives of higher quality. To take a step towards a causal interpretation of the correlation between executives supply and firm performance we now move on to our main identification scheme: firms' response to executives death in markets with different degrees of density.

4 Results

In this section, we estimate the effect of executives' exit on firms' ROA. We interpret executives' death as a shock to firms' demand for new hires. Consistent with this interpretation, we show in Appendix Figure A.1 that the number of firms' executives drops by virtually 1 on the year of the death (the coefficient is equal to -0.98), and then it recovers in the following two years, respectively by 0.31 and 0.24 (both coefficients are statistically significant at 1%). The coefficient is virtually zero in years 3 and 4. We further show in Panel B that this effect on the number of executives is not driven by internal promotions: the number of promotions is not significantly different after the death event. This indicates that the increase in executives following the death event is driven by executives' hiring on the external labor market.

[8]In the sample of white-collars changing jobs from 2010, 42% have a college degree, against 73% in the sample of executives.

4.1 Baseline results

We run the OLS panel regression detailed in Section 2, Equation 2.1, and present the results in Table 4, Panel A. We look at the effects of an executive's death on the firm performance over the three subsequent years: in the notation of Equation 2.1, $\tau = [t-3, t]$. The estimate in Column (1), where we only control for firm and year fixed effects, indicate that ROA drops by an average of approximately 0.8 percentage points in the three years after the death event. The estimate is significant at 5% level. Given the sample mean of 2%, the effect is economically large. In column (2) we include industry×year and CZ×year fixed effects. The estimate remains virtually unchanged. Not surprisingly, this confirms that the effect on firm performance is not related to shocks at the industry or geographical levels correlated with executives' deaths. In Column (3) we add firm characteristics (dummies for tercile of: assets, age, ROA interacted with year dummies, all measured at t-3). Again, the results are unaffected. Finally, we add dummies for terciles of the total number of firms' executives interacted with year dummies in Column (4). This addresses the concern that the results could be driven by diverging trends between firms with a small versus large number of executives. The estimate remains very similar.

The results of our basic estimation indicate that executives deaths have a large impact on profitability. This regression is a useful starting point in our analysis but arguably a negative effect of death on performance can result independently from executives supply: an executive is likely to have some firm specific capital that gets destroyed by death and, in the process of rebuilding it, firm performance might suffer. To address this concern, we then move to the estimation of Equation 2.2, where we allow the executive death's effect on ROA to depend on the thickness of the local market for executives. In these regressions, one could think at the effect in thick markets as the one resulting from the destruction of firm specific human capital, and any extra effect in thin market as due to low executives supply. The results of Panel B in Table 4 are clear cut: all the effect come from deaths in thin markets. In fact, we find that, across all specifications, the drop of ROA in thin markets is around 1.8 percentage points, and highly statistically significant at the 1% level. This means that, compared to the sample mean, ROA drops by 90%. Instead, in thick markets we find virtually no effect. This result indicates that the lower statistical significance of Panel A is due to bunching together thin (where the effect is strong) and thick (where there is no effect) markets: once we separate them, it emerges clearly in thin markets. Second, it suggests that the firm-specific human capital story finds little support in the data. In thick markets, where it is easier to find a replacement, the firm's performance is hardly affected by the death event. Instead, in thin markets the drop is large and precisely estimated. This is consistent with the hypothesis that the (local) supply of top management skills affects firm performance.

Our basic specification estimates an average effect in the three years following the death event. We next examine the dynamics of the effects, re-estimating a version of Equation 2.2 where we allow the effect to differ for each year surrounding the event. We report the full results in Table 5. Given that the results are extremely stable across specifications, we only comment the most saturated regression of Column (4), whose coefficients are also plotted in Figure 2. First, for our identification strategy to hold, the drop in ROA should show no prior trend. Reassuringly, the coefficient on DecEx_{t+1} is not statistically different from zero both in thin and in thick markets. Second, in thin markets ROA drops substantially on the year of the event, with an estimated value of -2.87 percentage points, and remains negative and highly significant in the two following years. It is still negative three years after the death event (-0.71). On the contrary, in thick markets we observe a modest drop in the year of the event (around -0.4), and positive values in subsequent years. None of the coefficients is statistically significant, indicating that for these firms there is no departure from the firm-level average ROA (recall that all regressions include firm fixed effects). We conclude that while in thick markets executives deaths hardly affect performance, in thin market the effect is substantial and long lasting.

4.2 Robustness

We now show that our results are robust to a series of specification choices. A first issue relates to the distinction between thin and thick labor markets. In our basic specification we split the sample at the median and used dummies for thin and thick markets. Of course, the effect of labor market density is likely to be monotonic. We repeat the exercise using the continuous indicator of density, defined as the logarithm of one plus the number of executives working at other firms in the same CZ× industry in the previous year. Specifically, we run the following equation:

$$\text{ROA}_{i,j,t} = \beta_{cz,t} + \pi_{s,t} + \beta_1 \text{Dens}_{j,t} \times \text{DecEx}_{i,\tau} + \beta_2 X_{i,t} + \beta_3 \text{Dens}_{j,t} + \beta_4 \text{DecEx}_{i,\tau} + f_i + w_{i,j,t} \quad (4.1)$$

Results are reported in Appendix Table A.1. We find that the impact effect of the death event is strong, around 3.17 percentage points (in column 4). This effect should be interpreted as that for a firm in a local market with no other executives. The interaction is 0.47 and significant at 1%, indicating that, as the density increases, the negative effects of executives deaths are attenuated. This implies that the effect is negative for most of the markets, with the exception of the very large ones. Finally, we find some evidence of a negative effect of density it itself in the first two columns. Note however that this should not be interpreted in a cross sectional sense, that is, firms in denser markets having lower ROA. Given that we always include firm fixed effects, and given that firms do not change markets, the coefficient is only identified by the time series variation in the number of executives within market. In fact, when we add more controls at the level of the firm (Columns 3 and 4), the effect disappears.

Next, we check the sensitivity of the results to restricting the sample to a more conservative set of sudden executive deaths. For this, we repeat the analysis by excluding deceased executives with claims to the administration for paid-sick leave in any prior year, and present the baseline specifications in Appendix Table A.3. The coefficients are virtually the same as in Panel B of Table 4.

Finally, we use an alternative measure of performance. We choose productivity, defined as value added (in 2015 constant thousand euros) per worker. Productivity is a more comprehensive measure of the firm's efficiency, as it also accounts for the number and the compensation of employees. The results are reported in Appendix Table A.2 and fully confirm those obtained with ROA. As shown in Panel A, productivity in affected firms in thin markets drop on average by 9% in the three years following the death event, and the effect is highly significant. As for ROA, no effect emerges for firms in thick markets: if anything, the estimate is positive, but statistically insignificant. In Panel B we repeat the exercise using the continuous indicator of density, finding a negative intercept and a positive coefficient of the interaction, both significant at 1%. This indicates that, as density increases, the negative effects of executives deaths on labor productivity are attenuated.

5 Is it really executives supply?

Our evidence so far is consistent with the hypothesis that the local supply of executives matters for firm performance. However, one might still argue that the effect we find is spurious, as there might be unobserved firm characteristics that are correlated with density and that determine the intensity of a firm's reaction to the death shock. For example, sparser executive markets might be also less dense in terms of other firm's inputs, such as general workers and intermediates. It might be that firms in such areas are more fragile and therefore more affected by any negative shock, including an executive's death. We believe that our rich set of local, sectoral and firm controls makes this possibility unlikely. However, given that it is theoretically possible, we now supply further evidence building on some unique implications of the economic mechanism behind our hypotheses.

5.1 Executives wage response in other firms

As a first exercise, we study the wage response of executives employed by firms in the same market as the affected one. Our hypothesis is that affected firms need to replace the deceased executive, possibly poaching the replacement executive from other firms in the same local market. One implication of this theory is that executives wages in neighboring firms should increase after a death event in another firm due to the increase in executives demand, and the more so the thinner the market. Our granular data allow us to test it. Specifically, we estimate Equation 2.3, regressing executive wages on the interaction of the dummy variable $\text{DecEx}_{j,t-1}$ with the dummies for thin and thick markets. Note the change of observation unit, now at the executive rather than at the firm level. We only use one lag of the death shock, as the hiring pressure on the local executives market tends to concentrate in the year following the death event. We exclude all firms that ever had a death event, so that the sample is only of never affected firms. In addition to the firm level controls of the previous tables, all regressions also include executives fixed effects and, in some specifications, executive controls. Table 6 presents the results. In the first column we do not distinguish by market density and find a positive but statistical insignificant coefficient. Once we distinguish between thin and thick markets, The estimates in column (2) indicate that executives wages increase on average by around 0.44%, statistically significant at 5% confidence level, when a neighboring executive dies in the same thin labor market in the previous year. In thick markets we still find a small positive effect, but not statistically significant at conventional levels. The coefficient remains fairly stable when we gradually include industry×year, and CZ×year fixed effects, and when we control for potential diverging trends between young and old executives, male and female executives, and executives with short and long tenure. These results are therefore consistent with the idea that the effects on performance are due to differences in executives supply.

While the wage spillovers are consistent with the idea that executives deaths are associated with an increases in the demand for executives, there is another potential explanation. In fact, the disruption caused by executives deaths in affected firm might benefit competitors on the product market and, consequently, their employees. If the set of competitors overlaps with that of the executives market, that is, if competitors are mostly local firms in the same sector, the increase in the wage might be due to an improved performance in neighboring firms. We handle this problem in two ways. First, we check in Panel B of the same Table 6 whether other white-collars in the firms' hierarchy experience an increase in wages, which would presumably be the case if employees pay is indirectly affected through product market competition. Reassuringly, we find virtually no effect on other white-collars compensation in either thin or thick markets. Second, we run the same specification as in Panel A but exclude from the sample executives working in non-tradable industries, for which product market competition is local, and higher performance of non-affected firms in the same local market could in principle explain the increase in wages that we observe. As shown in Appendix Table A.4, the estimates on executives' wages employed at neighboring firms are still strongly statistically significant, and if anything larger, once we exclude non-tradable industries.[9] We conclude that the effect on wages is attributable to the upward pressure of the demand for executives of the firms affected by the death event.

5.2 Disruption within affected firms

Our theory predicts that in thin markets it should be harder to form good matches. This effect should be particularly apparent after executives deaths, which induce unplanned hires. We exploit this prediction to derive a set testable implications related to the quality of the matches formed after the death event in thin and thick markets, through both the education level of new hires and future separation rates.

First, we look at the educational attainments of new hires. We have seen in Table 3 that, in general, new hires are of lower "quality" in thinner markets. We now check if this is the case following a death event. In Panel A of Table 7 we run the same regression as in Table 3, but change the explanatory variable and the set of controls: Instead of an indicator of market density, we use the deceased executive dummy interacted with the thin and thick market dummies, and we add firm fixed effects. We find that firms in thin markets are more likely to hire an executive without a high school diploma and less likely to hire one with a college degree following deaths' events. While these result are in line with the reduced form evidence of Table 3, we stress the difference in the data variation used to identify the coefficients: there, we show that higher density is correlated with higher education cross-sectionally. Here, given that we have firm (and thin market) dummies, the regression shows that, after being hit by an executive's death, a firm in a thin market is more likely to hire executives with lower education compared to the hires of *the same firm* in "normal" periods. This indicates that, when facing an unexpected executive exit, firms in thin markets on average hire less educated executives compared to cases in which the exit was expected and therefore the replacement planned in advance.[10]

[9] We classify the following industries as non-tradable: Construction, Utilities, Transport, Personal Services, Trade, Real Estate, Hotel and Restaurant, and Professional Services.

[10] In column (4) we also run a check of any potential selection effect deriving from missing education information. We construct a dummy equal to 1 for missing education information and run the same regression as before using this dummy as the dependent variable. We find that the probability of a missing education entry is not correlated with our explanatory variables, reassuring us that there is no systematic bias in missing education data after a death event.

We hypothesize that the lower quality of matches could also lead to an increase in subsequent separations for executives within affected firms. We test this in Panel A of Table 8, where we look at how death events affect the intensity of executive separations. We run a regression at the firm level, where the dependent variable is the ratio of executives that leave the firm in year t and work for another firm in year t+1 to the total number of executives in the firm in year t. We focus on executives that work at $t + 1$ to single out voluntary quits from retirements and firings. We find a positive and statistically significant coefficient in all specifications. For firms in thin markets, the fraction of executive turnover increases in the three years following a death event by around 1.6 percentage point. Compared to a sample mean of 4%, this represents an increase in the separation rate of 36%.

In addition to a higher separation rate, disruption should also imply that the ones leaving the firms are those with more outside options, that is, the high skilled executives. In Table 7, Panel B, we construct a dummy for the education of the executives who leave the firm, symmetrically to what we do for new hires in Panel A. We find that, after a death event, executives with a high school degree are less likely to leave a firm in a thin market and those with a college degree more likely to do so. Again, no significant effect emerges for firms in thick markets.

Putting all these results together, we conclude that an executive's death event has little effect on firms in thick markets in terms of executives quality. On the contrary, in thin markets both the direct effect (new hires) and the indirect effects (separation of existing executives) point to a deterioration of the quality of the executives pool, which is likely to cause the deterioration in performance documented above.

6 Discussion

6.1 External validity

Our results are informative for the effects of unexpected executive turnover on firms' outcomes. Nonetheless, these results can plausibly be extended to other types of shocks that require firms to acquire quickly new types of skills on the market – say a new, large potential business opportunity in China. If the firm does not respond quickly by hiring a new executive with the required skills (for instance, having experience with doing business in China), the opportunity is gone. Arguably, firms are continuously subject to a variety of similar shocks. How do our findings speak to the implications of labor market thickness for firm performance in "normal times", that is, when firms might have more time to find a suitable match? Even if this remains outside the scope of this paper, one first pass to shed light on this question is to estimate the effect on firm performance of executive exit that are arguably more likely to be anticipated. For this, we re-run our baseline regression using executive retirement as an anticipated form of executive exit. We present the results in Table 9. As for executive death, the effect of executive retirement on performance is negative and significant only in thin markets. Quantitatively, the effect on performance is significantly weaker, around -0.5 against -1.85 for unplanned exit in Table 4, Panel B. Still, it represents a 20% drop in ROA compared to average in the three years following the exit. Given that executive exits are common event in a firm's life cycle, this result indicates that the scarcity of executives supply affects steady-state firm performance in a consistent way.

6.2 Economic significance of the effects

Is the negative effect of executives' exit on firms' ROA in thin CZ×industry reflected in market-level data, or is it offset in the aggregate? To answer this question, we first sum separately the earnings before interest and taxes (EBIT), and the assets of all firms operating in the same CZ×industry, and construct a measure of ROA at the market level, defined as the ratio of market-level EBIT over market-level assets for each CZ×industry and year. For each CZ×industry and year, we also compute a dummy indicating whether (at least) one firm in that CZ×industry is hit by the death of (at least) one executive in the same or previous three years, and interact this dummy depending on whether this occurs in a thin or thick market. We then run similar regressions as those with firm-level data, here aggregated at the CZ×industry level, and present the results in Table A.5. We find that a death event hitting one firm in a given thin CZ×industry market causes a drop by around 0.5 percentage point in the overall profitability of that local industry. Similarly, we present the same regressions for labor productivity aggregated at the market level. As shown in Panel A, a death event hitting one firm in a given thin CZ×industry market causes a drop in the overall labor productivity of that local industry.

Finally, we compute a back-of-the-envelope total value of the aggregate losses associated to the death events in thin markets (in which we found statistically significant negative effects on firms' profits). To compute the aggregate losses, we apply the estimated coefficient (-1.849) in Table 4 on the variable Deceased executive (t-3,t) $\times$ thin market (multiplied by 4) to the 2015 constant dollar value of the affected firms' assets in the year before the death events. We aggregate these estimated lost profits across the set of affected firms operating in thin markets only. We find that lost profits amount to approximately 21 billion euros over the sample period, that is around 1.8 billion euros per year.[11] Compared to Italian aggregate

[11] The aggregate losses sum up to approximately 25 billion euros over the sample period when we alternatively use the estimates from column 4 of Table A.1 from the ROA specification using the continuous measure

(non-financials) corporate earnings in 2015 (around 570 billion euros), this corresponds to around 0.3% of aggregate corporate profits. Given the rare frequency of death events, this suggests that the relative shortage of executives' supply in the economy has a sizeable effect on firm performance in the aggregate.

We repeat the same exercise across retirement events. Again, we aggregate these estimated lost profits across the set of firms for which at least operating in thin markets only, using estimated coefficient on the variable Deceased executive (t-3,t) × thin market (now of Table 9) to the 2015 constant dollar value of the affected firms' assets in the year before retirement events. We find that lost profits amount to approximately 64.9 billion euros over the sample period, that is around 6.7 billion euros per year, around 1% of Italian aggregate corporate profits in 2015. Note that this estimate is in line with the previous one. In our sample, retirement events are 11 times more frequent than death events, and their individual impact on firm performance in thin markets is three times smaller.

7 Conclusion

This article explores whether the local supply of executives affects firm performance. Using exhaustive administrative data on Italian social security records, we construct measures of local labor market tightness for executives that vary by industry and location. We then exploit executives' deaths as an exogenous shock to executives' exit, and show that firms in thin labor market experience a drop of 1.8 percentage point in ROA following death events, which amounts to a 90% reduction with respect to the sample average. Strikingly, we find virtually no impact for death events that occur in dense markets for executives. The effect shows no prior trends, and lasts for at least three years.

Consistent with the notion that thin labor markets lead to poorer firm-executive matches, we find that death events are followed by an increase in the separation rate for the other executives of the firm, in particular for those with a college degree. We confirm firms' difficulty in finding a suitable replacement as the source of the drop in performance: in fact, peers wages in the same market increase, but only in thin markets. Taken together, these findings suggest that the scarcity of managerial skills is an important dimension in explaining differences in firms' performance across industries and regions. From a policy perspective, they suggest that local policies aiming at boosting growth should take into consideration the supply of executive skills.

of market density, arguably a more precise way of computing these aggregate losses. For this, for each firm we multiply the 2015 constant dollar value of the affected firms' assets in the year before the death events by 4*(-3.175+0.473*Ln(1+#NbExecutives (Industry,CZ)) (t-1)) where #NbExecutives (Industry,CZ)) is the total number of executives in the market in which the firm operates.

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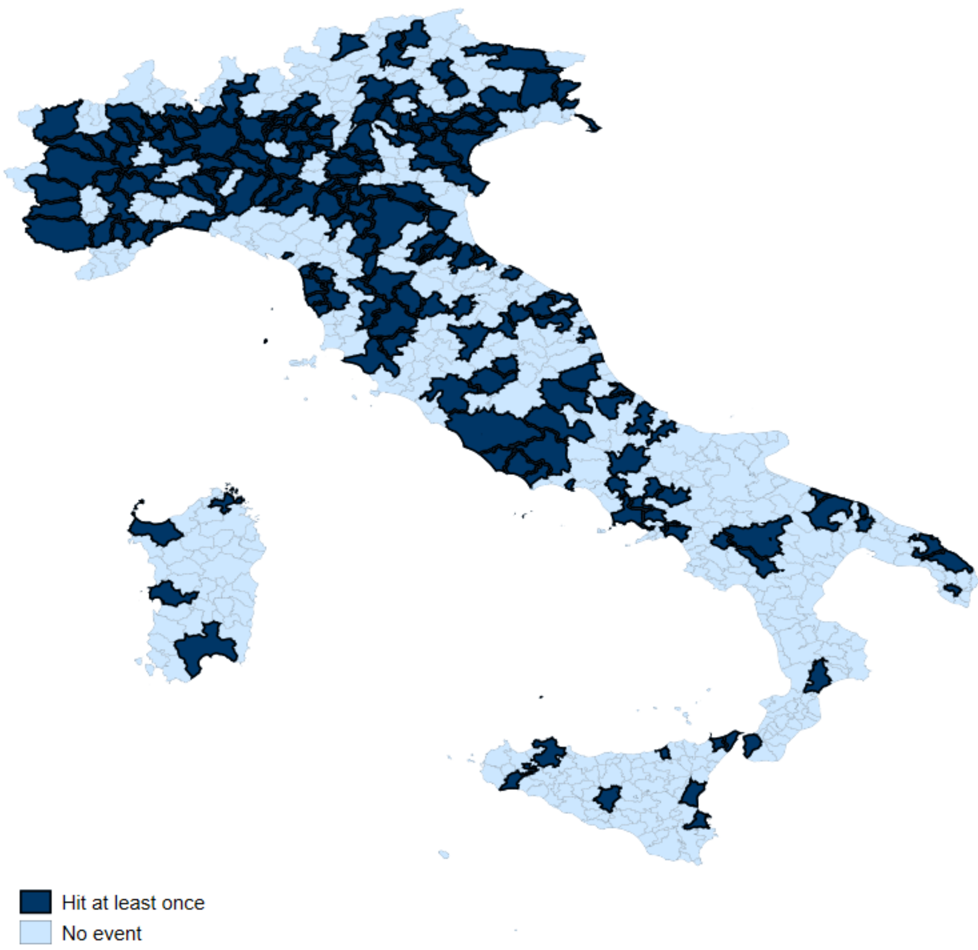
8 Graphs and tables

Figure 1

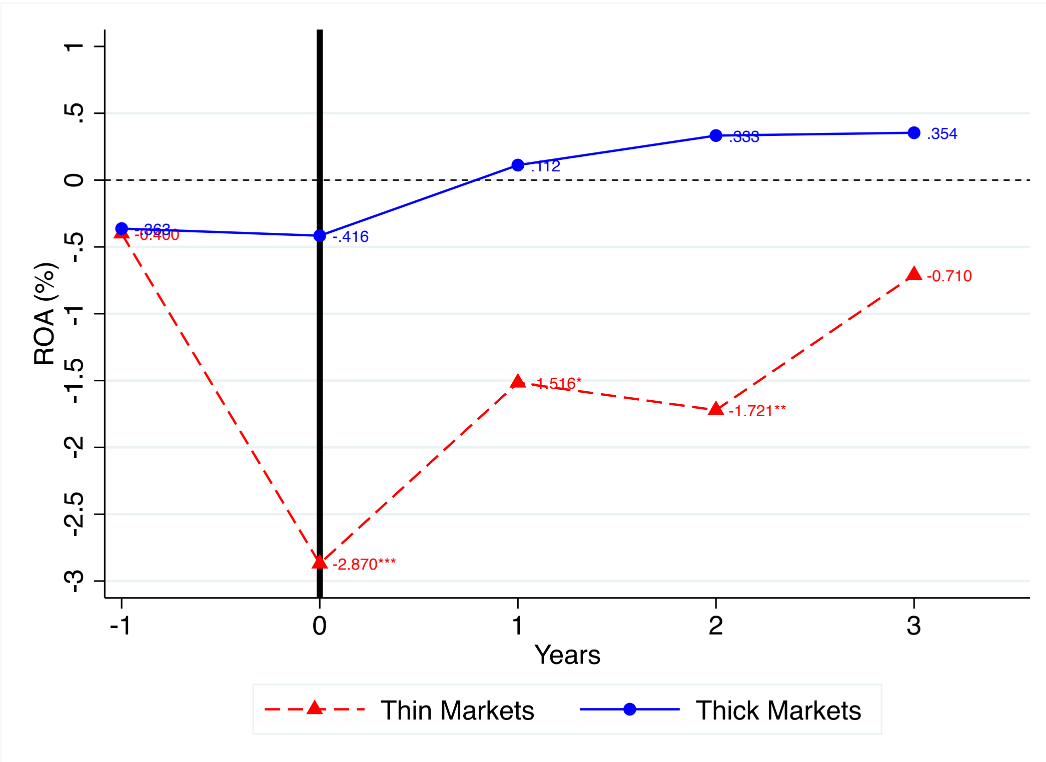
Location of Executives Death Event



Notes: This map presents executives death events located in each Italian Commuting Zones over the sample period.

Figure 2

Executives Exits and Firms' ROA in Thin versus Thick Labor Markets: Dynamics



Notes: This figure presents difference-in-differences estimates of return on assets in the year before and three years after the occurence of a deceased executive in both thin and thick labor markets. Return on assets is defined as earnings before interest and taxes (EBIT) over the current value of assets. The red dashed line connects estimated coefficients, $\beta_{\tau\mathrm{n}}$, whereas the blue solid line connects estimated coefficients, $\beta_{\tau\mathrm{k}}$, of the following regression:

$$\mathrm{ROA}_{i,j,t} = \sum_{\tau=-1}^{3} \beta_{\tau\mathrm{n}} \mathrm{DecEx}_{i,t-\tau} \times \mathrm{Thin}_{jt} + \sum_{\tau=-1}^{3} \beta_{\tau\mathrm{k}} \mathrm{DecEx}_{i,t-\tau} \times \mathrm{Thick}_{jt} + \beta_2 X_{i,t} + f_i + d_{cz,t} + d_{s,t} + \eta_{i,j,t}$$

where $\mathrm{DecEx}_{i,t-\tau} \times \mathrm{Thin}_{jt}$ (respectively $\mathrm{DecEx}_{i,t-\tau} \times \mathrm{Thick}_{jt}$) is a dummy equal to one if the death of an executive hits firm i in year $t-\tau$ in a thin labor market (respectively in a thick labor market). The specification also includes firm fixed effects, industry and CZ dummies interacted with year dummies, as well as firm-level characteristics (dummies indicating terciles of size, age, and ROA respectively) and terciles of the number of executives interacted with year dummies. Standard errors are clustered at the firm level. *, **, and *** denote significance at the 10%, 5%, and 1%, respectively. The sample period spans 2005 to 2015.

Table 1
Summary Statistics

This table presents the summary statistics for our sample. Panel A presents the firm sample, which consists of 321,804 firm-years between 2005 and 2015. A firm is included in our sample if it appears as having at least one executive in the INPS files in any year over the sample period. We exclude financial firms. ROA is defined as earnings before interest and taxes (EBIT) over total assets. Labor productivity is value added per worker. Deceased executive is a dummy indicating the death of an executive working in the firm in year t. Retired executive is a dummy indicating the retirement of an executive working in the firm in year t. Executive separation rate is the ratio of the number of executives who leave the firm in year t (and work for another firm in year $t+1$) over the total number of executives in the firm in year t. The first panel is based on all firms. The second panel distinguishes by labor market type. A labor market (the combination of a CZ and a sector) is defined as thin (respectively thick) if it lies below (respectively above) the sample median in terms of the total number of executives in each market. The third panel distinguishes between treated and untreated firms. Eventually treated firms are those that are hit by the death of one executive at least once over the sample period, and never treated firms are those never hit by a death event. The last panel reports characteristics at the market (commuting zones × industry) level, namely the total number of executives employed in all firms in a given market, and a dummy indicating whether at least one executive dies in a given market × year. Panel B presents the executives sample, separately for deceased and non-deceased executives. We exclude executives with pay below €50,000 in the previous year (around 2% of the full sample). Executive tenure is the number of years since the individual has joined the firm as an executive. The last panel reports the education of executives. Information on education is available only for executives who changed job since 2010. All monetary values are in 2015 constant thousand euros, and all continuous variables are windsorized at the first and ninety-ninth percentiles.

Panel A:	Firm Sample					
	Obs.	Mean	Std. Dev.	p1	p50	p99
ROA	321,804	0.021	0.190	-0.854	0.036	0.424
Labor Productivity	306,498	80.383	74.289	-78.330	65.261	360.974
Ln(Assets)	321,804	9.061	1.763	4.500	9.108	13.324
Firm Age	321,804	17.077	12.679	1.000	14.000	48.000
Number of executives	321,804	3.173	18.192	0.000	1.000	38.000
Deceased executive (t,t-3) (%)	321,804	0.773	8.755	0.000	0.000	0.000
Retired executive (t,t-3) (%)	321,804	8.201	27.438	0.000	0.000	100.000
Executive separation rate	321,804	0.040	0.169	0.000	0.000	1.000
	Thin Labor Markets			Thick Labor Markets		
	Obs.	Mean	Std. Dev.	Obs.	Mean	Std. Dev.
ROA	161,176	0.018	0.167	160,628	0.023	0.211
Ln(Assets)	161,176	9.32	1.68	160,628	8.79	1.80
Age	161,176	17.53	12.71	160,628	16.61	12.62
	Eventually Treated			Never Treated		
	Obs.	Mean	Std. Dev.	Obs.	Mean	Std. Dev.
ROA	9,003	0.048	0.133	312,801	0.020	0.191
Ln(Assets)	9,003	11.13	1.94	312,801	9.001	1.721
Age	9,003	16.66	11.88	312,801	17.08	12.70
CZ × Industry characteristics						
Number executives (CZ× Industry)	33,543	28.828	221.624	1.000	4.000	328.000
At least one Deceased executive (CZ× Industry)	33,543	0.020	0.141	0.000	0.000	1.000

Summary Statistics – Continued

Panel B:	Executive Sample					
	Obs.	Mean	Std. Dev.	p1	p50	p99
Sample of deceased executives						
Executive Tenure	1,077	11.903	8.018	1.000	10.000	30.000
Executive Age	1,077	52.837	5.505	37.000	54.000	60.000
Female	1,077	0.097	0.296	0.000	0.000	1.000
Wage (t-1)	1,077	136.342	93.873	55.521	113.151	519.764
Sample of non-deceased executives						
Executive Tenure	1,062,408	9.853	7.285	1.000	8.000	29.000
Executive Age	1,062,408	48.464	6.599	34.000	49.000	60.000
Female	1,062,408	0.132	0.339	0.000	0.000	1.000
Wage (t-1)	1,062,408	135.064	114.674	54.994	110.672	498.745
Education of new hires (from 2010)						
Below High-School	15,627	0.053	0.224	0.000	0.000	1.000
High-School	15,627	0.211	0.408	0.000	0.000	1.000
College	15,627	0.727	0.445	0.000	1.000	1.000

Table 2
Executive Transitions between Positions, Industries, and Areas

This table presents patterns in executives transitions across positions, industries, and areas in the executive-firm matched panel dataset. The sample period is 2005-2015. Panel A presents transitions for workers between white-collar occupations and executive occupations. Transitions are restricted to workers changing firms in the last two columns. The first entry in each cell reports the fraction of the transitions from the row position (white-collar or executive) to the column position (white-collar or executive). Panel B presents statistics for executives transitions across two different firms. The first column represents the fraction of the transitions that are within respectively the same Commuting Zone, the same 2-digit industry, and the same 2-digit industry × Commuting Zone. The second column represents the analogous fractions assuming random transitions for executives across two different sample firms. Panel C reproduces the same statistics for the French economy, and Panel D for executive turnover in a sample of U.S. listed firms using data from the Execucomp database.

Panel A: In the Hierarchy	Full sample		Conditional on turnover	
	White-collars (t)	Executives (t)	White-collars (t)	Executives (t)
White-collars (t-1)	99.7%	0.3%	98.7%	1.3%
Executives (t-1)	0.5 %	99.5%	4.8%	95.2%

Panel B: Executives transitions:	Data	Assuming random
% within same CZ	0.65	0.13
% within same 2-digit industry	0.55	0.12
% within same CZ × 2-digit industry	0.39	0.017
Panel C: France (DADS Panel)	**Data**	**Assuming random**
% within same CZ	0.71	0.15
% within same Industry (NES 17)	0.66	0.13
% within same CZ × Industry	0.50	0.03
Panel D: Top executives U.S. listed firms	**Data**	**Assuming random**
% within same State	0.32	0.055
% within same FF17 industry	0.4	0.14
% within same State × FF17 industry	0.17	0.012

Table 3
Market Thickness and New Hires Characteristics

Panel A of this table presents estimates from cross-section regressions of a dummy indicating whether a given executive joining a new firm in a given CZ × industry was employed in the previous year in a firm from the same CZ and industry on the previous year thickness of the executive labor market. All regressions include year fixed effects. In Column (2) we add industry dummies interacted with year dummies and in Column (3) CZ dummies interacted with year dummies. The sample includes all executives joining a new firm over the sample period, and employed by another firm in the previous year. The thickness is defined at the CZ × industry level and is constructed as the logarithm of one plus the total number of executives in the firm's CZ × industry. Panel B presents estimates from cross-section regressions of dummies for three education levels of executives who join a given firm in a given year on the previous year thickness of the executive labor market in which each executive takes their new jobs, and Panel C repeats the same regressions for the sample of white-collars who join a new firm. All regressions in Panels B and C include industry dummies and CZ dummies interacted with year dummies. Standard errors are clustered at the CZ × industry level. *, **, and *** denote significance at the 10%, 5%, and 1%, respectively.

	(1)	(2)	(3)
Panel A:	Hired Executive from same CZ×Industry?		
ln(1+# NbExecutives (Industry,CZ)) (t-1)	0.025***	0.024***	0.051***
	(0.005)	(0.003)	(0.006)
Year FE	Y	Y	Y
Industry-Year FE		Y	Y
CZ-Year FE			Y
Observations	46,547	46,547	46,547
R^2	0.020	0.067	0.197
Panel B:	Executive Education Level		
	Below High School	High School	College
ln(1+# NbExecutives (Industry,CZ)) (t-1)	-0.002	-0.013*	0.015**
	(0.004)	(0.007)	(0.007)
Industry-Year FE	Y	Y	Y
CZ-Year FE	Y	Y	Y
Observations	15,627	15,627	15,627
R^2	0.093	0.118	0.125
Panel C:	White-Collar Education Level		
	Below High School	High School	College
ln(1+# NbExecutives (Industry,CZ)) (t-1)	0.002	-0.008	0.005
	(0.004)	(0.006)	(0.006)
Industry-Year FE	Y	Y	Y
CZ-Year FE	Y	Y	Y
Observations	596,278	596,278	596,278
R^2	0.080	0.091	0.141

Table 4
Executives Exits and Firms' ROA

This table presents estimates from panel regressions of firms' ROA on respectively one dummy indicating whether the firm is hit by the death of (at least) one executive in the same or previous three years (Panel A), and two dummies indicating whether the firm is hit by the death of (at least) one executive in the same or previous three years in separately either a thin labor market, or a thick labor market (Panel B). A labor market is defined at the CZ × industry level and is defined as thin (respectively thick) if it lies below (respectively above) the sample median in terms of the total number of executives in each CZ × industry. All regressions include firm and year fixed effects. In Column (2) we add industry and CZ dummies interacted with year dummies, in Column (3) firm-level characteristics (dummies indicating terciles of size, age, and ROA respectively) interacted with year dummies, in Column (4) dummies indicating terciles of the number of executives interacted with year dummies. Regressions contain all firm-years of our firm sample (described in Table 1, Panel A) between 2005 and 2015. Standard errors are clustered at the firm level. *, **, and *** denote significance at the 10%, 5%, and 1%, respectively.

	(1)	(2)	(3)	(4)
Panel A:	ROA (× 100)			
Deceased executive (t,t-3)	-0.770**	-0.927**	-0.816**	-0.831**
	(0.393)	(0.395)	(0.397)	(0.397)
Year FE	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y
Industry-Year FE		Y	Y	Y
CZ-Year FE		Y	Y	Y
Size, Age, ROA (t-3) × Year FE			Y	Y
Nb of executives (t-3) × Year FE				Y
Observations	321,804	321,804	321,804	321,804
R^2	0.469	0.477	0.479	0.480

	(1)	(2)	(3)	(4)
Panel B:	ROA (× 100)			
Deceased executive (t,t-3) × thin market	-1.582***	-1.845***	-1.834***	-1.849***
	(0.562)	(0.562)	(0.586)	(0.586)
Deceased executive (t,t-3) × thick market	0.018	-0.065	0.154	0.137
	(0.537)	(0.542)	(0.527)	(0.528)
Thin market	-0.111	0.046	-0.156	-0.146
	(0.325)	(0.362)	(0.367)	(0.367)
Year FE	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y
Industry-Year FE		Y	Y	Y
CZ-Year FE		Y	Y	Y
Size, Age, ROA (t-3) × Year FE			Y	Y
Nb of executives (t-3) × Year FE				Y
Observations	321,804	321,804	321,804	321,804
R^2	0.469	0.477	0.479	0.480

Table 5
Executives Exits and Firms' ROA - Dynamics

This table presents estimates from panel regressions of firms' ROA on two set of dummies indicating whether the firm is hit by the death of (at least) one executive in the following year, the current, and each of the previous three years in either a thin labor market or a thick labor market. A labor market is defined at the CZ × industry level and is defined as thin (respectively thick) if it lies below (respectively above) the sample median in terms of the total number of executives in each CZ × industry. All regressions include firm and year fixed effects. In Column (2) we add industry and CZ dummies interacted with year dummies, in Columns (3) firm-level characteristics (dummies indicating terciles of size, age, and ROA respectively) interacted with year dummies, in column (4) dummies indicating terciles of the number of executives interacted with year dummies. Regressions contain all firm-years of our firm sample (described in Table 1, Panel A) between 2005 and 2015. Standard errors are clustered at the firm level. *, **, and *** denote significance at the 10%, 5%, and 1%, respectively.

	(1)	(2)	(3)	(4)
	ROA (× 100)			
Deceased executive (t+1) × thin market	-0.461	-0.725	-0.394	-0.400
	(0.606)	(0.627)	(0.661)	(0.659)
Deceased executive (t) × thin market	-2.537***	-2.800***	-2.866***	-2.870***
	(0.774)	(0.789)	(0.810)	(0.809)
Deceased executive (t-1) × thin market	-1.225*	-1.626**	-1.510*	-1.516*
	(0.733)	(0.737)	(0.782)	(0.781)
Deceased executive (t-2) × thin market	-1.346*	-1.783**	-1.705**	-1.721**
	(0.720)	(0.752)	(0.792)	(0.792)
Deceased executive (t-3) × thin market	-0.600	-0.826	-0.683	-0.710
	(0.610)	(0.636)	(0.682)	(0.683)
Deceased executive (t+1) × thick market	0.022	0.033	-0.349	-0.363
	(0.623)	(0.627)	(0.622)	(0.622)
Deceased executive (t) × thick market	-0.434	-0.485	-0.417	-0.416
	(0.728)	(0.736)	(0.763)	(0.764)
Deceased executive (t-1) × thick market	-0.101	-0.207	0.120	0.112
	(0.719)	(0.723)	(0.767)	(0.766)
Deceased executive (t-2) × thick market	0.165	0.133	0.355	0.333
	(0.799)	(0.809)	(0.805)	(0.805)
Deceased executive (t-3) × thick market	0.603	0.432	0.398	0.354
	(0.627)	(0.637)	(0.642)	(0.642)
Thin market	-0.110	0.050	-0.156	-0.146
	(0.325)	(0.362)	(0.367)	(0.367)
Year FE	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y
Industry-Year FE		Y	Y	Y
CZ-Year FE		Y	Y	Y
Size, Age, ROA (t-3) × Year FE			Y	Y
Nb of Executives (t-3) × Year FE				Y
Observations	321,804	321,804	321,804	321,804
R^2	0.469	0.477	0.479	0.480

Table 6
Executives Compensation at Neighboring Firms

This table presents estimates from panel regressions of executives (and white-collars in Panel B) wages on two dummies indicating whether a given CZ × industry is hit by the death of (at least) one executive in the previous year in either a thin labor market or a thick labor market. A labor market is defined at the CZ × industry level and is defined as thin (respectively thick) if it lies below (respectively above) the sample median in terms of the total number of executives in each CZ × industry. All regressions include firm, executive, and year fixed effects. In Column (3) industry and CZ dummies interacted with year dummies, in Column (4) executive-level characteristics (dummies indicating gender, and terciles of age and tenure respectively) interacted with year dummies. Regressions contain all executive-year of our executive sample (described in Table 1, Panel B) between 2005 and 2015, which includes only executives at firms never treated during the sample period. Standard errors are clustered at the Industry × CZ level. *, **, and *** denote significance at the 10%, 5%, and 1%, respectively.

	(1)	(2)	(3)	(4)
Panel A:	Executives Ln(Wage) (× 100)			
Deceased executive other firm (t-1)	0.229			
	(0.201)			
Deceased executive other firm (t-1) × thin market		0.442**	0.355*	0.357**
		(0.176)	(0.185)	(0.174)
Deceased executive other firm (t-1) × thick market		0.108	0.018	0.002
		(0.193)	(0.207)	(0.204)
Thin market		-0.359	-0.214	-0.416
		(0.314)	(0.353)	(0.352)
Year FE	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y
Executive FE	Y	Y	Y	Y
Industry-Year FE			Y	Y
CZ-Year FE			Y	Y
Age, Tenure, Gender × Year FE				Y
Observations	628,582	628,582	628,582	628,582
R^2	0.912	0.912	0.915	0.917
Panel B:	White-Collars Ln(Wage) (× 100)			
Deceased executive other firm (t-1)	0.064			
	(0.089)			
Deceased executive other firm (t-1) × thin market		0.054	-0.017	0.006
		(0.161)	(0.128)	(0.123)
Deceased executive other firm (t-1) × thick market		0.047	0.079	0.081
		(0.104)	(0.076)	(0.077)
Thin market		-0.200	0.154	0.057
		(0.268)	(0.274)	(0.245)
Year FE	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y
Executive FE	Y	Y	Y	Y
Industry-Year FE			Y	Y
CZ-Year FE			Y	Y
Age, Tenure, Gender × Year FE				Y
Observations	3,307,706	3,307,706	3,307,706	3,307,706
R^2	0.938	0.939	0.941	0.944

Table 7
Executives Exits and Education Levels of Entrants/Leavers (From 2010)

This table presents estimates from panel regressions of the education level of executives respectively joining the firm (*new hires*, Panel A) and leaving the firm (*leavers*, Panel B) in year t on two dummies indicating whether the firm is hit by the death of (at least) one executive in the previous three years in separately either a thin labor market, or a thick labor market. A labor market is defined at the CZ × industry level and is defined as thin (respectively thick) if it lies below (respectively above) the sample median in terms of the total number of executives in each CZ × industry. All regressions include firm fixed effects, as well as industry and CZ dummies interacted with year dummies. The sample period is 2005 and 2015. Standard errors are clustered at the firm level. *, **, and *** denote significance at the 10%, 5%, and 1%, respectively.

	(1)	(2)	(3)	(4)
Panel A:	New Hires			
	Below High School	High School	College	Missing Info
Deceased executive (t-1,t-3) × thin market	0.046*	0.083*	-0.134***	-0.051
	(0.024)	(0.048)	(0.051)	(0.057)
Deceased executive (t-1,t-3) × thick market	0.006	-0.021	0.037	-0.043
	(0.019)	(0.027)	(0.031)	(0.057)
Thin market	-0.034	-0.089	0.108	0.013
	(0.046)	(0.073)	(0.079)	(0.082)
Firm FE	Y	Y	Y	Y
Industry-Year FE	Y	Y	Y	Y
CZ-Year FE	Y	Y	Y	Y
Observations	15,627	15,627	15,627	24,239
R^2	0.790	0.694	0.704	0.739
Panel B:	Leavers			
	Below High School	High School	College	Missing Info
Deceased executive (t-1,t-3) × thin market	-0.029	-0.152**	0.183**	0.013
	(0.047)	(0.073)	(0.088)	(0.030)
Deceased executive (t-1,t-3) × thick market	0.033	-0.040	0.025	-0.018
	(0.030)	(0.036)	(0.044)	(0.029)
Thin market	0.195	-0.083	-0.089	-0.006
	(0.149)	(0.188)	(0.125)	(0.073)
Firm FE	Y	Y	Y	Y
Industry-Year FE	Y	Y	Y	Y
CZ-Year FE	Y	Y	Y	Y
Observations	6,087	6,087	6,087	25,213
R^2	0.836	0.809	0.807	0.554

Table 8
Executives Exits and Future Separations

This table presents estimates from panel regressions of executive turnover on two dummies indicating whether the firm is hit by the death of (at least) one executive in the previous three years in separately either a thin labor market, or a thick labor market. The dependent variable is the ratio of the number of executives who leave the firm in year t (and work for another firm in year $t+1$) over the total number of executives in the firm in year t. A labor market is defined at the CZ × industry level and is defined as thin (respectively thick) if it lies below (respectively above) the sample median in terms of the total number of executives in each CZ × industry. All regressions include firm, as well as industry and CZ dummies interacted with year dummies. Column (3) include firm-level characteristics (dummies indicating terciles of size, age, and ROA respectively) interacted with year dummies, and Column (4) dummies indicating terciles of the number of executives interacted with year dummies. Regressions contain all firm-years of our firm sample (described in Table 1, Panel A) between 2005 and 2015. Standard errors are clustered at the firm level. *, **, and *** denote significance at the 10%, 5%, and 1%, respectively.

	(1)	(2)	(3)	(4)
	Executive separation rate			
Deceased executive (t-1,t-3)	0.009**			
	(0.004)			
Deceased executive (t-1,t-3) × thin market		0.014**	0.013**	0.016**
		(0.006)	(0.007)	(0.007)
Deceased executive (t-1,t-3) × thick market		0.005	0.004	0.006
		(0.005)	(0.005)	(0.005)
Thin market		-0.006*	-0.005	-0.004
		(0.003)	(0.003)	(0.003)
Firm FE	Y	Y	Y	Y
Industry-Year FE	Y	Y	Y	Y
CZ-Year FE	Y	Y	Y	Y
Size, Age, ROA (t-3) × Year FE			Y	Y
Nb of executives (t-3) × Year FE				Y
Observations	321,804	321,804	321,804	321,804
R^2	0.175	0.175	0.181	0.209

Table 9
Planned Exit and Firms' ROA

This table presents estimates from panel regressions of firms' ROA on respectively a dummy indicating whether at least one executive retires in the same or previous three years in a thin or thick market. All regressions include firm, as well as industry and CZ dummies interacted with year dummies. Column (3) include firm-level characteristics (dummies indicating terciles of size, age, and ROA respectively) interacted with year dummies, and Column (4) dummies indicating terciles of the number of executives interacted with year dummies. Regressions contain all firm-years of our firm sample (described in Table 1, Panel A) between 2005 and 2015. Standard errors are clustered at the firm level. *, **, and *** denote significance at the 10%, 5%, and 1%, respectively.

	(1)	(2)	(3)	(4)
	ROA (× 100)			
Retired executive (t,t-3)	-0.433***			
	(0.143)			
Retired executive (t,t-3) × thin market		-0.666***	-0.521***	-0.513***
		(0.177)	(0.178)	(0.179)
Retired executive (t,t-3) × thick market		-0.204	-0.165	-0.159
		(0.218)	(0.217)	(0.218)
Thin market		0.072	-0.139	-0.129
		(0.363)	(0.368)	(0.368)
Firm FE	Y	Y	Y	Y
Industry-Year FE	Y	Y	Y	Y
CZ-Year FE	Y	Y	Y	Y
Size, Age, ROA (t-3) × Year FE			Y	Y
Nb of executives (t-3) × Year FE				Y
Observations	321,804	321,804	321,804	321,804
R^2	0.477	0.477	0.479	0.480

Online Appendix

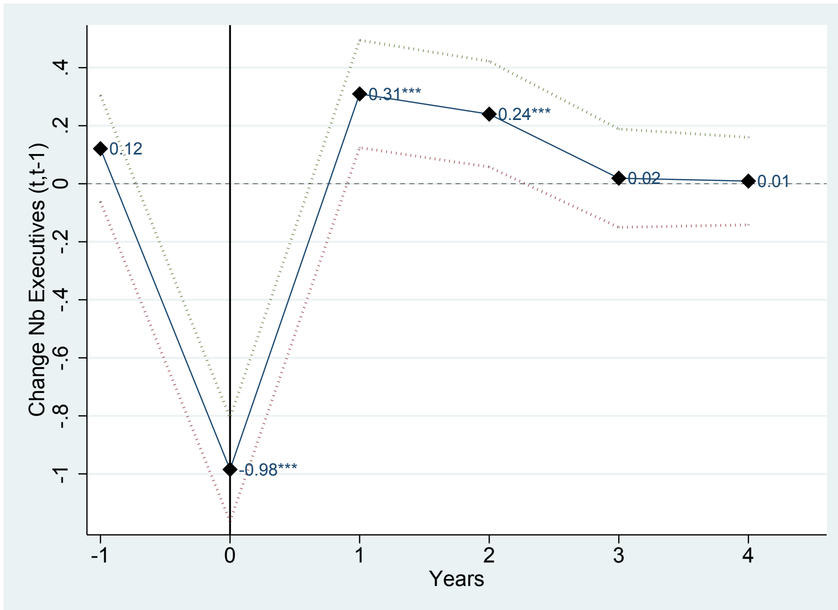
Are Executives in Short Supply? Evidence from Deaths' Events

Julien Sauvagnat and Fabiano Schivardi

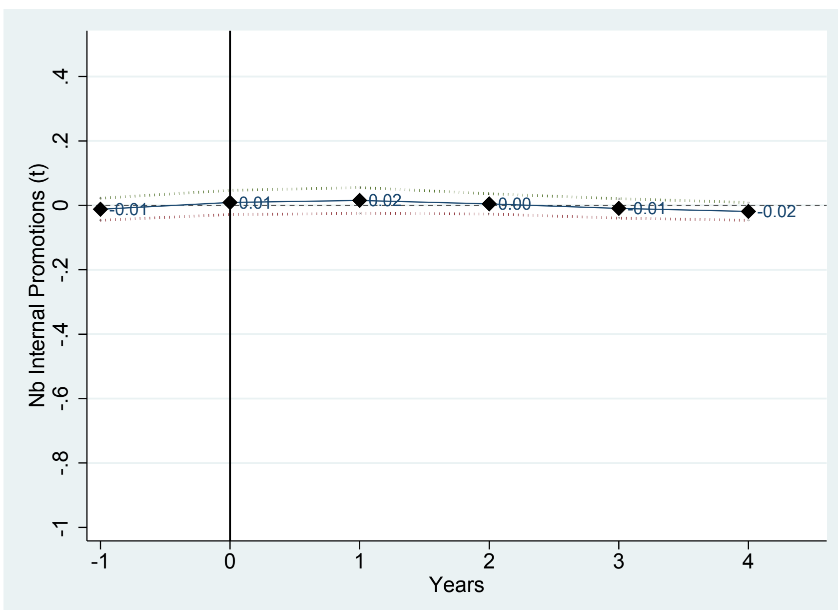
Figure A.1

Death Shocks and External Versus Internal Hiring

Panel A. Change in Number of Executives



Panel B. Number of White-collars' Internal Promotions (to Executives)



Notes: Panel A of this figure presents estimates from panel regressions of the change in the number of executives in a given firm for different years around the death event of one executive. All regressions include firm and year fixed effects. Panel B presents estimates from panel regressions of the number of firms' workers in non-executive occupations promoted to executives in a given firm for different years around the death event of one executive. The sample period is 2005–2015. Standard errors are clustered at the firm level. *, **, and *** denote significance at the 10%, 5%, and 1%, respectively, and dashed lines represent 5% level confidence interval bands.

Table A.1
Executives Exits and Firms' ROA - Continuous Measure of Market Density

This table presents estimates from panel regressions of firms' ROA on a dummy indicating whether the firm is hit by the death of (at least) one executive in the same year, and its interaction term with the logarithm of one plus the number of executives working in the same CZ×industry in the previous year. All regressions include firm and year fixed effects. In columns (2) to (4), we include industry and CZ dummies interacted with year dummies. In columns (3) and (4), we include firm-level characteristics (dummies indicating terciles of size, age, and ROA respectively) interacted with year dummies. In column (4), we also control for dummies indicating terciles of the number of executives interacted with year dummies. Regressions contain all firm-years of our firm sample (described in Table 1, Panel A) between 2005 and 2015. Standard errors are clustered at the firm level. *, **, and *** denote significance at the 10%, 5%, and 1%, respectively.

	(1)	(2)	(3)	(4)
Panel A:	ROA (× 100)			
Deceased executive (t,t-3)	-2.627***	-3.239***	-3.153***	-3.175***
	(0.892)	(0.913)	(0.945)	(0.944)
Deceased executive (t,t-3) × Market thickness	0.378**	0.465***	0.472***	0.473***
	(0.155)	(0.160)	(0.161)	(0.161)
Market thickness	-0.107	-0.143	0.015	0.002
	(0.155)	(0.165)	(0.163)	(0.164)
Year FE	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y
Industry-Year FE		Y	Y	Y
CZ-Year FE		Y	Y	Y
Size, Age, ROA (t-3) × Year FE			Y	Y
Nb of executives (t-3) × Year FE				Y
Observations	321,804	321,804	321,804	321,804
R^2	0.469	0.477	0.479	0.480

Table A.2
Executives Exits and Firms' Labor Productivity

This table presents estimates from panel regressions of firms' labor productivity (defined as value added over the total number of employees, in 2015 constant thousand euros) on two dummies indicating whether the firm is hit by the death of (at least) one executive in the same year in separately either a thin labor market, or a thick labor market, in Panel A, and interacted with the continuous measure of labor market thickness in Panel B (the logarithm of one plus the number of executives working in the same CZ ×industry). A labor market is defined at the CZ × industry level and is defined as thin (respectively thick) if it lies below (respectively above) the sample median in terms of the total number of executives in each CZ × industry. All regressions include firm and year fixed effects. In Columns (2) we add industry and CZ dummies interacted with year dummies, in Column (3) firm-level characteristics (dummies indicating terciles of size, age, and ROA respectively) interacted with year dummies, in Column (4) dummies indicating terciles of the number of executives interacted with year dummies. Regressions contain all firm-years of our firm sample (described in Table 1, Panel A) between 2005 and 2015. Standard errors are clustered at the firm level. *, **, and *** denote significance at the 10%, 5%, and 1%, respectively.

	(1)	(2)	(3)	(4)
Panel A:	Labor Productivity			
Deceased executive (t,t-3) × thin market	-6.628***	-7.471***	-7.181***	-7.464***
	(2.106)	(2.145)	(2.150)	(2.149)
Deceased executive (t,t-3) × thick market	2.679	2.597	3.034	2.765
	(1.993)	(2.040)	(2.019)	(2.021)
Thin market	-0.878	1.146	1.075	1.135
	(1.097)	(1.268)	(1.320)	(1.321)
Year FE	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y
Industry-Year FE		Y	Y	Y
CZ-Year FE		Y	Y	Y
Size, Age, ROA (t-3) × Year FE			Y	Y
Nb of executives (t-3) × Year FE				Y
Observations	306,498	306,498	306,498	306,498
R^2	0.700	0.707	0.716	0.717

Panel B:	Labor Productivity			
Deceased executive (t,t-3)	-11.628***	-14.001***	-13.776***	-14.212***
	(3.229)	(3.322)	(3.316)	(3.309)
Deceased executive (t,t-3) × Market thickness	1.980***	2.351***	2.380***	2.411***
	(0.565)	(0.581)	(0.572)	(0.570)
Market thickness	0.313	-0.125	-0.135	-0.830
	(0.600)	(0.655)	(0.680)	(0.681)
Year FE	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y
Industry-Year FE		Y	Y	Y
CZ-Year FE		Y	Y	Y
Size, Age, ROA (t-3) × Year FE			Y	Y
Nb of executives (t-3) × Year FE				Y
Observations	306,498	306,498	306,498	306,498
R^2	0.700	0.707	0.716	0.717

Table A.3
Executives Exits and Firms' ROA - Excluding Deceased Executives With Prior Sick Leave

This table presents estimates from panel regressions of firms' ROA on respectively two dummies indicating whether the firm is hit by the death of (at least) one executive in the same or previous three years in separately either a thin labor market, or a thick labor market. These specifications exclude all firms with events for deceased executives with paid-sick leave in any prior year. A labor market is defined at the CZ × industry level and is defined as thin (respectively thick) if it lies below (respectively above) the sample median in terms of the total number of executives in each CZ × industry. All regressions include firm and year fixed effects. In Column (2) we add industry and CZ dummies interacted with year dummies, in Column (3) firm-level characteristics (dummies indicating terciles of size, age, and ROA respectively) interacted with year dummies, in Column (4) dummies indicating terciles of the number of executives interacted with year dummies. Regressions contain all firm-years of our firm sample (described in Table 1, Panel A) between 2005 and 2015. Standard errors are clustered at the firm level. *, **, and *** denote significance at the 10%, 5%, and 1%, respectively.

	(1)	(2)	(3)	(4)
	ROA (× 100)			
Deceased executive (t,t-3) × thin market	-1.578***	-1.835***	-1.861***	-1.876***
	(0.580)	(0.579)	(0.605)	(0.605)
Deceased executive (t,t-3) × thick market	0.047	-0.040	0.138	0.125
	(0.553)	(0.559)	(0.538)	(0.539)
Thin market	-0.105	0.050	-0.152	-0.141
	(0.326)	(0.363)	(0.368)	(0.368)
Year FE	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y
Industry-Year FE		Y	Y	Y
CZ-Year FE		Y	Y	Y
Size, Age, ROA (t-3) × Year FE			Y	Y
Nb of executives (t-3) × Year FE				Y
Observations	321,327	321,327	321,327	321,327
R^2	0.469	0.477	0.480	0.480

Table A.4
Executives Compensation at Neighboring Firms - Tradable Industries Only

This table presents estimates from variants of the panel regressions presented in Panel A of Table in which the sample is restricted to executives in tradable industries only. A labor market is defined at the CZ × industry level and is defined as thin (respectively thick) if it lies below (respectively above) the sample median in terms of the total number of executives in each CZ × industry. All regressions include firm, executive and year fixed effects. In Column (3), we add industry and CZ dummies interacted with year dummies, in Column (4) executive-level characteristics (dummies indicating gender, and terciles of age and tenure respectively) interacted with year dummies. Regressions contain all executive-year of our executive sample (described in Table 1, Panel B) between 2005 and 2015, which includes only executives at firms never treated during the sample period. Standard errors are clustered at the Industry × CZ level. *, **, and *** denote significance at the 10%, 5%, and 1%, respectively.

	(1)	(2)	(3)	(4)
	Executives Ln(Wage) (× 100)			
Deceased executive other firm (t-1)	0.489**			
	(0.200)			
Deceased executive other firm (t-1) × thin market		0.714***	0.620***	0.548**
		(0.216)	(0.236)	(0.230)
Deceased executive other firm (t-1) × thick market		0.333	-0.007	0.002
		(0.265)	(0.239)	(0.231)
Thin market		-0.359	-0.214	-0.416
		(0.314)	(0.353)	(0.352)
Year FE	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y
Executive FE	Y	Y	Y	Y
Industry-Year FE			Y	Y
CZ-Year FE			Y	Y
Age, Tenure, Gender × Year FE				Y
Observations	332,130	332,130	332,130	332,130
R^2	0.914	0.914	0.918	0.921

Table A.5
Executives Exits and Market ROA

This table presents estimates from panel regressions aggregated at the market level of firms' value-weighted ROA on respectively a dummy indicating whether a given Industry×CZ market is hit by death of (at least) one executive in the same or previous three years in separately either a thin labor market, or a thick labor market, in Panel A, and interacted with the continuous measure of labor market thickness in Panel B (the logarithm of one plus the number of executives working in the same CZ ×industry). ROA at the market level is defined as the ratio of market-level EBIT (the sum of the EBIT of each firm in a given market) over market-level assets for each CZ×industry and year. All regressions include market fixed effects, as well as industry and CZ dummies interacted with year dummies. Column (3) also include dummies indicating terciles of the average size, the average age, and the average ROA of firms in the same market, interacted with year dummies, and Column (4) include dummies indicating terciles of the number of executives in a given market interacted with year dummies. Regressions contain all (Industry×CZ) market-years in which there are at least three firms between 2005 and 2015. Standard errors are clustered at the firm level. *, **, and *** denote significance at the 10%, 5%, and 1%, respectively.

	(1)	(2)	(3)	(4)
Panel A:	Market ROA (× 100)			
Deceased executive in Industry×CZ (t,t-3)	-0.291			
	(0.194)			
Deceased executive in Industry×CZ (t,t-3) × thin market		-0.507**	-0.535**	-0.516**
		(0.228)	(0.225)	(0.225)
Deceased executive in Industry×CZ (t,t-3) × thick market		0.330	0.389	0.386
		(0.315)	(0.318)	(0.318)
Thin market		0.036	-0.005	0.001
		(0.456)	(0.462)	(0.461)
(Industry× CZ) Market FE	Y	Y	Y	Y
Industry-Year FE	Y	Y	Y	Y
CZ-Year FE	Y	Y	Y	Y
Market Average Size, Age, ROA (t-3) × Year FE			Y	Y
Market Nb of executives (t-3) × Year FE				Y
Observations	15,416	15,416	15,416	15,416
R^2	0.660	0.660	0.666	0.667

Panel B::	Market ROA (× 100)			
Deceased executive in Industry×CZ (t,t-3)	-0.291	-1.313*	-1.385**	-1.341**
	(0.194)	(0.690)	(0.683)	(0.682)
Deceased executive in Industry×CZ (t,t-3) × Market thickness		0.272*	0.291*	0.282*
		(0.164)	(0.163)	(0.163)
Market thickness		-0.614***	-0.561***	-0.528***
		(0.171)	(0.168)	(0.165)
(Industry× CZ) Market FE	Y	Y	Y	Y
Industry-Year FE	Y	Y	Y	Y
CZ-Year FE	Y	Y	Y	Y
Market Average Size, Age, ROA (t-3) × Year FE			Y	Y
Market Nb of executives (t-3) × Year FE				Y
Observations	15,416	15,416	15,416	15,416
R^2	0.660	0.660	0.666	0.667

Table A.6
Executives Exits and Market Labor Productivity

This table presents estimates from panel regressions aggregated at the market level of firms' value-weighted labor productivity on respectively a dummy indicating whether a given Industry×CZ market is hit by death of (at least) one executive in the same or previous three years in separately either a thin labor market, or a thick labor market, in Panel A, and interacted with the continuous measure of labor market thickness in Panel B (the logarithm of one plus the number of executives working in the same CZ ×industry). Labor productivity at the market level is defined as the ratio of market-level value-added (the sum of the value-added of each firm in a given market) over the total number of employees in the same market for each CZ×industry and year. All regressions include market fixed effects, as well as industry and CZ dummies interacted with year dummies. Column (3) also include dummies indicating terciles of the average size, the average age, and the average ROA of firms in the same market, interacted with year dummies, and Column (4) include dummies indicating terciles of the number of executives in a given market interacted with year dummies. Regressions contain all (Industry×CZ) market-years in which there are at least three firms between 2005 and 2015. Standard errors are clustered at the firm level. *, **, and *** denote significance at the 10%, 5%, and 1%, respectively.

	(1)	(2)	(3)	(4)
Panel A:	Market Labor Productivity			
Deceased executive in Industry×CZ (t,t-3)	-2.893**			
	(1.337)			
Deceased executive in Industry×CZ (t,t-3) × thin market		-4.245***	-4.131**	-4.141**
		(1.630)	(1.602)	(1.602)
Deceased executive in Industry×CZ (t,t-3) × thick market		1.031	1.197	1.241
		(1.630)	(1.631)	(1.633)
Thin market		1.021	0.878	0.855
		(2.374)	(2.360)	(2.332)
(Industry× CZ) Market FE	Y	Y	Y	Y
Industry-Year FE	Y	Y	Y	Y
CZ-Year FE	Y	Y	Y	Y
Market Average Size, Age, ROA (t-3) × Year FE			Y	Y
Market Nb of executives (t-3) × Year FE				Y
Observations	15,416	15,416	15,416	15,416
R^2	0.856	0.857	0.858	0.859
Panel B::	Market Labor Productivity			
Deceased executive in Industry×CZ (t,t-3)	-2.893**	-13.252***	-13.077***	-13.313***
	(1.337)	(4.170)	(4.097)	(4.121)
Deceased executive in Industry×CZ (t,t-3) × Market thickness		2.739***	2.727***	2.788***
		(0.915)	(0.904)	(0.910)
Market thickness		-1.025	-1.210	-1.547
		(1.029)	(1.030)	(1.023)
(Industry× CZ) Market FE	Y	Y	Y	Y
Industry-Year FE	Y	Y	Y	Y
CZ-Year FE	Y	Y	Y	Y
Market Average Size, Age, ROA (t-3) × Year FE			Y	Y
Market Nb of executives (t-3) × Year FE				Y
Observations	15,416	15,416	15,416	15,416
R^2	0.856	0.857	0.858	0.859