Going Public and the Internal Organization of the Firm

Daniel Bias[1], Benjamin Lochner[2], Stefan Obernberger[3], and Merih Sevilir[4]

[1]Swedish House of Finance at the Stockholm School of Economics

[2]FAU Erlangen-Nuremberg, Institute for Employment Research (IAB)

[3]Erasmus School of Economics at Erasmus University Rotterdam

[4]Kelley School of Business at Indiana University

May 30, 2022

Abstract

We examine how firms adapt their organization when they go public. To conform with the requirements of public capital markets, we expect IPO firms to become more organized, making the firm more accountable and its human capital more easily replaceable. We find that IPO firms transform into a more hierarchical organization with smaller departments. Hiring is strongest in jobs requiring knowledge in finance, accounting, and management. New hires are better educated, but less experienced than incumbents, which reflects the staffing needs of a more hierarchical organization. Employee turnover is sizeable and directly related to changes in hierarchical layers. Wage inequality increases in IPO firms as they become more hierarchical. Overall, going public is associated with a comprehensive transformation of the firm's organization which becomes geared towards operating efficiently and in accordance with capital market standards.

We thank Fernando Anjos, Shai Bernstein, Florian Hoffmann, Nadya Malenko, Ernst Maug, Sebastian Pfeil, Francisco Urzúa I. and seminar participants at Bilkent University, EIEF Rome, Erasmus University, ESMT Berlin, George Mason University, Halle Institute for Economic Research, Indiana University, Stockholm School of Economics and University of Kansas for advice on the project. We thank Christoph Kaserer for sharing his dataset on German IPOs.

1. Introduction

In his presidential address to the American Finance Association, Rajan (2012) highlighted the interdependence between the firm's financing needs and its inner functioning: to obtain outside finance, the entrepreneur had to subject the firm to a transformation from *differentiation* to *standardization*, making the firm's operations more accountable and its human capital more easily replaceable. A decade later, we still know very little about this transformation and how it changes the inner functioning of the firm.

In this paper, we open up the black box by investigating how firms adapt their organization when they go public. We argue that firms going public *standardize* their organization in three major ways in order to conform their operations with the requirements of public capital markets. First, the firm's organization will become more hierarchical, making its human capital more easily replaceable. Second, to operate a public firm and to comply with regulation, finance and accounting will play a much more central role within the firm's organization, reflected by an influx of employees with expertise in these areas.[1] Third, the stronger emphasis on compliance and accountability will be enforced by a growing number of (middle) managers and employees with expertise in information and communication technology (ICT).

To test our predictions, we analyze IPOs listed in Germany between 1984 and 2015. We rely on social security records provided by the German Institute for Employment Research to map out the IPO firm's organization in terms of its hierarchical structure, organizational functions (Accounting, Finance, ICT, HR, Sales, Marketing), and managerial oversight (top level managers versus middle managers). As our main measures of a firm's hierarchical structure, we use the number of hierarchical layers in the firm and the dispersion of employees over the firm's hierarchical layers. We perform difference-in-differences analyses from two years before to two years after the IPO using a matched control sample of private firms, which are comparable in terms of size, pre-matching period growth, industry affiliation, and a range of employment

[1]Going public, firms need to ensure compliance with a number of additional laws and regulations. For example, public firms need to produce and disclose substantially more information on a regular basis, disclose new, material information as soon as possible, and implement a risk management system that identifies and reports risk exposures. See Section 3 for a detailed discussion.

characteristics. Our main result is that IPO firms become much more organized, reflected in a more hierarchical structure, more prominent organizational functions, and more (managerial) oversight.

Our analysis is guided by theoretical work on the hierarchical organization of labor to solve problems related to production. (Garicano, 2000, Garicano and Rossi-Hansberg, 2006). In knowledge-based hierarchies, firms are organized in hierarchical layers and employees in higher layers solve more complex problems. The central trade-off in forming these hierarchies is between communication costs and knowledge acquisition costs which arise, for example, for training an employee to solve a certain set of problems.

A flat organization faces low communication costs, but the organization's acquisition of knowledge is not organized efficiently as every employee has to solve all types of problems in all degrees of difficulty. This setup makes the organization flexible and innovative. On the other hand, a hierarchical organization incurs higher communication costs, but it can economize on knowledge acquisition by assigning the most difficult problems to the most skilled employees, making the firm more efficient, but less flexible. In such a hierarchical organization, employees can be replaced by a subordinate employee ("replacement through promotion") or by a new hire with expertise in solving a similar set of problems ("replacement through standardization"). Hence, we hypothesize that IPO firms transform into a more hierarchical organization because it makes the firm's human capital more easily replaceable.

Becoming more hierarchical has two important implications for the characteristics of the firm's labor force. First, a more hierarchical organization needs to rely less on the firm-specific experience of their employees and more on the educational background of their employees. Experience will become less relevant because employees face more standardized tasks and receive more guidance from supervisors. Meanwhile, a more hierarchical organization will require a larger number of highly qualified employees at the top layers of the hierarchy. Hence, we expect IPO firms to put a stronger emphasis on education, a component of human capital which is more standardized than experience and can thus be replaced more easily. Second, relative to autarky, a hierarchical organization will lead to larger cross-sectional differences in knowledge

and wages, leading to higher inequality in the firm (cf. Garicano and Rossi-Hansberg, 2006).

We find that going public subjects the firm's organization to fundamental changes, resulting in a much more organized firm two years after the IPO. Most prevalent among these changes, IPO firms adapt their hierarchical structure by adding hierarchical layers and reducing control spans. Firms that have less than the maximum amount of observable layers before the IPO add one full layer on average. Only about half of the increase in layers relative to control group can be explained by growth in employment, establishments, operated industries, or regions. Hence, IPO firms become much more hierarchical than what firm growth would normally predict. Meanwhile, the layers in the hierarchy also change their relative size: the middle layers increase more than proportionally, making the organisation's hierarchical structure more pyramidal and less lean. As a consequence control spans, which denote the ratio of employees in a given layer to the employees in the layer below, decrease. The manager-to-employee ratio in the middle layers halves. Hence, middle managers oversee much smaller departments after the IPO.

Consistent with earlier research, we find that going public is associated with employment growth over a five year period, starting 24 months before the IPO. Employment growth varies hugely across hierarchical layers, organizational functions, and management. We document the highest growth of employment in the firm's "enabling" functions (Accounting, Finance, ICT, and HR) and in middle management. The share of the jobs that require expertise in finance or accounting in the labor force increases by roughly 50% relative to control group. The share of middle managers, employed for monitoring and supervision of employees and processes, doubles. The abnormal growth in these groups relative to their control groups cannot be explained by growth in total employment, establishments, operated industries, or regions. Hence, IPO firms do not simply scale up their labor force: IPO-related hiring reflects the firm's transformation towards a more organized firm, adapted to capital market standards.

The changes in net employment and organizational structure do not reveal the full extent of internal reorganization. Employee turnover amounts to 60% of net employment growth, i.e., the IPO firm has to hire 1.6 employees in order to fill one additional position. New hires increase the IPO firm's knowledge on two dimensions specific to going public. First, the firm's labor

force gains knowledge in accounting and finance. Second, the IPO firm recruits more employees from other public firms, suggesting that a public firm background is valuable to firms going public. In general, new hires are much better educated than the hires of the control firm and they increase the level of education in the IPO firm, in both absolute terms and relative to control group. Meanwhile, hires are younger and they have worked fewer years in the same job and industry than the incumbents. Because of the large number of new hires, the IPO firm's labor force becomes therefore less experienced and younger, relative to control firms. These findings align well with the transformation suggested in Rajan (2012) because experience, which is more difficult to replace than education, becomes a less relevant dimension in public firms. Hence, IPO firms leverage knowledge and experience through their hierarchical organization, allowing them to mostly hire young employees, who receive lower wages than incumbents and are relatively easy to replace.

Wages grow stronger in IPO firms than in their matched control firms. The growth in wages is almost entirely driven by new hires, who earn much higher wages on average than the new hires of the control firms. Meanwhile, the IPO firm's new hires are less well paid than incumbent employees who are older and more experienced. Taken together, these results reflect our earlier observations that staffing takes place more than proportionally in the firm's middle layers and in its enabling functions such as Finance, Accounting, ICT, and HR. The employees staffed into these roles need to bring along a high level of education (a university degree in many cases), but the hierarchical organization allows the firm to hire relatively young and inexperienced employees, making these employees cheaper than incumbents. Hence, IPO firms have to pay higher wages on average than control firms, but they pay lower wages than they would have paid if they had opted to remain less hierarchical (for a more detailed explanation of this argument, see Section 2, and Garicano, 2000). We conclude that going public requires the firm to heavily invest into human capital that is specific to public firms, making the associated headcount and their high wages a significant cost of going public. Meanwhile, hierarchization is a means to economize on the knowledge acquisition costs of this organization, allowing the firm to more efficiently leverage the knowledge of their employees.

As predicted by the theory, inequality in terms of knowledge and wages increases as IPO firms become more hierarchical. Layering is particularly relevant for managerial compensation: middle managers display the lowest growth in wages and, over a five year period, their wages grow less than half of the wages of the middle managers in the control group. Meanwhile, managers making it to the top layer of the IPO firm see the largest increase in their wages, which amounts to 2.5 times the wage increase in the control group. Note that we cannot observe equity-based compensation, suggesting that we underestimate the extent of increases in wage inequality in management.

Turnover is particularly high in the top layer of the IPO firm. More than 60% of top managers employed in the firm two years before the IPO have left the firm two years after the IPO. To fill one additional top management position, the firm hires three new top managers on average. Half of the abnormal managerial turnover in IPO firms is driven by changes in the organizational structure of the firm: managerial turnover at the top layer increases by 58 percentage points if firms add one hierarchical layer. We find that the leaving top managers tend to continue to work for smaller firms, in other industries, and in non-managerial occupations. In general, these observations are consistent with the notion that entrepreneurial-minded managers leave the firm because they prefer to work in more innovative and less bureaucratic organizations or because they lack the managerial capabilities required under the new organizational structure of the public firm.

Overall, we find that going public is associated with hiring into jobs that require knowledge of operating a public firm, substantial employee turnover, and the building up of hierarchies, organizational functions, and management structures. The outcome of these changes is a much more organized firm, which is arguably more accountable and transparent. The organization and characteristics of the labor force change in a way that make it easier to replace individual employees. Hence, we observe organizational changes consistent with a transformation towards standardization as argued by Rajan (2012).

We make several contributions to existing literature. First, our paper is the first to provide empirical evidence that the firm's financing needs and the firm's inner functioning are related.

Hence, we answer the call of Rajan (2012) to study this link by examining how firms adapt their organization when they go public, providing firms with access to public capital markets, the most significant source of external financing.

Second, we contribute to the literature on why going public is associated with changes of the firm's comparative advantage. Extant literature has associated going public with a shift from innovation to commercialization, but studies differ in their causal interpretation of that result. Pástor, Taylor, and Veronesi (2009) argue that IPOs simply coincide with a strategy to commercialize the firm's products on a larger scale. However, Bernstein (2015) reports a strategic shift from internal innovation to exploiting innovation through acquisitions. Larrain, Phillips, Sertsios, and Urzúa I (2021) associate this shift towards commercialization with increases in firm profitability. Our paper unifies these existing views. We find that firms going public become more hierarchical and it is well established that more hierarchical firms are associated with lower innovation (Thompson, 1965), entrepreneurship (Tåg, Åstebro, and Thompson, 2016) and higher efficiency (Caliendo, Monte, and Rossi-Hansberg, 2015). Hence, the IPO firm's changes of its internal organization may explain the shift in the firm's innovation and investment policies and increased profitability reported in existing studies.

Our findings are also related to existing work on why IPO firms become active acquirers. Celikyurt, Sevilir, and Shivdasani (2010) document that firms perform a high number of acquisitions shortly after going public because they gain access to public capital markets. We find that IPO firms build up financial expertise and management capabilities, making IPO firms well suited for acquisitions of private firms lacking the capabilities to commercialize innovation on a large scale. This finding is consistent with recent studies suggesting that internal M&A teams create value in takeovers (Aktas, Boone, Witkowski, Xu, and Yurtoglu, 2020; Gokkaya, Liu, and Stulz, 2021), indicating that internal financial expertise is valuable when making acquisitions.

We also contribute to the literature on the monetary costs of going public (Zingales, 1995; Pagano, Panetta, and Zingales, 1998; Kim and Weisbach, 2008; Brav, 2009; Celikyurt et al., 2010; Saunders and Steffen, 2011; Bernstein, 2015; Ewens, Xiao, and Xu, 2020). IPO firms need to invest heavily in enabling functions (F&A, ICT&HR) and management capacity. The

increased headcount required to run and operate a public firm will increase the firm's wagebill. This finding is consistent with the observation that a large proportion of small startups prefers to get acquired by public firms in order to obtain access to public capital markets, because the wagebill related to going public would be a significant burden for small startups.

Finally, we contribute to the literature on the consequences of going public on labor. Bernstein (2015) documents the departure of existing inventors around the IPO as well as the arrival of new inventors through acquisitions shortly after the IPO. Babina, Ouimet, and Zarutskie (2020) document post-IPO departures of highly-skilled employees to startups, and study the wage profile of existing and newly hired employees of the firm. Borisov, Ellul, and Sevilir (2021) show that going public leads to significant employment growth, especially in innovative and human capital intensive industries. We contribute to these studies by presenting a theoretical framework that links these human capital outcomes to how the firm adapts its organization in the process of going public.

2. Theoretical framework

In this section, we provide the theoretical underpinnings linking going public to changes in the firm's internal organization. Our main hypothesis is motivated by Rajan (2012) who argues that firms going public have to ensure that their human capital can be replaced (easily). Rajan points to a major concern associated with the transfer of ownership: if the firm's intangible assets are embedded in the human capital of a small number of employees, these intangible assets will likely be lost when these employees leave the firm. Outside finance will, therefore, be difficult to obtain if the firm's assets are embedded in human capital which cannot be replaced.

We hypothesize that IPO firms become more hierarchical in order to make the firm's human capital easier to replace. We argue that hierarchies accomplish the replaceability of human capital through two distinct mechanisms. First, a hierarchical structure facilitates the transfer of firm-specific human capital, i.e., knowledge about solving firm-specific problems, from higher layer employees to lower layer employees, ensuring a lower concentration of firm-specific human

capital in individual employees. Hence, hierarchical layers ensure that nobody in the organization exclusively possesses knowledge critical to the firm's success, allowing the organization to replace departing employees through promoting lower-layer employees. Second, a hierarchical organization makes it easier (and more necessary) to create standardized tasks and roles, which facilitates the integration of individuals recruited from the external labor market. Hence, in a hierarchical organization, even the entrepreneur's role will look more like the role of a typical CEO, making it possible for an outsider to replace her.

We rely on Garicano (2000) for a formal presentation of this argument and our main hypothesis. The author studies the organization of knowledge in a model where communication across different hierarchical layers facilitates the cooperation of employees with heterogeneous skills. In this model, it is optimal to organize the acquisition of knowledge required to solve the problems encountered by the organization in a "knowledge-based hierarchy." In a knowledge-based hierarchy, routine tasks are performed by production workers who possess knowledge of how to solve the most common problems. Production workers who encounter problems they cannot solve refer them to the next layer of the organization, formed by specialist problem solvers. Problems are then passed on until someone can solve them. The knowledge-based organization faces a trade-off between communication and knowledge acquisition costs. By adding layers of problem solvers, the organization reduces the cost of knowledge acquisition, at the cost of increasing the communication required. In the context of our paper, we interpret knowledge acquisition costs as the costs for training an employee or a new hire to replace a departing employee. Hence, the important insight of Garicano (2000) for our study is that the firm can economize on knowledge acquisition by adding hierarchical layers, making it easier to replace human capital.[2]

A major benefit of taking the perspective of knowledge-based hierarchies is that it helps us to understand the implications of going public for the firm's labor force. First, a more hierar-

[2]Note that going public is likely to increase the acquisition costs of knowledge because knowledge about operating a public firm is hardly available in private firms. The firm will thus have to decide whether to provide training to a large number of employees in a flat organization, or a smaller number of employees in the higher layers of a more hierarchical organization. The theory predicts that the firm will optimize this trade-off by adding hierarchical layers and reducing control spans.

chical organization needs to rely less on the firm-specific experience of its employees because experience is substituted by supervision. That is, employees in a more hierarchical organization solve a more narrow set of problems and kick up exceptional problems to their supervisors more frequently. Hence, experience obtained through solving rare problems is less valuable. Meanwhile, education will become a more important dimension of employees' human capital because a larger share of employees will be employed to solve complex problems requiring a high level of qualification. Second, an organization with standardized tasks and functions can substitute experience for education because education represents training on a standardized set of tasks and functions, whereas experience helps to solve non-standard tasks and functions. Third, a more hierarchical organization is also associated with higher inequality within the firm. Garicano and Rossi-Hansberg (2006) demonstrate that relative to autarky, a hierarchical organization leads to larger cross-sectional differences in knowledge and wages because additional layers increase the utilization rate of knowledge in the top layers.

3. Regulation of publicly traded firms in Germany

Over the past 30 years, security market regulation in Germany has been moving closer to U.S. regulation, which has always served as a role model. While the specific rules have changed over the years and there are still differences between German and U.S. regulation, both markets have always shared similar principles requiring regular disclosures, ad-hoc disclosures, and professional risk and information management systems.[3] Below, we discuss the rules and regulations applying to German IPOs. Our main conclusion from this discussion is that firms going public face qualitatively similar challenges as firms in the U.S.. However, U.S. firms seem to have always been subject to stricter regulation, suggesting that the implications of going public documented in this study are likely to be less severe than the implications of going public are for U.S. firms.[4]

[3]For a detailed discussion of the evolution of German disclosure regulation of public firms and the differences between German regulation and US regulation on the matter, see von Kirchbach (2007).

[4]Leuz and Wysocki (2016) provide an overview on the literature that aims to assess the economic consequences of public firm regulation. In a recent study, Ewens et al. (2020) find "that various disclosure and

3.1. Disclosure regulation

In Germany, firms can opt to list their stocks in the regulated market or the open market ("Freiverkehr"). Since May 1987, the regulated market is split into two segments, official market ("amtlicher Markt") and regular market ("geregelter Markt"). Firms trading in the regulated market are required by law (§3 Abs. 2 AktG10) to publish consolidated financial statements with appendix (§264 Abs. 1 HGB) and an annual report at the end of the fiscal year (§290 Abs. 1 HGB). Firms trading in the official market also have to publish an intermediate report after six months (§44b Abs. 1 BörsG). Until 2016, German security law (§15 WpHG) required firms to disclose and disseminate inside information potentially impacting the firm's stock price as soon as possible (ad-hoc). Since 2016, a EU-wide directive on market abuse (MAR) replaced German law, but kept the general principles in place (Article 7a MAR).

The Frankfurt Stock Exchange imposes additional disclosure requirements on firms listing in their prime market. In 2007, the Frankfurt Stock Exchange reorganized its market structure into three distinct segments: Prime Standard, General Standard, and Open Market. Firms listed in Prime Standard are required to publish quarterly reports according to IAS or US-GAAP, disclose a corporate calendar, hold at least one analyst conference per year, and release ad-hoc statements in German and English (see "Börsenordnung der Frankfurter Wertpapierbörse" §§47-57). Before 2007, additional disclosure requirements were tied to being a member of one of the stock exchange's indices DAX (large caps), MDAX (mid caps), SDAX (small caps), TecDAX (high technology firms, many of which were previously listed in the "Neuer Markt", which preceded TecDAX). Firms listed in one of the indices had to publish quarterly reports and all of these firms were transferred to Prime Standard in 2007.[5] Other German stock exchanges use similar rules to differentiate market segments, but considering the very small number of listings at these exchanges we refrain from discussing these here in detail.

internal governance rules lead to a total compliance cost of 4.3% of the market capitalization for a median U.S. public firm".

[5]The differences in disclosure requirements appear to be rather small. For example, firms listed at the Neuer Markt were required to publish their annual report within three months after the end of the fiscal year, whereas firms listed in other indices were offered a period of four months. For a more detailed discussion of these differences, see Feinendegen and Nowak (2001).

3.2. Risk management

According to German law, a firm's executive board is required to take measures ensuring that risks are identified and minimized in a risk monitoring system (§91 Abs. 2 AktG). Non-compliance has significant implications for the executives because they will be liable to the firm for any damages as a result of the non-compliance (§93 Abs. 2 Satz 1 AktG). The risk monitoring system has to be audited in the statutory audit (§317 Abs. 4 HGB).

3.3. Corporate governance codex

In 2002, the German Corporate Governance codex was introduced as the outcome of an initiative to improve corporate governance and transparency of German companies and to make them more attractive for international investors. The codex is not legally binding but publicly listed firms have to disclose in their annual reports to what extent they comply with the codex (§161 AktG). The codex formulates additional requirements regarding the provision of information to the advisory board (part D), the timely disclosure of regular reports to the public (part G), and compensation (part F).

4. Data and methodology

4.1. Construction of IPO firm-level dataset

The construction of our IPO firm-level dataset proceeds in the following steps. First, we combine information on German IPOs from Thomson Reuter's Securities Data Corporation (SDC), the Deutsche Börse AG, the Bloomberg database, and a list of German IPOs provided by Christoph Kaserer from the Technical University Munich. This procedure results in a comprehensive list of 883 German IPOs between 1984 and 2015. Second, for all these IPOs, we identify the BvD firm identifiers from Orbis. Third, we utilize the Orbis-ADIAB linking table to identify IPO firms in the employment data provided by the the Institute for Employment Research (Institut für Arbeitsmarkt- und Berufsforschung, IAB). This linking table maps the

IAB internal (system-free) establishment identifiers to Bureau van Dijk (BvD) firm identifiers.[6] Finally, we combine the IPO data with the employment data. For the latter, we rely on the IAB establishment history panel (Betriebs-Historik-Panel, BHP), which covers the universe of establishments in Germany. In total, we obtain establishment-year data for 583 IPO firms.

From the establishment-year data, we construct a firm-year dataset using the BvD identifiers. In the final step, we restrict our sample to IPO firms with employment data from five years before the IPO to two years thereafter because our research focus lies on firms' labor reorganization around an IPO. In the end, we are left with data for 327 IPOs, which we can then use for our matching approach.

4.2. Matching algorithm and statistics

We follow a matching approach to construct a control group of private firms with similar characteristics three-years before the IPO firms go public.[7] We proceed in four steps: First, to rule out substantial differences in the number of total employees, we restrict our set of potential control firms to those deviating not more than 50% in size from the IPO firms. Second, we match on the IPO year, the two-digit national industry code (WZ2008), and a categorical variable of firms' number of establishments, differentiating between single, two, three to five, five to ten, and more than ten-establishment firms. Third, we construct the normalized Euclidean distance over the total number of employees, the one-year growth of total employees, the firm age, the mean imputed wage, the mean employee age, and the shares of medium-qualified employees and high-qualified employees. Fourth, we choose for each IPO firm the matched control firm with the lowest Euclidean distance.

[6]Comprehensive documentation of the linking process is provided by Antoni, Koller, Laible, and Zimmermann (2018). The most important variables for the record linkage are the establishment and the company name, the legal form, the industry code, and the postal code. The record linkage is carried out separately for the years 2014 and 2016. We make the assumption that these links of establishments to firms are valid for earlier periods.

[7]We considered using withdrawn IPOs as the basis of our identification strategy in line with earlier studies (cf., e.g., Bernstein, 2015 and Borisov et al., 2021). However, we decided against this approach for a number of reasons. First, the number of withdrawn IPOs is very small in Germany (N=88) and even smaller in our sample (N=34). Second, we find that a matched sample is more suitable for the purpose of this study because it allows us to begin the "treatment period" years ahead of the IPO. Withdrawn IPOs should develop similarly to successful IPOs up to the point of the withdrawal, which usually is very shortly before the scheduled IPO date.

This matching approach returns a matched control firm for 325 of the 327 IPO firms. Table 1 provides statistics on the matching quality. We use the normalized differences proposed by Imbens and Wooldridge (2009) and used by Imbens and Rubin (2015) to examine the average differences between the IPO firms and the matched control firms. Imbens and Rubin (2015) suggest that the normalized differences should be below 0.25. The normalized differences for the total number of employees and the one-year growth rate of total employees are 0.004 and 0.043. For all other matching variables, this statistic does not exceed 0.074. We conclude that the control group matches closely the employment characteristics of IPO firms.

4.3. Construction of employee-level data

We obtain employee-level information from the Integrated Employment Biographies (IEB) provided by the IAB. The IEB covers the majority of individuals working in Germany between 1975 and 2017, only excluding civil servants and the self-employed. The data contain day-to-day information on each employment period in all jobs that are covered by social security. Unique worker and establishment identifiers allow to follow workers over time and across different employers. In addition, in these data, we observe important worker characteristics such as gender, birth dates, nationality, place of residence and work, educational attainment, as well as job characteristics such as occupational and industry codes, and the average daily wage. For each IPO and matched control firm, we observe information on the full workforce from five years before the IPO to two years thereafter. For all employees employed at these firms during this time period, we obtain the full employment history from ten years before the IPO to three years thereafter to investigate the origins and destinations of moving employees and to measure employees' experience.

4.4. Variable construction

4.4.1. Hierarchies, functions, and management

We use occupational codes available in the IEB to map out the firm's organization in terms of its hierarchical, organizational, and management structure. Employers assign occupational codes to each employee according to the occupational classification scheme "Klassifikation der Berufe" (KldB). The most recent occupational classification scheme is based on five digits, differentiating 700 occupation sub-groups and up to four task complexity levels within occupation sub-groups.[8]

Our analysis of the firm's hierarchical structure is based on the firm's number of hierarchical layers. To map employees' occupational codes into hierarchical layers, we follow Caliendo et al. (2015) who develop the approach using French occupation codes, and Gumpert, Steimer, and Antoni (2021) who translate the mapping to German occupation codes. In essence, each layer reflects the level of task complexity encoded into the occupational code. Because there are four task complexity levels, we can observe a maxmimum of four hierarchical layers.

We compute two additional measures to more comprehensively capture whether firms become more hierarchical. These measures consider both the number of layers and the employment share of each layer, $S_{j,f,t} = \frac{E_{j,f,t}}{E_{f,t}}$, where $E_{j,f,t}$ denotes the number of employees in layer j of firm f in year t and $E_{f,t}$ the firm's total number of employees. The first measure, *hierarchization*, is defined as

$$1 - \sum_{j=1}^{4} (S_{f,j})^2. \tag{1}$$

Hierarchization ranges from 0 for a flat firm with a single layer to 0.75 for a hierarchical firm with four layers and equally distributed employment across layers. Hence, the most hierarchical organization has a control span of 1 (the employee ratio of one layer to the layer below is 1:1). *Hierarchization* does not differentiate between an upward pyramidal structure (i.e., employment

[8]We use the KldB1988 occupational classification scheme until 2010 and the KldB2010 after 2010. The KldB1988 occupational classification scheme is based on three digits, differentiating 334 occupations groups (see Bundesanstalt für Arbeit (1988) for a detailed description). The KldB2010 occupational classification scheme is based on five digits, differentiating 700 occupation sub-groups and up to four task complexity levels within occupation sub-groups (see Paulus and Matthes (2013) for a detailed description).

shares are decreasing with layers) and a downward pyramidal structure (i.e., employment shares are increasing with layers). Our second measure, *pyramidization*, ensures that the score is higher for pyramidal structures with control spans larger than one by giving stronger weights to higher layers:

$$1 - \sum_{j=1}^{4} (\frac{w_j E_{j,f,t}}{E_{w,f,t}})^2, \tag{2}$$

where w_j is the employment weight of layer j. We assign a weight of 1 to layer 1, 2 to layer 2, 3 to layer 3, 4 to layer 4. $E_{w,f,t}$ is the sum of the weighted employment of the four layers, $\sum_{j=1}^{4} w_j E_{j,f,t}$. *Pyramidization* ranges from 0 for a flat firm with a single layer to 0.75 for a firm with four layers and a pyramidal structure. The chosen weights ensure that the highest scores are given to a pyramidal structure with control spans which are a) larger than one and b) larger as we go higher up the hierarchy. (The maximum score of 0.75 is reached for an organization with the following control spans: layer 1 to layer 2: 4/3=1.33, layer 2 to layer 3: 3/2=1.5, layer 3 to layer 4: 2/1=2.)

We use the same occupational codes to map employees into four organizational functions and management positions: finance & accounting (F&A), information communication technology and human resources (ICT & HR), sales and marketing (S&M), and research and development (R&D). Based on the definition of managers in Blossfeld (1987), we define top managers as employees in the highest hierarchical layer of a firm and middle managers in the lower layers. See Appendix A for further details on variable definitions.

4.4.2. Education

We construct a variable for workers' educational attainment by using information on both schooling and education in terms of the German vocational system. We first use the method proposed by Fitzenberger, Osikominu, and Völter (2006) to correct for misreporting and inconsistencies. We then build an ordinal variable with five distinct values: 1) intermediate school leaving certificate without vocational training, 2) intermediate school leaving certificate with

vocational training, 3) upper secondary school leaving certificate without vocational training, 4) upper secondary with vocational training, 5) College or university degree.

4.4.3. Wages

The administrative individual-level data reports the total wage sum over workers' employment spells. We hence are able to calculate average daily wages for each individual worker. These wage sums, however, are right censored at the contribution assessment ceiling ('Beitragsbemessungsgrenze'). The censoring limit is given by the statutory pension fund and varies over time and region. We follow Dustmann, Ludsteck, and Schönberg (2009) and fit a series of Tobit regression to impute the right tail of the wage distribution. To this end, wages are first deflated using the CPI. Then, we perform Tobit regressions separately for Eastern and Western Germany as well as male and females, where we define a wage observation as censored whenever the reported wage is higher than 99% of the censoring threshold. In all regressions we control for age-categories, education categories, and all possible interactions.[9]

4.4.4. Growth and turnover rates

Our definition of growth and turnover rates of firms builds on the work by Davis, Haltiwanger, Handley, Jarmin, Lerner, and Miranda (2014) and Antoni, Maug, and Obernberger (2019). We define the growth rate of employment from time t to $t+k$ as $g_{f,t,t+k} = \frac{E_{f,t+k}-E_{f,t}}{0.5*(E_{f,t+k}+E_{f,t})}$, where $E_{f,t}$ denotes level of employment in firm f at time t. To decompose the growth rate into the hiring rate and the separation rate ($g_{f,t,t+k} = h_{f,t,t+k} - s_{f,t,t+k}$), we define $h_{f,t} = \frac{H_{f,t}}{0.5*(E_{f,t+k}+E_{f,t})}$ and $s_{f,t,t+k} = \frac{S_{f,t}}{0.5*(E_{f,t+k}+E_{f,t})}$, where $H_{f,t}$ and $S_{f,t}$ denote the number of employees entering and leaving the firm at time t. The turnover rate equals the smaller value of the firm's hiring and separation rate.

[9]Wages can only be imputed for full-time workers since the social security data only indicates whether an individual works full-time or part-time, but lacks details on hours worked. The share of part-time observations with censored wages is however negligibly small (less than 1%).

4.5. Descriptive statistics

Table 2 provides descriptive statistics on our sample. The sample consists of 325 IPO firms and 325 matched control firms over over eight periods around the IPO (t-5 to t+2). On average, a firm has 556 employees organized in 3.38 layers.[10] The mean employment growth rate is 9%. The mean imputed real daily wage is 118 EUR. For our sample, the number of top managers is higher than the number of middle managers. By definition, any firm must have top managers because top managers are defined as all managers in the top layer. Only firms with middle layers will thus have middle managers according to our definition. In reality, the hierarchical structure of management will be more sophisticated than what our variables can capture. Nevertheless, we find that our approach provides a meaningful decomposition of management within a firm.

4.6. Research Design

We apply a matched-sample difference-in-differences approach at the firm level by regressing one-year and multi-year growth rates on an IPO indicator, the log number of total employees in year four before the IPO, and the one-year growth rate of total employees from year five to year four before the IPO, plus a set of fixed effects:

$$\begin{aligned} g_{f,t-1+k,t+k} = \alpha_t + \theta_k \cdot IPO_f + \beta_1 \cdot g_{f,t-5,t-4} + \beta_2 \cdot ln(E_{f,t-4}) \\ + \lambda_t + \eta_f + \pi_f + \epsilon_{f,t+k}, k = -3, ..., 2, \end{aligned} \tag{3}$$

where λ_t denotes year fixed effects, η_f industry fixed effects, and π_f four region dummies for the Northern, Southern, Western, and Eastern part of Germany. The standard errors are clustered at the firm level, and regressions are unweighted.

[10] For 14 out of 2,600 IPO firm-year observations, we observe a total employment of one employee. These 14 firm-year observations can be traced back to five firms. Two of the firms are spin-offs, which might start out with very low numbers of employment. One firm went bankrupt shortly after the end of the observation period. We have no information about the remaining two firms. While we cannot rule out data errors, we find that these numbers are not implausible either.

5. Results

In this section, we discuss the results of our empirical analysis. In Section 5.1, we examine employment growth and turnover from three years before the IPO to two years after the IPO. In Section 5.2, we decompose the firm's organization into hierarchical layers, organizational functions, and its management structure, and relate employee inflows and turnover to changes in the organization of the firm. In Section 5.3, we describe the consequences of the reorganization for the composition and compensation of the labor force.

5.1. Going public, employee flows, and turnover

Table 3 provides a detailed analysis of employment growth and employee turnover from three years before the IPO to two years after the IPO.

In Panel A, we observe the differences in employment growth and employee turnover between IPO firms and their control firms for period t-3, the period ahead of the matching (which takes place at the end of t=-3). Figure 1 indicates parallel trends between IPO firms and control firms in terms of employment and employment growth. Panel A tests this visual impression formally. We find that there are no significant differences in terms of employment growth and employee turnover.

In Panel B, we observe employment growth and employee turnover over the full event period from t-2 to t+2 (five years). Over this period, employment growth is 39 percentage points higher for IPO firms than for control firms. The turnover rate is 23 percentage points higher, indicating that employment growth does not capture the full amount of hiring associated with the IPO. Overall, the IPO firm has to hire 1.6 employees to fill one additional position (=(0.23+0.39)/0.39).

Panel C decomposes the employment growth and employee turnover in Panel B into annual growth rates. IPO firms start growing abnormally in t-2. Most of the growth takes place in t-1 and t. Growth is relatively low in t-1, which is followed by a consolidation period. Turnover rates help us to better understand the dynamics. Before the IPO, we observe less turnover than

in the control firms. At the time of the IPO and thereafter, turnover rates become abnormally high, suggesting that the labor force is not only affected by an increase in scale, but also by restructuring, which may indicate that relatively many employees wish to leave or are required to leave because their human capital is no longer compatible with the reorganized firm.

Overall, Table 3 suggests that the employment growth associated with going public is not confined to the period after the IPO. In light of the recent literature, the order of magnitude of employment growth before the IPO both in absolute terms and relative to the employment growth after the IPO is surprising. However, the results are consistent with the results in Pagano et al. (1998) that firms go public after high investment and high asset growth. The authors argue that growth in assets anticipates the funds raised in the IPO. Our results are also consistent with the notion that firms may need to showcase a compelling growth story in order to be able to go public in Europe.

5.2. Going public and the reorganization of the firm

In this section, we examine how firms adapt their organizations from three different angles: hierarchies, functions, and management.

5.2.1. Hierarchies

We start by examining the firm's hierarchical organization, which provides us with an understanding of the overall level of organization of the firm. We perceive a more organized firm as one with more hierarchical layers and smaller control spans. We hypothesize that firms going public become more hierarchical because it lowers their knowledge acquisition costs, making human capital more easily replaceable (see Section 2 for a more formal development of this hypothesis). Furthermore, a more bureaucratic organization is more accountable because it is easier to monitor and supervise.

We compute three measures of a firm's hierarchical structure. Our most simple measure, *layers*, denotes the number of hierarchical layers we observe in the data. *Hierarchization* measures the dispersion of employees over the hierarchical layers of the firm. Hierarchization increases

when firms add layers or when control spans (ratio of employees between two layers) decrease. In principle, control spans decrease when relatively more employees enter the higher layers of the hierarchy. As a consequence, hierarchization is highest when employees are equally distributed over the maximum number of layers. Alternatively, *pyramidization* is a measure that increases when organizations become more pyramidal. For a more detailed discussion of these measures, see Section 4.4.1.

Figure 2, Panel A, depicts the growth in hierarchical layers from t=-4 to t=+2. We observe a much more pronounced increase in the IPO group than in the control group. Note that many firms have already reached the maximum number of observable layers (four layers) in t=-3. Therefore, Figure 2, Panel B, shows the growth in layers of firms with less than four layers at t=-3 (the point at which we perform our matching of IPO firms to control firms). Panel B shows that IPO firms add one full layer in the process of going public if they still can add layers.

Table 4 examines to what extent the IPO firm's hierarchical structure changes relative to a control group. In column (1), we regress changes in layers from t-3 to t+2 on an IPO-indicator using the sample of all firms with less than the maximum amount of layers in t=-3. Relative to the control group, IPO firms add 0.67 layers. Firms tend to add hierarchical layers when their labor force grows (cf. Caliendo et al., 2015) and when they expand geographically because travelling takes up time and managers have limited time resources (cf. Gumpert et al., 2021). Therefore, we control for the growth in total employment in column (2) and, alternatively, the growth in production workers in column (3), both measured over the same time period as the growth in layers. In addition, we control for the change in the number of establishments, regions where the firm operates establishments, and industries of the establishments.

Controlling for the growth in employment reduces the differences between both groups to 0.31 layers (column 2), i.e., 46.2% of the layer increase in IPO firms cannot be explained by employment growth. The total number of employees contains employees who have been hired to meet the requirements of public capital markets and their regulatory bodies. The growth in production workers is, therefore, a better predictor of the increase in hierarchies per increase

in unit of production output, in the absence of going public. Using this control variable, the differences in layer growth between both groups is 0.51 layers. Thus, 76.1% of the layer increase in IPO firms cannot be explained by the growth in production. 0.45 layers amount to 59.3% (=0.51/0.86 where 0.86 is the standard deviation of the number of layers reported in Table 2) of the standard deviation in layers observed for our sample. We conclude that a substantial and economically meaningful fraction of the layer increase is associated with going public. In the Internet Appendix (Table IA.1), we show that the conclusions we obtained from this analysis also hold if we add firms with four layers to the sample.

In columns (4) to (6) of Table 4, we use *hierarchization* as the dependant variable. As this dependent variable also captures change in value even when the maximum number of layers is reached, we use our full sample for these regressions. In column (4), we find that the hierarchization of IPO firms increases by 0.035, which is equal to 18% of the standard deviation in hierarchization (0.035/0.19). Controlling for employment growth decreases the coefficient estimate of hierarchization by a third to 0.023. We obtain almost identical results when we use *pyramidization* (Columns 7 to 9). In the Internet Appendix (Table IA.1), we re-run Table 4 for all IPOs for which the control firms have the same number of layers in t=-3. Overall, we obtain even stronger results for this smaller, but more balanced sample. We conclude that all IPO firms become more hierarchical, also those firms with the maximum number of observable layers in t=-3.

In Table 5, we analyze the growth of each hierarchical layer relative to the growth of this layers in the control group. We use normalized employment growth for the respective layer over the whole period from t-2 to t+2 as our dependent variable. In Panel A, we observe that all layers of IPO firms grow much more strongly than in their control firms. However, the middle layers grow by about 50% more than the top and bottom layers.

In Panel B, we control for total employment growth and several measures of geographic expansion such as the increase in regions where the firm operates establishments, in establishments, and in industries in order to isolate the effect of going public beyond what growth in employment and firm complexity would predict. We find that the middle ranks in the organi-

zation (layer 2 and layer 3) grow by 14 to 17 percentage points more than in the control group, even after controlling for growth. Meanwhile, the growth in production workers (layer 1) is even significantly lower than in the control group. Hence, employment growth and firm growth are not able to explain the dynamics changing the (hierarchical) organization of the firm.

In Panel C of Table 5, we control for growth in production workers (layer 1) instead of total employment growth. This analysis reveals that all higher layers grow more strongly in IPO firms than what growth in production would normally predict.

Panel D documents that growth rates do not reveal the full extent of hiring and reorganization taking place at the upper layers. The highest turnover rates can be found for layer 4. For this category almost three employees have to be hired to fill one new position.[11] This observation is consistent with the notion that solving the exceptional problems faced by a public firm requires refocusing the top layer towards a different sets of knowledge.

Table 6, Panel A, describes how the employee inflows described above change the relative importance of the four hierarchical layers. The share of layer 1 in the firm decreases by 3.09 percentage points or 5.31% (=3.09/58.17). The middle layers increase in size by 6.29% and 15.81%, respectively.

Finally, we examine how the restructuring changes the IPO firm's control span(s), where control span is defined as the ratio of lower-level-employees to higher-level employees. Hence, control span estimates the average number of employees per supervisor, which seems a reasonable proxy for the average size of departments or groups within the organization. In the context of knowledge-based hierarchies, the theory of Garicano (2000) predicts that firms decrease their control spans if knowledge-acquisition costs increase, which is likely to happen when firms go public. For example, when firms go public, all of the firm's operations need to be compliant with regulation and employees need to acquire knowledge of how regulation affects their role (see footnote 2 for details). Smaller groups allow each group to specialize on one specific problem, which is more efficient than asking larger groups to oversee a larger variety of problems. To

[11]We arrive at the ratio of three-to-one in the following way. We take net employment growth for layer 4 from Panel A, 0.36, and add it to turnover from Panel D, 0.63, to arrive at the hiring rate at layer 4. Dividing the hiring rate of 0.99 (=0.36+0.63) by 0.36, we arrive at 2.75 hires per additional layer 4 job created.

stick with our example: it will be more economical for IPO firms to have a group of compliance experts rather than training each and every employee on compliance issues.

We rely on Table 6 to compute control spans. At the end of year three (t=-3), the control spans of layer 4, layer 3, and layer 2 are 3.5 (=15.2%/4.3%), 1.5 (=22.2%/15.2%), and 2.6 (=58.2%/22.2%), respectively. Based on the changes relative to control group indicated in the last column of Table 6, the control span of layer 4 increases by 51.9%. Meanwhile, the control spans of the middle layers decrease (layer 3: -8.05%; layer 2: -11.9%). Hence, we observe an increase in the number of groups in the middle layers. Meanwhile, each employee in the top layer ("executive") oversees a larger number of groups, widening their control spans. We conclude from these results that the firm's top executives concern themselves less with problems related to production, which may be evidence that top management indeed take on more typical roles and get less involved in daily business, which will make it easier to replace them with top managers of other companies.

5.2.2. Organizational functions

Organizational functions reflect and organize the core processes of a company. An analysis of organizational functions provides us with an understanding of whether the organization becomes more or less lean, and of how the focus of the organization changes. In our analysis, we distinguish two broad categories: Business functions and enabling functions.

We define "business functions" as those functions that are directly related to the firm's business: Sales and Marketing (S&M) represent functions that are important to commercialize the firm's products. Research and Development (R&D) indicates the firm's stance/drive towards innovation. We define "enabling functions" as those functions that are not directly related to the firm's business. They ensure that businesses can operate efficiently and in compliance with regulation. Finance and Accounting (F&A) are tasked with ensuring that the firm meets the requirements of public capital markets and regulation. These tasks entail implementing an internal monitoring and performance measurement system, and providing information to investors and designing modern corporate financial policies. ICT is tasked, among other things,

with implementing monitoring and performance measurement systems. HR has to ensure that the human capital is developed and recruited.

We hypothesize that enabling functions become much more important in public firms, in particular, if they are related to finance, accounting, monitoring, or supervision. Table 5 confirms our predictions. Enabling functions grow by 55 percentage points (F&A) and 58 percentage points (ICT&HR) more in IPO firms than in control firms. The increase is larger than in any of the four hierarchical layers and roughly twice as large as the relative growth in business functions. S&M and R&D grow by 19 percentage points and 29 percentage points, respectively. Table 6 documents that these inflows change the relative importance of enabling functions and business functions. F&A increases by 2.49 percentage points or 45.36% (=2.49/5.49) relative to control group. ICT&HR, making up a larger share already before the IPO, grow by 1.22 percentage points or 11.11% (=1.22/10.98) relative to control group. Business functions become relatively less important and decrease by 21.89% (S&M) and 3.38% (R&D) respectively. These results are not inconsistent with a strategic shift towards the commercialization of products presented in earlier research (cf. Pástor et al., 2009, Bernstein, 2015, and Larrain et al., 2021). After all, business functions exhibit significant growth, too. However, commercialization does not appear to be a driving force behind the organizational changes in the firm.

5.2.3. Management

In this section, we examine how management is restructured in the process of going public and ask what happens to the incumbent top managers who leave the firm. The firm's management ensures that the firm's operations reflect the firm's strategy and key objectives. Public firms, more than private firms, will have to ensure that the firm's operations are very well aligned with its key objectives. Hence, public firms have to spend more time on alignment and supervision, requiring a larger number of managers, in particular in middle management. Management will not only increase in quantity but also in quality. Hands-off managers who wish to instill creativity and innovative drive are likely to be replaced by hands-on managers who wish to ensure that public firm standards are upheld. Hence, we expect high turnover

among managers and departures of innovation-minded, entrepreneur-like managers who dislike bureaucratic organizations.

In Table 5, we present employment growth in middle and top management. In Panel A, we observe that both top management and middle management grow more than the control group. Top management grows in line with what growth in employment and firm complexity would predict (Panel B), but more than what growth in production workers would predict (Panel C). Middle management on the other hand grows much more than the rest of the firm, regardless of the perspective. Remarkably, turnover in both management groups is huge (Panel D). For every additional top management position created, on average 2.76 top managers have to be hired (0.65 from Panel C plus net employment growth 0.37 from Panel A equals total hiring of 1.02. Total hiring divided by net employment growth is equal to 2.76). In middle management, 1.8 middle managers have to be hired to fill one new position. In Table 10, we examine to what extent management turnover is driven by adding layers. We find that adding one layer increases top management turnover by 40 percentage points, suggesting that a substantial share of managers is not compatible with or unwilling to adapt to the new, more hierarchical organization. We conclude that hierarchical changes and management turnover are directly related.

Table 6 describes how the reorganization and hiring of management staff changes the relative significance of management in the firm's organization. Two years after the IPO, the share of middle managers in the firm has increased by 88.36% (=1.67/1.89), relative to control group. Meanwhile, top managers have become more scarce, relative to the size of the firm and the control group (-28.54%=-1.45/5.08). Accordingly, the control span of top managers increases by 40% relative to control group (the share of top managers decreases by 28.54 percent. Thus, the control span increases by the factor 1/(1-0.2854), which is equal to 39.93%) and the control span of middle managers drops by half (the share of middle managers increases by 88.36 percent. These results suggest that the knowledge of top managers is leveraged, while middle managers oversee much smaller departments. Reflecting these developments, the pay ratio of top managers to middle managers increases by 13.05% (=0.154/1.18, Table 9, Panel B). Overall, these findings

are consistent with the economics of knowledge hierarchies which predict that additional layers increase the utilization rate of knowledge of those employees who stay or enter in the top layer, when a new layer is introduced, while the utilization rate of knowledge decreases in all other layers.

The tremendous reorganization of management raises the question of how incumbent managers fare during and after the IPO. Figure 4 depicts the changes to the incumbent management, which we observe at the end of t-3. We find that 60% of top managers leave the IPO firm until the end of year two, which is 10 percentage points or 20% more than in the control group (Panel A). Remarkably, the share of incumbent female top managers was much higher in IPO firms than in the control group, and the retention of these female top managers is higher than in the control group afterwards.

Looking at the destinations of leaving top managers, we conclude that leaving managers are looking for more entrepreneurial destinations: Most leaving top managers directly start a new job, but this job is less likely to be a management job again; more managers end up at a smaller destination in t+2 and the destination is always much smaller than the destination of leaving control top managers. Finally, managers work at a younger establishment afterwards and they are more likely to leave to another industry (Figure 5).

5.3. Going public and the characteristics of the labor force

In this section, we examine how the reorganization of the IPO firm changes the characteristics and compensation of the labor force. We use the economics of knowledge-based hierarchies to predict how the characteristics of the labor force should change when firms go public. Garicano and Rossi-Hansberg (2006) show that a more hierarchical organization leads to larger cross-sectional differences in knowledge and wages. If firms going public become more hierarchical, the utilization rate of knowledge will increase in the top layer(s), leading to higher inequality in the firm with respect to knowledge and wages. The resulting earnings structure will compensate employees for moving upwards in the hierarchy, consistent with Rajan's

'promotion through replacement'.

Table 8 documents how wages develop from three years before the IPO to two years after the IPO. Overall, wages grow by 11.0% on average, which is 3.76% more than in the control group. This increase is primarily driven by the wages for new hires. Over the full observational period, wages of hires increase by 15.2%, which is 7.22% more than in the control group. Figure 3 shows that new hires are highly-educated individuals with little work experience, explaining why they earn relatively high wages for new hires (better education), but relatively low wages when compared to incumbents (lower experience). Wages of incumbents increase by 8.77%, which is only about 2.03% above the wage increase in the control group.

Wages in all layers increase, but mostly in line with the control group; wages in the top layer mark the only economically and statistically significant exception. IPO employees in the top layer see the strongest increases in their wages, both in absolute terms and relative to control group. This result is consistent with the notion that the utilization rate of knowledge increases in the top layer when firms become more hierarchical. As a consequence, wage inequality increases within the firm as documented by an increase in the pay ratio of layer 4 to layer 1. Other measures of inequality increase as well: Inequality scores increase when comparing the 75th (90th) to the 25th (10th) percentile of wages and education (Table 9).

In Section 2, we argue that a hierarchical organization enables the firm to staff employees into standardized roles, which makes human capital more easily replaceable. At the same time, a hierarchical organization levers the knowledge of employees in the top layers, requiring highly educated employees in the top layers. Therefore, we expect that the labor force will be transformed along two dimensions. First, as the top layers will require a high level of (standardized) knowledge, the overall level of education of the labor force will increase. Second, because of standardization, job and industry experience and tenure on the job will become less important after the reorganization. Table 6, Panel D, confirms these predictions. The labor force becomes significantly younger and less experienced (tenure in the firm, job, and industry decrease). Meanwhile, the labor force's level of education increases.

Figure 3 helps us to understand whether the IPO firm's hires exhibit different characteristics

than the hires of the control firms. We find that new hires of IPO firms are in general younger and less experienced (in terms of tenure in the job or industry), but they are better educated. Furthermore, IPO hires have more experience in finance and accounting jobs and at public firms than incumbents. Consequently, the labor force of the IPO firm shows stronger increases in experience in these categories than the control group (cf. Panel I and Panel K). Most notably, the recruiting of employees with experience in public firms picks up strongly around the time of the IPO. This insight could point towards increased demand from the firm's side. Given the observation that most of the increase happens after the IPO, an alternative explanation could be that the firm, once public, became a more interesting destination for employees from public firms.

6. Discussion and conclusion

We examine how firms adapt the composition and organization of their labor force when they go public. Our analysis yields three major findings. First, finance and accounting becomes a much more central aspect of the firm's operations. Second, compliance and cooperation is enforced by a growing number of managers. And third, the firm's organization of labor becomes more hierarchical. Our results are consistent with the notion of an organizational transformation towards standardization as suggested in Rajan (2012), making the firm more accountable and accessible for outside financing. Moreover, the resulting more efficient structure facilitates the firm's ability to acquire innovation from outside, mitigating the decline in its ability to generate internal innovation.

References

Aktas, N., Boone, A., Witkowski, A., Xu, G., Yurtoglu, B., 2020. The Role of Internal M&A Teams in Takeovers. Review of Finance 25, 1047–1088.

Antoni, M., Koller, K., Laible, M.-C., Zimmermann, F., 2018. Orbis-ADIAB: From record linkage key to research dataset: Combining commercial company data with administrative employer-employee data. IAB FDZ Methodenreport 04/2018 EN .

Antoni, M., Maug, E., Obernberger, S., 2019. Private equity and human capital risk. Journal of Financial Economics 133, 634 – 657.

Babina, T., Ouimet, P., Zarutskie, R., 2020. IPOs, human capital, and labor reallocation. Available at SSRN 2692845 .

Bernstein, S., 2015. Does going public affect innovation? The Journal of Finance 70, 1365–1403.

Blossfeld, H.-P., 1987. Labor-Market Entry and the Sexual Segregation of Careers in the Federal Republic of Germany. American Journal of Sociology 93, 89–118.

Borisov, A., Ellul, A., Sevilir, M., 2021. Access to public capital markets and employment growth. Journal of Financial Economics .

Brav, O., 2009. Access to capital, capital structure, and the funding of the firm. Journal of Finance 64, 263–308.

Bundesanstalt für Arbeit, 1988. Systematisches und alphabetisches verzeichnis der berufsbenennungen. bundeanstalt für arbeit. Tech. rep., Bundesanstalt für Arbeit.

Caliendo, L., Monte, F., Rossi-Hansberg, E., 2015. The anatomy of french production hierarchies. Journal of Political Economy 123, 809–852.

Celikyurt, U., Sevilir, M., Shivdasani, A., 2010. Going public to acquire? the acquisition motive in IPOs. Journal of Financial Economics 96, 345–363.

Davis, S. J., Haltiwanger, J., Handley, K., Jarmin, R., Lerner, J., Miranda, J., 2014. Private equity, jobs, and productivity. American Economic Review 104, 3956–90.

Dustmann, C., Ludsteck, J., Schönberg, U., 2009. Revisiting the German Wage Structure. Quarterly Journal of Economics 124, 843–881.

Ewens, M., Xiao, K., Xu, T., 2020. Regulatory costs of being public: Evidence from bunching estimation. Available at SSRN .

Feinendegen, S., Nowak, E., 2001. Publizitätspflichten börsennotierter aktiengesellschaften im spannungsfeld zwischen regelberichterstattung und ad-hoc-publizität-überlegungen zu einer gesetzeskonformen und kapitalmarktorientierten umsetzung. Tech. rep., Working Paper Series: Finance & Accounting.

Fitzenberger, B., Osikominu, A., Völter, R., 2006. Imputation rules to improve the education variable in the iab employment subsample. Schmollers Jahrbuch: Journal of Applied Social Science Studies / Zeitschrift für Wirtschafts- und Sozialwissenschaften 126, 405–436.

Garicano, L., 2000. Hierarchies and the organization of knowledge in production. Journal of Political Economy 108, 874–904.

Garicano, L., Rossi-Hansberg, E., 2006. Organization and Inequality in a Knowledge Economy*. The Quarterly Journal of Economics 121, 1383–1435.

Gokkaya, S., Liu, X., Stulz, R. M., 2021. Do firms with specialized M&A staff make better acquisitions? NBER working paper .

Gumpert, A., Steimer, H., Antoni, M., 2021. Firm Organization with Multiple Establishments*. The Quarterly Journal of Economics 137, 1091–1138.

Imbens, G. W., Rubin, D. B., 2015. Causal Inference for Statistics, Social, and Biomedical Sciences: An Introduction. Cambridge University Press.

Imbens, G. W., Wooldridge, J. M., 2009. Recent developments in the econometrics of program evaluation. Journal of Economic Literature 47, 5–86.

Kim, W., Weisbach, M. S., 2008. Motivations for public equity offers: An international perspective. Journal of Financial Economics 87, 281–307.

Larrain, B., Phillips, G. M., Sertsios, G., Urzúa I, F., 2021. The effects of going public on firm performance and strategy: Evidence from international IPOs. Available at SSRN 3830690 .

Leuz, C., Wysocki, P. D., 2016. The economics of disclosure and financial reporting regulation: Evidence and suggestions for future research. Journal of Accounting Research 54, 525–622.

Pagano, M., Panetta, F., Zingales, L., 1998. Why do companies go public? An empirical analysis. Journal of Finance 53, 27–64.

Pástor, L., Taylor, L. A., Veronesi, P., 2009. Entrepreneurial learning, the IPO decision, and the post-IPO drop in firm profitability. Review of Financial Studies 22, 3005–3046.

Paulus, W., Matthes, B., 2013. The German classification of occupations 2010 – structure, coding and conversion table. FDZ-Methodenreport .

Rajan, R. G., 2012. Presidential address: The corporation in finance. The Journal of Finance 67, 1173–1217.

Saunders, A., Steffen, S., 2011. The costs of being private: Evidence from the loan market. Review of Financial Studies 24, 4091–4122.

Thompson, V. A., 1965. Bureaucracy and innovation. Administrative Science Quarterly pp. 1–20.

Tåg, J., Åstebro, T., Thompson, P., 2016. Hierarchies and entrepreneurship. European Economic Review 89, 129–147.

von Kirchbach, J. M., 2007. Publizitätspflichten börsennotierter Gesellschaften in Deutschland und den USA. Ph.D. thesis.

Zingales, L., 1995. Insider Ownership and the Decision to Go Public. The Review of Economic Studies 62, 425–448.

Figure 1
Mean number of total employees

This figure presents the development of the mean number of total employees for IPO firms and matched control firms separately. A detailed description of all variables can be found in Appendix A.

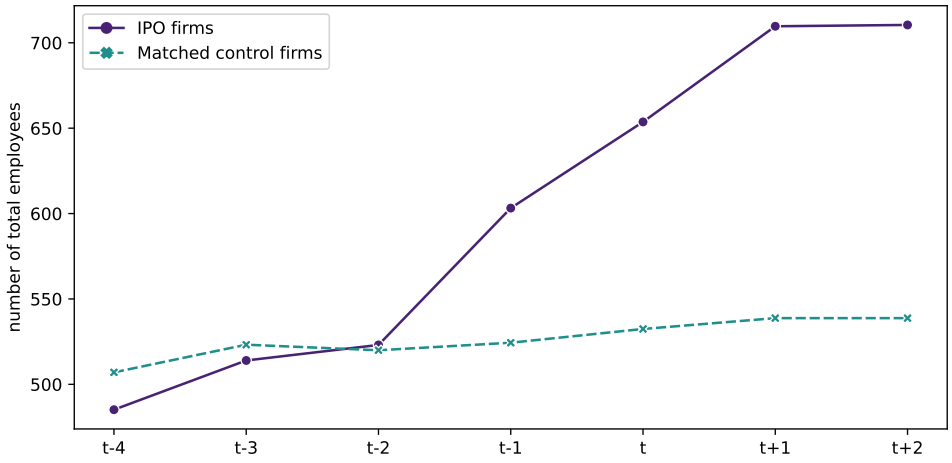
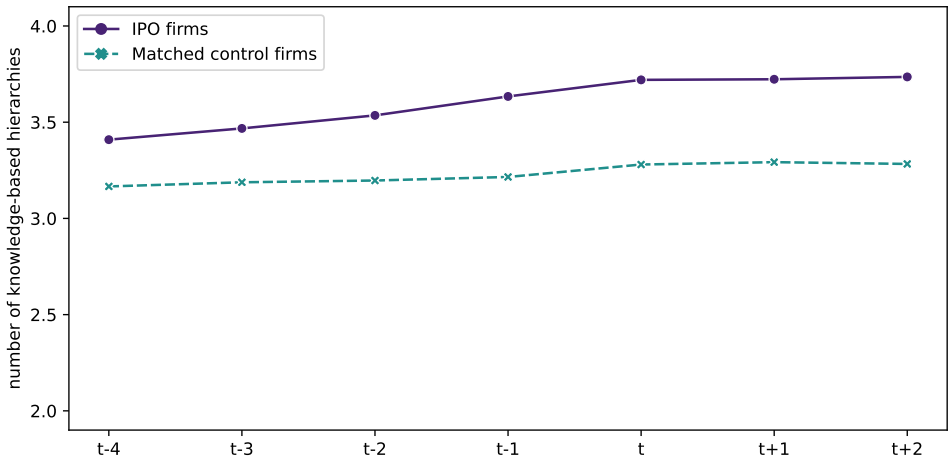


Figure 2
Mean number of knowledge hierarchies

This figure presents the development of the mean number of knowledge hierarchies for IPO firms and matched control firms separately. Subfigure (a) presents the number of knowledge hierarchies for all firms, and Subfigure (b) for firms with less than four layers in t-3. A detailed description of all variables can be found in Appendix Appendix A.

(a) All firms



(b) Firms with less than four layers in t-3

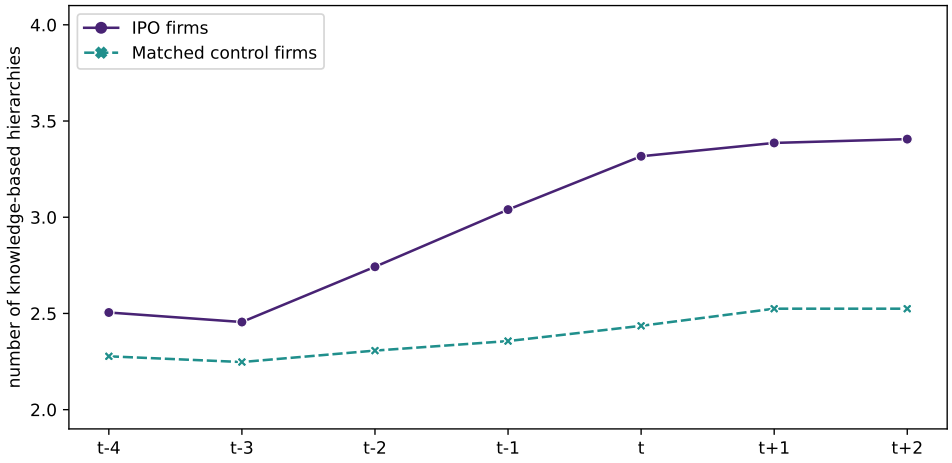
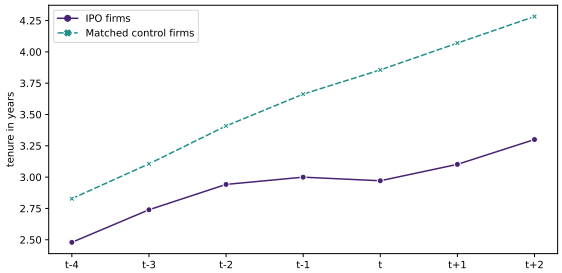


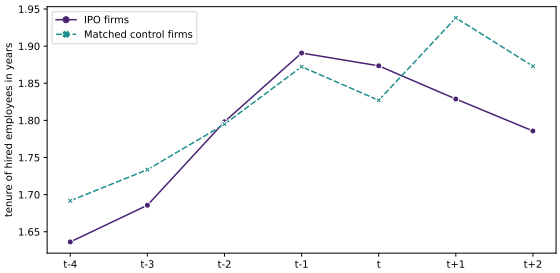
Figure 3
What happens to the expertise of the labor force?

This figure illustrates the expertise of the labor force for IPO firms and matched control firms separately. Subfigures (a) and (b) present the mean tenure of all employees and of new hires before the move. Analogously, Subfigures (c) and (d) present the mean age, Subfigures (e) and (f) the mean occupation experience, Subfigures (g) and (h) mean industry experience, Subfigures (i) and (j) the mean finance & accounting (F&A) experence, Subfigures (k) and (l) the mean listed firm experience, and Subfigures (m) and (n) the mean education score. A detailed description of all variables can be found in Appendix Appendix A.

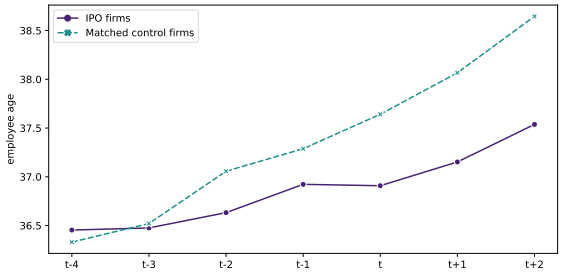
(a) Tenure of employees



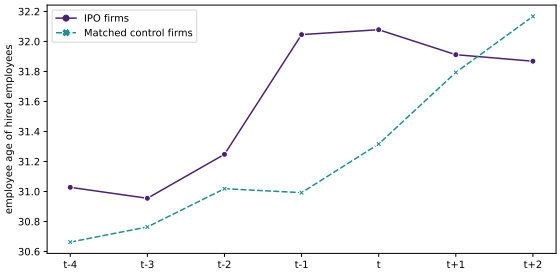
(b) Tenure of hires



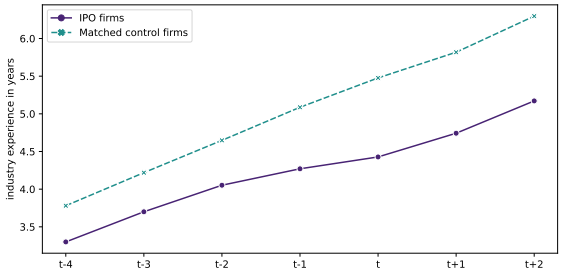
(c) Age of employees



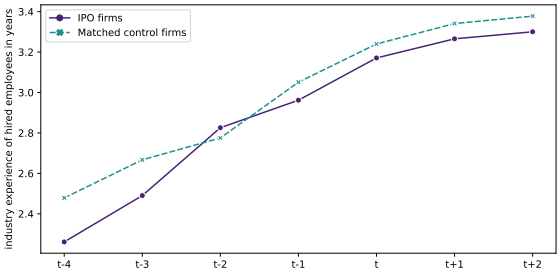
(d) Age of hires



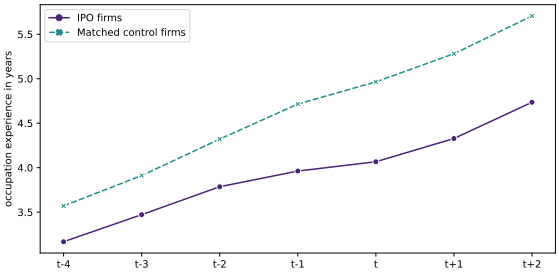
(e) Industry experience of employees



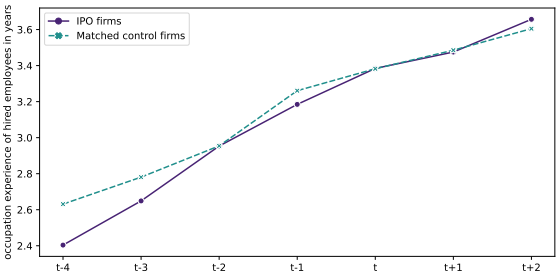
(f) Industry experience of hires



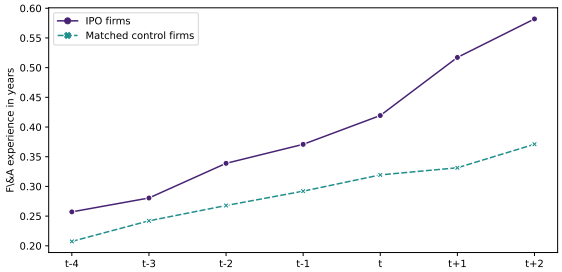
(g) Occupation experience of employees



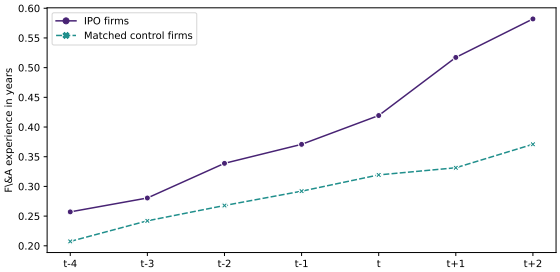
(h) Occupation experience of hires



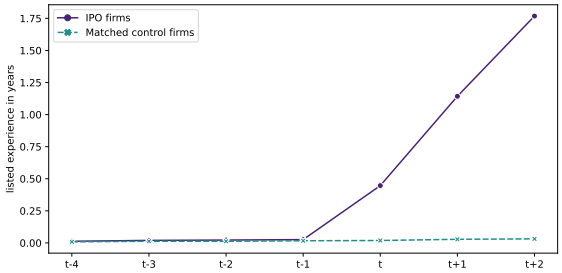
(i) F&A experience of employees



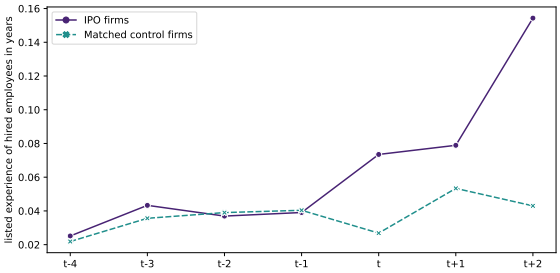
(j) F&A experience of hires



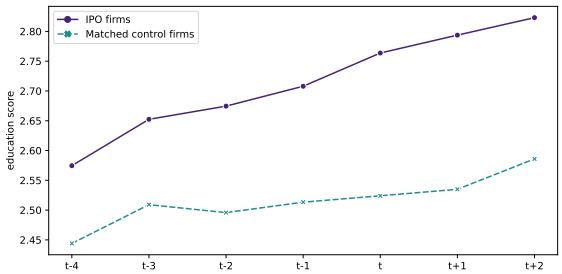
(k) Listed firm experience of employees



(l) Listed firm experience of hires



(m) Education of employees



(n) Education of hires

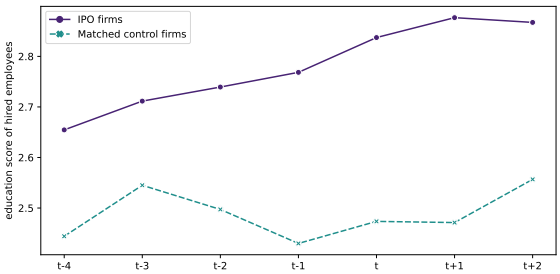
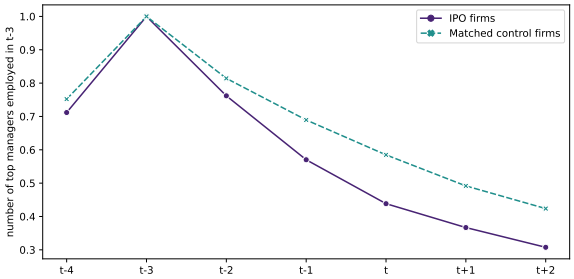


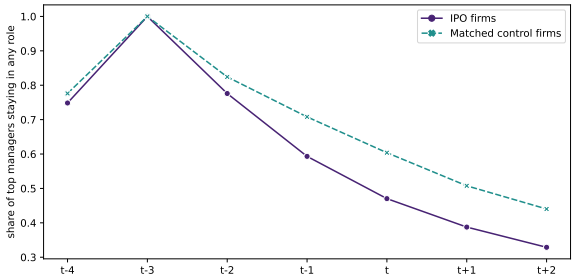
Figure 4
What happens to the firm's top managers employed in t-3?

This figure illustrates the characteristics of top managers employed in t-3 over time for IPO firms and matched control firms separately. Subfigure (a) present the share of top managers staying in the firm in the same role and Subfigure (b) the share of top managers staying in the firm in any role. Subfigure (c) presents the top managers' mean tenure, Subfiure (d) their mean age, and Subfigure (e) the mean share of females. A detailed description of all variables can be found in Appendix A.

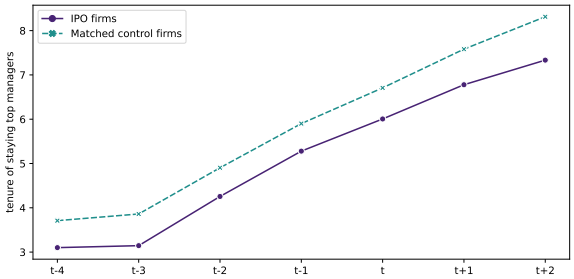
(a) Share of staying top managers



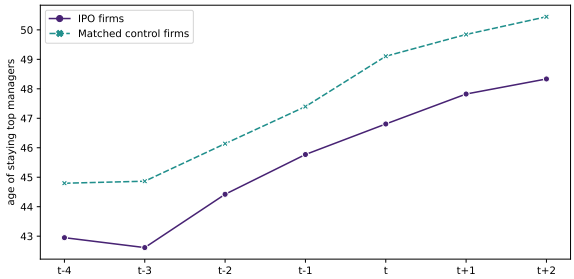
(b) Share of staying top managers in any role



(c) Tenure of top managers



(d) Age of top managers



(e) Female among top managers

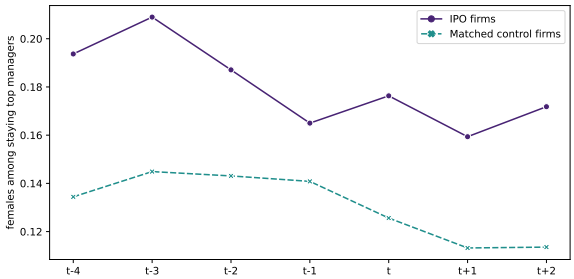
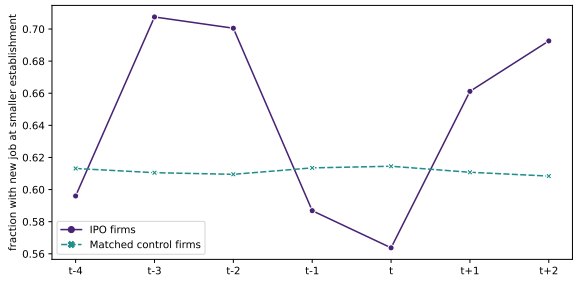


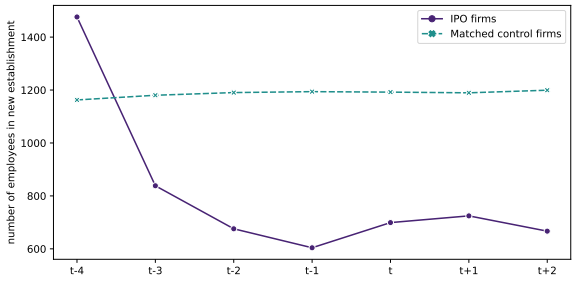
Figure 5
What are the destination of top managers leaving the firm?

This figure illustrates the characteristics of new jobs and new employers of top managers leaving the IPO firms and matched control firms. Subfigure (a) presents the fraction of top managers leaving to a smaller establishment, Subfigure (b) the new establishments' mean number of employees, Subfigure (c) fraction leaving to a younger establishment, Subfigure (d) the new establishments' mean age, Subfigure (e) the fraction with a new job in layer 4, Subfigure (f) the fraction with a new job as managers, and Subfigure (g) the fraction with a new job in the same industry. A detailed description of all variables can be found in Appendix A.

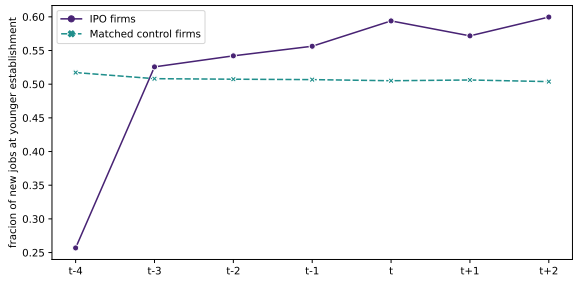
(a) New job at smaller establishment



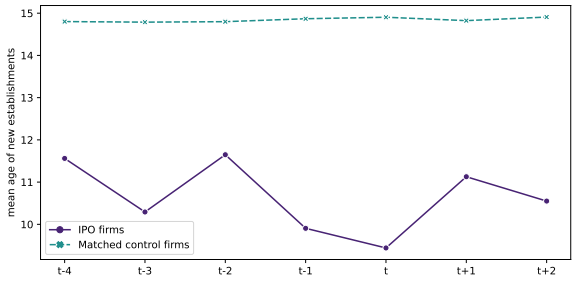
(b) New establishment's no. employees



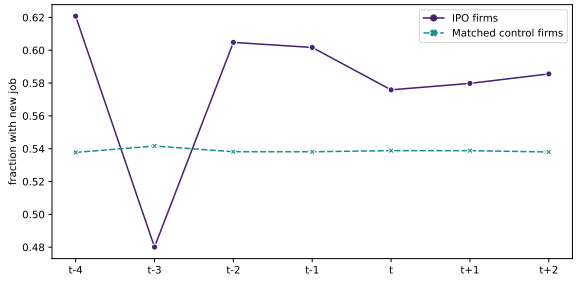
(c) New job at younger establishment



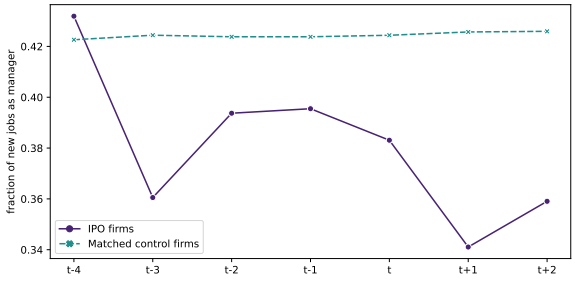
(d) New establishment's age



(e) New job in layer 4



(f) New job as manager



(g) New job in same industry

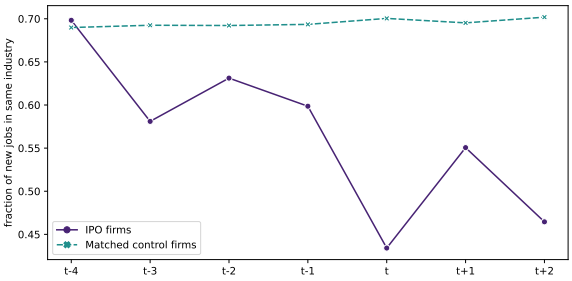


Table 1

Matching statistics

This table presents the matching statistics on the 325 IPO firms and the 325 matched control firms in t-3. A detailed description of all variables can be found in Appendix A.

	IPO firms			Matched controls			Differences	
	mean	median	SD	mean	median	SD	rel. difference in means (%)	Imbens-Wooldridge test
employees	511.12	97.00	1 411.51	520.41	95.00	1 594.12	1.82	0.00
growth rate empl.	0.14	0.08	0.32	0.12	0.06	0.28	12.87	0.04
mean imputed wage	119.74	115.33	32.77	118.74	114.68	33.65	0.84	0.02
age	35.99	35.60	4.64	36.04	35.97	4.39	0.13	0.01
share with secondary degree (%)	61.28	65.08	21.56	62.39	65.85	20.15	1.82	0.04
share with university degree (%)	25.02	16.13	24.44	22.55	12.82	22.82	9.88	0.07
firm age	11.95	11.00	7.70	12.27	11.00	7.58	2.68	0.03
layers	3.47	4.00	0.81	3.19	3.00	0.92	8.07	0.23
number of F&A employees	10.34	3.00	23.16	10.85	2.00	35.89	5.00	0.01
number of ICT & HR employees	18.99	2.00	55.12	15.21	1.00	48.39	19.90	0.05
number of middle managers	4.71	1.00	15.27	4.07	0.00	16.11	13.53	0.03
number of top managers	11.29	3.00	35.99	9.93	1.00	31.24	12.04	0.03

Table 2

Descriptive statistics

This table presents descriptive statistics. The sample consists of 5,200 firm-years for 325 IPO firms and 325 matched control firms over eight periods around the IPO (t-5 to t+2). Reported are the number of observations (Obs), mean value (Mean), standard deviation (SD), 25th percentile (25th), median (50th), and 75th percentile (75th). A detailed description of all variables can be found in Appendix A.

	Obs	Mean	SD	25th	50th	75th
number of employees	5 200	556	1 593	36	111	348
growth rate of employees	4 554	0.09	0.31	−0.02	0.05	0.19
hiring rate of employees	4 554	0.29	0.25	0.12	0.22	0.37
separation rate of employees	4 554	0.20	0.20	0.09	0.14	0.23
wage	5 192	124	37	96	120	148
log wage	5 192	4.70	0.31	4.50	4.71	4.92
share of employees with censored wages (%)	5 192	16.46	16.13	5.00	11.99	22.75
number of establishments	5 200	3.96	16.89	1.00	1.00	2.00
number of regions	5 200	1.33	0.73	1.00	1.00	1.00
number of industries	5 200	1.21	0.57	1.00	1.00	1.00
hierarchies						
layers	5 200	3.39	0.86	3.00	4.00	4.00
hierarchization	5 200	0.39	0.19	0.25	0.41	0.54
pyramidization	5 200	0.46	0.19	0.35	0.49	0.59
share of layer 1 (%)	5 200	60.21	28.09	37.01	66.67	84.15
share of layer 2 (%)	5 200	21.55	19.81	6.52	16.37	30.98
share of layer 3 (%)	5 200	14.71	23.66	0.27	2.99	16.67
share of layer 4 (%)	5 200	3.54	7.53	0.00	1.47	3.88
business functions						
share of S&M employees (%)	5 200	4.41	12.10	0.00	0.00	1.97
share of R&D employees (%)	5 200	13.34	18.38	0.00	6.19	17.87
enabling functions						
share of F&A employees (%)	5 200	5.28	10.49	0.17	1.85	5.45
share of ICT & HR employees (%)	5 200	11.03	22.22	0.00	1.09	6.25
management						
share of middle managers (%)	5 200	1.74	5.25	0.00	0.00	1.40
share of top managers (%)	5 200	4.10	8.61	0.42	1.71	4.23

Table 3

Employment growth and employee turnover

The table reports estimated differences in employment growth and turnover rates between IPO firms and matched control firms, for the periods t-3 to t+2. Panel A presents the rates for period t-3 and Panel B over the five periods t-2 to t+2. Panel C presents a decomposition of the five-period rates from Panel B into yearly rates. The yearly coefficients for the growth rates add up to the cofficient over five-periods. This decomposition does not hold for the turnover rate as it is defined as the minimum between the hiring and the separation rate. The regression specification follows Eq. 3. In every regression, we control for the growth rate of t-4, $g_{f,t-5,t-4}$, and the log number of employees in t-4, $ln(E_{f,t-4})$. In addition, we control for year fixed effects, two-digit industry fixed effects, region fixed effects, and number-establishment fixed effects. See Section 4.6 for further details. The number of observations is 650 (325 IPO firms and 325 matched control firms). [t-2;t], [t+1;t+2], and [t-2;t+2] report the estimated differences over multi-period windows. T-statistics based on robust standard errors clustered at the firm level are presented in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. A detailed description of all variables can be found in Appendix A.

	growth rate	turnover rate
Panel A: Employment growth in t-3		
t-3 (pre-matching period)	0.014	0.004 6
	(0.67)	(0.46)
Panel B: Employment growth over the periods t-2 to t+2		
[t-2; t+2]	0.39***	0.23***
	(8.81)	(3.52)
Panel C: Decomposition of employment growth from t-2 to t+2		
t-2	0.037**	−0.021***
	(2.09)	(−2.91)
t-1	0.14***	−0.013
	(7.21)	(−1.40)
t	0.21***	0.050***
	(6.09)	(4.05)
t+1	0.069**	0.064***
	(2.13)	(4.69)
t+2	−0.062	0.052***
	(−1.43)	(4.71)

Table 4

Organizational growth

The table reports the estimated differences in the organizational growth between IPO firms and matched control firms over the five-period window t-2 to t+2 ([t-2;t2]). The dependent variables are the change in layers, the change in the hierachization, and the change in pyramidization. IPO is a dummy variable that indicates IPO firms. growth rate of employees$_{[t-2;t+2]}$ is the growth rate of the number of employees, growth rate of layer 1$_{[t-2;t+2]}$ is the growth rate of employees in layer 1 (i.e., production workers), Δlog establishments$_{[t-2;t+2]}$ is the change in the log number of establishments, Δregions$_{[t-2;t+2]}$ is the change in the number of regions in which the firm has establishments, and Δindustries$_{[t-2;t+2]}$ is the number of industries in which the firm operates. In every regression, we control for the growth rate of t-4, $g_{f,t-5,t-4}$, the log number of employees in t-4, $ln(E_{f,t-4})$, year fixed effects, two-digit industry fixed effects, region fixed effects, and number-establishment fixed effects. The regression models in columns 1 to 3 are estimated on the subsample of firms with less than four layers in year t=-3 (101 IPO firms and 101 matched control firms) and the regression models in columns 4 to 9 are estimated on the full sample (325 IPO firms and 325 matched contol firms). T-statistics based on robust standard errors clustered at the firm level are presented in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. A detailed description of all variables can be found in Appendix A.

	Δlayers			Δhierarchization			Δpyramidization		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
IPO	0.67***	0.31***	0.51***	0.035***	0.028**	0.035***	0.036***	0.032***	0.034***
	(6.25)	(2.77)	(4.61)	(3.43)	(2.58)	(3.30)	(3.53)	(2.93)	(3.23)
growth rate of employees$_{[t-2;t+2]}$		0.61***			0.031***			0.027***	
		(6.24)			(3.18)			(2.68)	
growth rate of layer 1$_{[t-2;t+2]}$			0.35***			0.012			0.023***
			(4.50)			(1.42)			(2.74)
Δlog establishments$_{[t-2;t+2]}$		−0.32	−0.19		−0.027	−0.020		−0.033	−0.032
		(−1.03)	(−0.59)		(−1.18)	(−0.87)		(−1.45)	(−1.39)
Δregions$_{[t-2;t+2]}$		0.24	0.24		−0.021	−0.019		−0.020	−0.020
		(1.09)	(1.02)		(−1.23)	(−1.13)		(−1.21)	(−1.16)
Δindustries$_{[t-2;t+2]}$		0.092	0.046		0.019	0.020		0.016	0.017
		(0.34)	(0.17)		(1.28)	(1.37)		(1.08)	(1.11)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number estab. FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	202	202	202	650	650	650	650	650	650
R2	0.37	0.50	0.45	0.07	0.10	0.09	0.10	0.12	0.13

Table 5

Decomposition of employment growth and employee turnover

The table reports estimated differences in employment growth and turnover rates between IPO firms and matched control firms controls, for the period t-2 to t+2. The regression specification in Panel A follows Eq. 3. In every regression, we control for the growth rate of t-4, $g_{f,t-5,t-4}$, and the log number of empl. in t-4, $ln(E_{f,t-4})$. In addition, we control for year fixed effects, two-digit industry fixed effects, region fixed effects, and number-establishment fixed effects. See Section 4.6 for further details. In Panel A, the dependent variables are growth rates over the periods t-2 to t+2 for the employment categories indicated in each column. In Panel B, the dependent variables are also the growth rates of the five-period window. As further controls for firm growth, we add the growth rate of total empl. over the periods t-2 to t+2, the change in the log number of estab., the change in the number of regions in which the firm has estab., and the change in the number of industries in which the firm operates. In Panel C, we replace the growth rate of total empl. by the growth rate of layer 1. In Panel C, the dependent variables are the turnover rates over the periods t-2 to t+2 for the employment categories indicated in each column. The turnover rate is defined as the minimum of the hiring rate and the separation rate. Compared to Panel B, we replace the five-period growth rate of total empl. by growth rates of the respective employment categories. The number of observations is 650 (325 IPO firms and 325 matched control firms). T-statistics based on robust standard errors clustered at the firm level are presented in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. A detailed description of all variables can be found in Appendix A.

	Hierarchies				Business functions		Enabling functions		Management	
	layer 1	layer 2	layer 3	layer 4	S&M	R&D	F&A	ICT & HR	middle man.	top man.
Panel A: Growth rates over [t-2;t+2]: basic controls										
IPO	0.33***	0.46***	0.49***	0.36***	0.19***	0.29***	0.55***	0.58***	0.48***	0.37***
	(6.45)	(7.59)	(7.16)	(4.59)	(2.78)	(4.28)	(7.75)	(8.20)	(5.99)	(4.93)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number estab. FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	650	650	650	650	650	650	650	650	650	650
R2	0.31	0.22	0.18	0.14	0.10	0.12	0.19	0.18	0.13	0.17

Table 5 continued

	Hierarchies				Business functions		Enabling functions		Management	
	layer 1	layer 2	layer 3	layer 4	S&M	R&D	F&A	ICT & HR	middle man.	top man.
Panel B: Growth rates over [t-2;t+2]: controls for firm growth										
IPO	−0.053*	0.17***	0.14**	0.089	0.051	0.014	0.26***	0.30***	0.23***	0.100
	(−1.94)	(3.05)	(2.15)	(1.10)	(0.70)	(0.22)	(3.58)	(4.04)	(2.85)	(1.30)
growth rate of empl.	0.99***	0.77***	0.85***	0.63***	0.32***	0.70***	0.72***	0.65***	0.63***	0.59***
	(30.87)	(12.87)	(13.07)	(7.99)	(4.61)	(9.87)	(9.53)	(7.93)	(8.42)	(8.02)
Δlog estab.	−0.006 3	−0.089	−0.21**	−0.13	0.15	0.20*	−0.11	−0.011	−0.28	0.036
	(−0.19)	(−1.00)	(−2.37)	(−0.99)	(0.89)	(1.84)	(−0.98)	(−0.09)	(−1.58)	(0.30)
Δregions	−0.024	−0.047	0.19***	0.24**	−0.053	−0.13	0.096	0.10	0.24*	0.21**
	(−0.89)	(−0.71)	(2.65)	(2.20)	(−0.41)	(−1.29)	(1.05)	(1.13)	(1.95)	(2.44)
Δindustries	−0.011	0.094*	0.16**	−0.030	0.050	0.016	0.088	0.17**	0.018	−0.079
	(−0.53)	(1.66)	(2.41)	(−0.39)	(0.48)	(0.25)	(1.37)	(2.34)	(0.17)	(−0.94)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number estab. FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	650	650	650	650	650	650	650	650	650	650
R2	0.82	0.46	0.43	0.26	0.14	0.31	0.36	0.34	0.23	0.30
Panel C: Growth rates over [t-2;t+2]: alternative controls for firm growth										
IPO	n/a	0.32***	0.28***	0.19**	0.091	0.13*	0.38***	0.40***	0.33***	0.20***
	n/a	(4.97)	(4.04)	(2.36)	(1.29)	(1.90)	(4.99)	(5.48)	(4.07)	(2.62)
growth rate of layer 1	n/a	0.39***	0.53***	0.38***	0.24***	0.44***	0.45***	0.41***	0.38***	0.35***
	n/a	(5.79)	(8.70)	(5.19)	(4.20)	(6.58)	(5.90)	(6.13)	(5.67)	(4.93)
Δlog estab.	n/a	0.047	−0.096	−0.038	0.18	0.30**	−0.016	0.076	−0.19	0.13
	n/a	(0.46)	(−0.97)	(−0.28)	(1.08)	(2.51)	(−0.13)	(0.62)	(−1.06)	(1.01)
Δregions	n/a	−0.011	0.23***	0.27**	−0.041	−0.095	0.13	0.13	0.26**	0.24***
	n/a	(−0.15)	(2.93)	(2.39)	(−0.32)	(−0.94)	(1.37)	(1.37)	(2.16)	(2.59)
Δindustries	n/a	0.12*	0.18***	−0.009 2	0.058	0.039	0.11*	0.19**	0.039	−0.058
	n/a	(1.87)	(2.70)	(−0.11)	(0.55)	(0.56)	(1.74)	(2.52)	(0.35)	(−0.64)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number estab. FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	650	650	650	650	650	650	650	650	650	650
R2	1.00	0.32	0.33	0.21	0.14	0.23	0.29	0.28	0.19	0.25

Table 5 continued

	Hierarchies				Business functions		Enabling functions		Management	
	layer 1	layer 2	layer 3	layer 4	S&M	R&D	F&A	ICT & HR	middle man.	top man.
Panel D: Turnover rates over [t-2;t+2]: additional controls for firm growth										
IPO	0.29***	0.37***	0.58***	0.63***	0.23**	0.26**	0.57***	0.47***	0.60***	0.65***
	(4.05)	(4.15)	(4.59)	(5.68)	(2.48)	(2.22)	(2.74)	(4.15)	(5.36)	(5.60)
growth rate of category	−0.16**	−0.090	−0.17**	0.089	0.14	−0.14	−0.092	−0.042	0.22***	0.18**
	(−2.10)	(−1.10)	(−1.99)	(1.05)	(1.31)	(−1.16)	(−0.51)	(−0.61)	(2.79)	(2.00)
Δlog estab.	0.19	0.10	0.29	0.54	0.15	−0.10	0.23	0.14	0.089	0.58
	(1.42)	(0.66)	(1.51)	(1.52)	(0.66)	(−0.38)	(1.23)	(0.84)	(0.44)	(1.09)
Δregions	−0.22**	−0.15	−0.18	−0.36**	−0.29*	0.045	−0.18	−0.20	−0.17	−0.21
	(−2.11)	(−1.15)	(−1.38)	(−2.43)	(−1.73)	(0.18)	(−1.39)	(−1.44)	(−1.12)	(−1.28)
Δindustries	−0.016	−0.007 5	0.003 0	−0.18	0.054	0.11	−0.044	0.031	0.017	−0.17
	(−0.12)	(−0.06)	(0.02)	(−0.88)	(0.30)	(0.61)	(−0.35)	(0.27)	(0.12)	(−0.58)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number estab. FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	650	650	650	650	650	650	650	650	650	650
R2	0.31	0.17	0.18	0.19	0.16	0.14	0.11	0.18	0.15	0.18

Table 6

Organizational change

This table presents the change in employment shares for employees from year t=-3 to year t=2 in the four layers, for the IPO firms and the IPO firms compared to the matched control firm. Panel A presents the change in employment shares for the four layers and Panel B for the occupation focus groups. The percentage change is calculated relative to the value of year t=-3. A detailed description of all variables can be found in Appendix A.

	IPO			ΔIPO - ΔMatched		ΔIPO - ΔMatched	
	t=-3	t=-1	t=2	[t=-3,t=-1]		[t=-3,t=2]	
	mean	mean	mean	DiD	t-stat	DiD	t-stat
Panel A: Employment share of hierarchies							
layer 1	58.17	58.46	57.00	−1.16	−1.33	−3.09**	−2.43
layer 2	22.24	21.68	21.70	0.64	0.81	1.40	1.30
layer 3	15.25	15.97	17.21	0.76	1.34	2.41***	2.87
layer 4	4.34	3.89	4.09	−0.24	−0.58	−0.73	−1.19
Panel B: Employment share of organizational functions							
S&M employees	4.11	3.82	3.47	−0.23	−0.90	−0.93**	−2.17
R&D employees	14.78	13.97	12.94	−0.28	−0.50	−1.02	−1.49
F&A employees	5.49	5.84	7.90	0.45	0.96	2.49***	3.48
ICT & HR employees	10.98	11.60	11.97	0.44	1.03	1.22*	1.71
Panel C: Employment share of management							
middle managers	1.89	2.31	3.21	0.70**	2.40	1.67***	4.42
top managers	5.08	4.25	4.41	−0.80	−1.50	−1.45**	−2.09
Panel D: Employee characteristics							
tenure	2.74	3.00	3.30	−0.30***	−5.26	−0.62***	−6.63
age	36.48	36.92	37.54	−0.32**	−2.07	−1.06***	−4.97
industry experience	3.70	4.27	5.17	−0.30***	−4.46	−0.61***	−6.13
occupation experience	3.47	3.96	4.74	−0.31***	−5.09	−0.53***	−5.38
education score	2.65	2.71	2.82	0.05*	1.75	0.09**	2.46

Table 7

Organizational change by hierarchical layer

This table presents the change in employment shares for employees from year t=-3 to year t=2 in the four layers, for the IPO firms and the IPO firms compared to the matched control firm. Panel A presents the change in employment shares for the four layers and Panel B for the occupation focus groups. The percentage change is calculated relative to the value of year t=-3. A detailed description of all variables can be found in Appendix A.

	IPO at t=-3				IPO at t=2				ΔIPO - ΔMatched			
	layer 1	layer 2	layer 3	layer 4	layer 1	layer 2	layer 3	layer 4	layer 1	layer 2	layer 3	layer 4
business functions												
S&M employees	2.60	1.51	0.00	0.00	2.42	1.05	0.00	0.00	−0.39	−0.54*	0.00	0.00
R&D employees	0.50	12.98	1.30	0.00	0.50	11.23	1.21	0.00	−0.08	−0.80	−0.14	0.00
enabling functions												
F&A employees	0.15	2.95	2.37	0.02	0.27	4.47	3.08	0.08	−0.15	1.79***	0.80*	0.05
ICT & HR employees	0.03	0.03	10.92	0.00	0.05	0.11	11.80	0.00	−0.04	−0.01	1.27*	0.00
management												
middle managers	0.00	0.24	1.65	0.00	0.00	0.46	2.75	0.00	0.00	0.31**	1.36***	0.00
top managers	0.00	0.01	0.73	4.34	0.00	0.01	0.30	4.09	0.00	−0.15	−0.57	−0.73

Table 8

Going public and wage growth

This table presents the change in log wages from year t=-3 to year t=-1 and from year t=-3 to year t=2, for the IPO firms and the IPO firms compared to the matched control firms. Panel A presents the change in log wages for all employees, hires and incumbents, Panel B for the hierarchies, Panel C for the organizational functions, and Panel D for the management. T-statistics based on robust standard errors clustered at the firm level are presented in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. A detailed description of all variables can be found in Appendix A.

	IPO			ΔIPO - ΔMatched		ΔIPO - ΔMatched	
	t=-3	t=-1	t=2	[t=-3,t=-1]		[t=-3,t=2]	
	mean	mean	mean	DiD	t-stat	DiD	t-stat
Panel A: Wages of labor force, incumebtns, and new hires							
all employees	119.74	128.81	136.05	0.028***	2.77	0.042***	3.14
hired employees	106.23	115.14	127.17	0.050**	2.22	0.076***	3.29
incumbent employees	125.39	134.51	138.59	0.023**	2.12	0.018	1.29
Panel B: Wages of hierarchies							
layer 1	102.03	107.68	113.70	0.008	0.63	0.008	0.48
layer 2	132.09	144.52	149.99	0.051***	2.98	0.032*	1.73
layer 3	152.88	162.51	171.96	0.029	1.49	−0.002	−0.08
layer 4	185.28	203.42	212.80	0.035	1.40	0.059**	2.11
Panel C: Wages of organizational functions							
S&M employees	144.94	155.63	161.09	0.027	1.09	0.025	0.83
R&D employees	139.90	148.32	165.52	0.023	1.18	0.015	0.78
F&A employees	146.80	153.93	161.98	0.031	1.28	−0.002	−0.06
ICT & HR employees	137.83	150.56	155.17	0.044**	2.18	0.012	0.50
Panel D: Wages of management							
middle mangers	168.54	178.24	184.59	−0.005	−0.16	−0.109**	−2.39
top managers	182.33	201.12	209.71	0.058**	2.25	0.080***	2.80

Table 9

Going public and inequality

This table presents the change in pay and eudcation ratios from year t=-3 to year t=-1 and from year t=-3 to year t=2, for the IPO firms and the IPO firms compared to the matched control firms. Panel A presents the change in different pay ratios and Panel B the change in different education score ratios. T-statistics based on robust standard errors clustered at the firm level are presented in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. A detailed description of all variables can be found in Appendix A.

	IPO			ΔIPO - ΔMatched		ΔIPO - ΔMatched	
	t=-3	t=-1	t=2	[t=-3,t=-1]		[t=-3,t=2]	
	mean	mean	mean	DiD	t-stat	DiD	t-stat
Panel A: Education score ratios							
education ratio top/bottom	1.73	1.76	1.73	0.080*	1.79	0.107**	2.04
education ratio 90th/10th	2.18	2.26	2.33	0.086	1.39	0.136*	1.93
education ratio top/middle	1.10	1.04	1.06	0.004	0.06	−0.066	−0.79
education ratio 75th/25th	1.65	1.70	1.80	0.039	1.00	0.169***	3.29
Panel B: Pay ratios							
pay ratio top/bottom	1.77	1.87	1.87	0.090***	3.42	0.088***	3.16
pay ratio 90th/10th	2.44	2.54	2.54	−0.004	−0.17	0.028	1.14
pay ratio top/middle	1.18	1.22	1.26	0.021	0.48	0.154***	2.80
pay ratio 75th/25th	1.58	1.61	1.61	0.006	0.35	0.041**	2.54

Table 10

Going public, organizational change, and management turnover

The table reports estimated differences in turnover rates of middle managers, top managers, and all employees between IPO firms and matched control firms controls, for the periods t-2 to t+2. We interact the IPO dummy with the change in the number of layers over the periods t-2 to t+2, which is centered at its mean.We control for the five-period growth rates of the respective employment categories. As controls for firm growth, we add the change in the log number of establishments over the periods t-2 to t+2, the change in the number of regions in which the firm has establishments, and the change in the number of industries in which the firm operates. In every regression, we control for the growth rate of t-4, $g_{f,t-5,t-4}$, the log number of employees in t-4, $ln(E_{f,t-4})$, year fixed effects, two-digit industry fixed effects, region fixed effects, and number-establishment fixed effects. T-statistics based on robust standard errors clustered at the firm level are presented in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. A detailed description of all variables can be found in Appendix A.

	middle managers	top managers	all employees
	(1)	(2)	(3)
IPO	0.58***	0.54***	0.34***
	(4.91)	(4.21)	(4.85)
Δlayers$_{[t-2;t+2]}$	0.066	0.074	−0.040
	(0.52)	(0.56)	(−0.56)
IPO x Δlayers$_{[t-2;t+2]}$	0.47***	0.58***	0.12
	(2.91)	(3.30)	(1.30)
growth rate of employee category$_{[t-2;t+2]}$	−0.062	0.022	−0.33***
	(−0.86)	(0.33)	(−4.94)
Δlog establishments$_{[t-2;t+2]}$	0.10	0.64**	0.23
	(0.41)	(2.45)	(1.59)
Δregions$_{[t-2;t+2]}$	−0.13	−0.22	−0.18*
	(−0.71)	(−1.11)	(−1.72)
Δindustries$_{[t-2;t+2]}$	−0.017	−0.23	0.012
	(−0.11)	(−1.31)	(0.13)
Year FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Region FE	Yes	Yes	Yes
Number estab. FE	Yes	Yes	Yes
Obs	650	650	650
R2	0.16	0.21	0.27

Appendix A. Variable definitions

Variable	Description
Firm and employment characteristics	
IPO	Dummy variables that indicates IPO firms.
number of employees	Number of total employees of a firm.
employment growth rate	Employment growth rate of a firm from time t to time $t+k$.
hiring rate	Hiring rate of a firm from time t to time $t+k$.
separation rate	Separation rate of a firm from time t to time $t+k$.
wage	Mean imputed real daily wage of a firm. The base year for the inflation adjustment using the Consumer Price Index is 2015.
log wage	Mean imputed log real daily wage of a firm. The base year for the inflation adjustment using the Consumer Price Index is 2015.
firm age	Age of a firm measured by the first occurrence of an establishment in the employment data.
share of medium-qualified	Share of medium-skilled employees in a firm, i.e. employees with a lower secondary, intermediate secondary or upper secondary school leaving certificate and a vocational qualification.
share of high-qualified	Share of high-skilled employees in a firm, i.e. employees with a degree from a university of applied sciences or a university.
number of establishments	Number of establishments of a firm.
number of industries	Number of industries in which a firm operates. It is measured by the number of unique two-digits industry codes of a firm's establishments.
number of regions	Number of establishments in which a firm has an establishment. We differentiate between four regions. These are South, North, East, and West Germany.
Knowledge-based hierarchies	
layers	Number of hierarchical layers in a firm, ranging from 1 to 4.
hierarchization	Hierarchization of a firm measured based on the number of hierarchical layers and their employment shares: $1-\sum_{l=1}^{4}(\frac{E_{f,j,t}}{E_{f,t}})^2$, where $E_{f,j,t}$ denotes the number of employees in layer j of firm f in year t and E_f its total number of employees. Hierarchization ranges from 0 for a flat firm with a single layer to 0.75 for a hierarchical firm with four layers and equally distributed employment across layers. The most hierarchical organization has a control span of 1 (the employee ratio of one layer to the layer below is 1:1).
pyramidization	Pyramidization of a firm measured by the number of hierarchical layers and their employment shares assigning weights to each layer. The weights ensure that the score is higher for pyramidal structures with control spans larger than one by giving larger weights to higher layers: $1-\sum_{j=1}^{4}(\frac{w_j E_{j,f,t}}{E_{w,f,t}})^2$, where w_j is the employment weight of layer j. We assign a weight of 1 to layer 1, 2 to layer 2, 3 to layer 3, 4 to layer 4. $E_{w,f,t}$ is the sum of the weighted employment of the four layers, $\sum_{j=1}^{4} w_j E_{j,f,t}$. Pyramidization ranges from 0 for a flat firm with a single layer to 0.75 for a firm with four layers and a pyramidal structure having the following control spans: layer 1 to layer 2: 4/3=1.33, layer 2 to layer 3: 3/2=1.5, layer 3 to layer 4: 2/1=2.
layer 2	Employees in occupations belonging to layer 2 (problem solvers - level 1).
layer 3	Employees in occupations belonging to layer 3 (problem solvers - level 2).
layer 4	Employees in occupations belonging to layer 4 (problem solvers - level 3).

continued on next page

Appendix A. continued

Variable	Description
Organizational functions	
S&M employees	Employes in sales and marketing occupations, defined by the 2010 Occupation Classification Codes (KldB2010) 43233 (occupations in IT-sales-complex tasks), 6112 (occupations in sales), 61194 (managers in purchasing and sales), 921 (occupations in advertising and marketing), and 9322 (occupations in visual marketing), as well as the 1988 Occupation Classification Codes 682 (salespersons), 687 (commercial agents, travellers), and 688 (mobile traders) .
R&D employees	Employees in the occupation groups technicians and engineers defined by Blossfeld (1987).
F&A employees	Employees in finance & accounting occupations, defined by the 2010 Occupation Classification Codes (KldB2010) 721 (occupations in insurance and financial services), 722 (occupations in accounting, controlling and auditing), and 723 (occupations in tax consultancy), as well as the 1988 Occupation Classification Codes 691 (bank specialists), 694 (life, property insurance specialists), 752 (management consultants, organisors), 753 (chartered accountants, tax advisers), 771 (cost accountants, valuers), 772 (accountants), and 881 (economic and social scientists, statisticians).
ICT & HR employees	Employees in information communication technology and human resources occupations, defined by the 2010 Occupation Classification Codes (KldB2010) 715 (occupations in human resources management and personnel service) and 43353 (occupations in database development and administration-complex tasks) , as well as the 1988 Occupation Classification Codes 774 (data processing specialists) and 863 (Work, vocational advisors).
Management	
managers	Employees in the occupation group manager defined by Blossfeld (1987).
middle managers	Managers in hierarchies below the highest hierarchy of a firm.
top managers	Managers in the highest hierarchy level of a firm.
Employee characteristics	
tenure	Number of years that an employee is employed at the establishment
age	Employee age.
industry experience	Number of years that an employee is employed at an establishment in the two-digit industry.
occupation experience	Number of years that an employee is employed in the twelve occupation groups defined by Blossfeld (1987).

continued on next page

Appendix A. continued

Variable	Description
education score	Worker education is reported by employers after every year and whenever a job ends (whatever may occur first). Since non- and misreporting has no direct consequences, there might be misreporting. To correct for these potential misreportings, we follow the imputation procedure suggested by Fitzenberger et al. (2006). Specifically, we utilize the reporting rule which prescribes that only the highest educational degree of an employee needs to be reported. Hence, educational attainment should not decline over consecutive job spells. The original education variable in the admin data distinguishes six categories, plus an additional category for missing information. We convert these into the following categories: (0) missing; (1) intermediate school leaving certificate without vocational training (low); (2) intermediate school leaving certificate with vocational training (medium); (3) upper secondary school leaving certificate without vocational training (medium); (4) upper secondary school leaving certificate with vocational training (high); (5) college or university degree (high).
F&A experience	Number of years that an employee is employed in a finance & accounting occupation.
listed firm experience	Number of years that an employee is employed at a listed firm.
female	Dummy variable that indicates female employees.

INTERNET APPENDIX

for

Going Public and the Internal Organization of the Firm

(NOT INTENDED FOR PUBLICATION)

Table IA.1

Organizational growth: firms with same number of layers in t-3

The table repeats the analysis shown in Table 4 for 196 IPO firms and 196 matched control firms with the same number of layers in t-3. Each column examines the estimated differences in the organizational growth between IPO firms and matched control firms over the five-period window t-2 to t+2 ([t-2;t2]). The dependent variables are the change in the layers, the change in hierarchization, the change in the pyramidization. IPO is a dummy variable that indicates IPO firms. growth rate of employees$_{[t-2;t+2]}$ is the growth rate of the number of employees, growth rate of layer $1_{[t-2;t+2]}$ is the growth rate of employees in layer 1 (i.e., production workers), Δlog establishments$_{[t-2;t+2]}$ is the change in the log number of establishments, Δregions$_{[t-2;t+2]}$ is the change in the number of regions in which the firm has establishments, and Δindustries$_{[t-2;t+2]}$ is the number of industries in which the firm operates. In every regression, we control for the growth rate of t-4, $g_{f,t-5,t-4}$, the log number of employees in t-4, $ln(E_{f,t-4})$, year fixed effects, two-digit industry fixed effects, region fixed effects, and number-establishment fixed effects. T-statistics based on robust standard errors clustered at the firm level are presented in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. A detailed description of all variables can be found in Appendix A.

	Δlayers			Δhierarchization			Δpyramidization		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
IPO	0.25***	0.10*	0.18***	0.051***	0.046***	0.053***	0.052***	0.053***	0.055***
	(4.28)	(1.85)	(3.15)	(4.04)	(3.51)	(4.08)	(4.39)	(4.30)	(4.56)
growth rate of employees$_{[t-2;t+2]}$		0.48***			0.035***			0.023*	
		(8.38)			(2.66)			(1.86)	
growth rate of layer $1_{[t-2;t+2]}$			0.27***			0.016			0.023**
			(5.35)			(1.49)			(2.18)
Δlog establishments$_{[t-2;t+2]}$		−0.31**	−0.23*		−0.038	−0.032		−0.049*	−0.049*
		(−2.56)	(−1.85)		(−1.37)	(−1.14)		(−1.87)	(−1.86)
Δregions$_{[t-2;t+2]}$		0.077	0.12		−0.027	−0.024		−0.029	−0.028
		(0.86)	(1.23)		(−1.30)	(−1.15)		(−1.48)	(−1.41)
Δindustries$_{[t-2;t+2]}$		−0.017	−0.003 7		0.018	0.019		0.015	0.015
		(−0.24)	(−0.05)		(1.09)	(1.16)		(0.99)	(0.98)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number estab. FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	392	392	392	392	392	392	392	392	392
R2	0.23	0.37	0.30	0.22	0.25	0.23	0.27	0.30	0.30

Table IA.2

Employment growth and employee turnover: knowledge-based hierarchies

The table reports estimated differences in employment growth, hiring, and separation rates of the layers between IPO firms and matched control firms controls. [t-2;t] reports the estimated difference over t-2, t+1, and t, [t+1;t+2] over t+1 and t+2, and [t-2;t+2] over the t-2, t-1, t, t+1, and t+2. The regression specification follows Eq. 3. In every regression, we control for the growth rate of t-4, $g_{f,t-5,t-4}$, and the log number of employees in t-4, $ln(E_{f,t-4})$. In addition, we control for year fixed effects, two-digit industry fixed effects, and region fixed effects. See Section 4.6 for further details. T-statistics based on robust standard errors clustered at the firm level are presented in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. A detailed description of all variables can be found in Appendix A.

	growth rate	turnover rate
Panel A: Layer 1		
t-2	0.051*	0.006 2
	(1.76)	(0.63)
t-1	0.19***	0.000 49
	(6.69)	(0.05)
t	0.13***	0.043***
	(4.13)	(4.16)
t+1	0.053**	0.033***
	(2.20)	(3.57)
t+2	0.015	0.020**
	(0.61)	(2.11)
[t-2; t]	0.30***	0.004 8
	(7.00)	(0.16)
[t+1; t+2]	0.058*	0.025
	(1.81)	(0.58)
[t-2; t+2]	0.33***	0.22***
	(6.45)	(3.59)
Panel B: Layer 2		
t-2	0.12***	0.025***
	(2.93)	(2.89)
t-1	0.17***	0.029**
	(4.48)	(2.46)
t	0.14***	0.030***
	(3.66)	(2.62)
t+1	0.076**	0.024**
	(2.15)	(2.40)
t+2	0.041	0.024**
	(1.42)	(2.14)
[t-2; t]	0.36***	0.065
	(6.80)	(1.57)
[t+1; t+2]	0.11***	0.064***
	(2.66)	(2.71)
[t-2; t+2]	0.46***	0.31***
	(7.59)	(3.74)

Table IA.2 continued

	growth rate	turnover rate
Panel C: Layer 3		
t-2	0.10**	0.030***
	(2.41)	(2.84)
t-1	0.18***	0.031***
	(4.09)	(2.65)
t	0.23***	0.044***
	(4.93)	(3.95)
t+1	0.12***	0.061***
	(2.74)	(5.61)
t+2	0.013	0.054***
	(0.30)	(5.71)
[t-2; t]	0.44***	0.12***
	(7.16)	(2.82)
[t+1; t+2]	0.12**	0.15***
	(2.24)	(5.01)
[t-2; t+2]	0.49***	0.49***
	(7.16)	(5.01)
Panel D: Layer 4		
t-2	0.075	0.029***
	(1.64)	(2.64)
t-1	0.11**	0.026**
	(1.98)	(2.04)
t	0.19***	0.090***
	(3.66)	(7.23)
t+1	0.031	0.059***
	(0.61)	(4.43)
t+2	0.043	0.043***
	(0.93)	(3.39)
[t-2; t]	0.30***	0.18***
	(4.47)	(4.29)
[t+1; t+2]	0.073	0.16***
	(1.16)	(5.44)
[t-2; t+2]	0.36***	0.65***
	(4.59)	(6.39)

Table IA.3

Employment growth and employee turnover: functions and management

The table reports estimated differences in employment growth, hiring, and separation rates of the occupation focus groups between IPO firms and matched control firms controls, for the periods from t-2 to t+2. The regression specification follows Eq. 3. In every regression, we control for the growth rate of t-4, $g_{f,t-5,t-4}$, and the log number of employees in t-4, $ln(E_{f,t-4})$. In addition, we control for year fixed effects, two-digit industry fixed effects, and region fixed effects. See Section 4.6 for further details. [t-2;t], [t+1;t+2], and [t-2;t+2] report the estimated differences over multi-period windows. T-statistics based on robust standard errors clustered at the firm level are presented in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. A detailed description of all variables can be found in Appendix A.

	growth rate	turnover rate
Panel A: S&M employees (business function)		
t-2	0.052	0.002 4
	(1.33)	(0.32)
t-1	0.089**	−0.004 2
	(2.05)	(−0.48)
t	0.069	0.013
	(1.50)	(1.35)
t+1	−0.002 6	0.010
	(−0.05)	(1.01)
t+2	0.019	−0.004 6
	(0.46)	(−0.49)
[t-2; t]	0.18***	0.14***
	(2.89)	(3.15)
[t+1; t+2]	0.022	0.048**
	(0.38)	(2.15)
[t-2; t+2]	0.19***	0.23**
	(2.78)	(2.53)
Panel B: R&D employees (business function)		
t-2	0.063	0.007 8
	(1.59)	(0.86)
t-1	0.091**	0.015
	(2.38)	(1.46)
t	0.11***	0.017
	(2.78)	(1.52)
t+1	0.064	0.036***
	(1.39)	(3.71)
t+2	0.044	0.007 2
	(1.08)	(0.88)
[t-2; t]	0.23***	0.12
	(3.85)	(1.52)
[t+1; t+2]	0.10*	0.027
	(1.92)	(0.66)
[t-2; t+2]	0.29***	0.22**
	(4.28)	(2.15)

Table IA.3 continued

	growth rate	turnover rate
Panel C: F&A employees (enabling function)		
t-2	0.042	0.016
	(0.95)	(1.33)
t-1	0.17***	0.039***
	(3.94)	(2.87)
t	0.19***	0.052***
	(4.18)	(4.13)
t+1	0.21***	0.049***
	(4.82)	(3.99)
t+2	0.057	0.049***
	(1.46)	(4.03)
[t-2; t]	0.35***	0.12**
	(5.87)	(2.56)
[t+1; t+2]	0.24***	0.17***
	(4.38)	(6.02)
[t-2; t+2]	0.55***	0.51***
	(7.75)	(3.67)
Panel D: ICT & HR employees (enabling function)		
t-2	0.11**	0.019**
	(2.55)	(2.20)
t-1	0.15***	0.019
	(3.50)	(1.61)
t	0.25***	0.030***
	(5.67)	(3.15)
t+1	0.15***	0.048***
	(3.78)	(4.89)
t+2	0.093**	0.040***
	(2.16)	(4.16)
[t-2; t]	0.43***	0.046
	(6.89)	(1.46)
[t+1; t+2]	0.22***	0.12***
	(4.11)	(4.51)
[t-2; t+2]	0.58***	0.43***
	(8.20)	(4.85)

Table IA.3 continued

	growth rate	turnover rate
Panel E: Middle managers (management)		
t-2	0.054	0.022***
	(1.01)	(2.63)
t-1	0.20***	0.028***
	(3.90)	(2.69)
t	0.26***	0.078***
	(4.47)	(5.99)
t+1	0.073	0.061***
	(1.34)	(4.62)
t+2	0.000 58	0.065***
	(0.01)	(5.33)
[t-2; t]	0.46***	0.24***
	(6.28)	(6.13)
[t+1; t+2]	0.073	0.21***
	(1.11)	(6.78)
[t-2; t+2]	0.48***	0.68***
	(5.99)	(6.10)
Panel F: Top managers (management)		
t-2	0.068	0.059***
	(1.63)	(3.87)
t-1	0.089*	0.066***
	(1.79)	(3.78)
t	0.15***	0.10***
	(2.81)	(6.91)
t+1	0.093*	0.052***
	(1.90)	(3.20)
t+2	0.022	0.062***
	(0.52)	(3.91)
[t-2; t]	0.27***	0.23***
	(4.05)	(4.46)
[t+1; t+2]	0.11*	0.19***
	(1.78)	(5.18)
[t-2; t+2]	0.37***	0.74***
	(4.93)	(6.07)

Table IA.4

Decomposition of employment growth and employee turnover: sub-periods

The table reports estimated differences in employment growth and turnover rates between IPO firms and matched control firms controls, for the periods t-2 to t+2 The regression specification in Panel A follows Eq. 3. In every regression, we control for the growth rate of t-4, $g_{f,t-5,t-4}$, and the log number of empl. in t-4, $ln(E_{f,t-4})$. In addition, we control for year fixed effects, two-digit industry fixed effects, region fixed effects, and number-establishment fixed effects. See Section 4.6 for further details. In Panel A, the dependent variables are growth rates over the periods t-2 to t+2 for the employment categories indicated in each column. In Panel B, the dependent variables are also the growth rates of the five-period window. As further controls for firm growth, we add the change in the log number of estab. over the periods t-2 to t+2, the change in the number of regions in which the firm has estab., and the change in the number of industries in which the firm operates. In Panel C, the dependent variables are the turnover rates over the periods t-2 to t+2 for the employment categories indicated in each column. The turnover rate is defined as the minimum of the hiring rate and the separation rate. We further control for the five-period growth rates of the respective employment categories. The number of observations is 650 (325 IPO firms and 325 matched control firms). T-statistics based on robust standard errors clustered at the firm level are presented in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. A detailed description of all variables can be found in Appendix A.

	Hierarchies				Business functions		Enabling functions		Management	
	layer 1	layer 2	layer 3	layer 4	S&M	R&D	F&A	ICT & HR	middle man.	top man.
Panel A: Growth rates over [t-2;t+2]: basic controls										
[t-2;t]	0.30***	0.36***	0.44***	0.30***	0.18***	0.23***	0.35***	0.43***	0.46***	0.27***
	(7.00)	(6.80)	(7.16)	(4.47)	(2.89)	(3.85)	(5.87)	(6.89)	(6.28)	(4.05)
[t+1;t+2]	0.058*	0.11***	0.12**	0.073	0.022	0.10*	0.24***	0.22***	0.073	0.11*
	(1.81)	(2.66)	(2.24)	(1.16)	(0.38)	(1.92)	(4.38)	(4.11)	(1.11)	(1.78)
[t-2;t+2]	0.33***	0.46***	0.49***	0.36***	0.19***	0.29***	0.55***	0.58***	0.48***	0.37***
	(6.45)	(7.59)	(7.16)	(4.59)	(2.78)	(4.28)	(7.75)	(8.20)	(5.99)	(4.93)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number estab. FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table IA.4 continued

	Hierarchies				Business functions		Enabling functions		Management	
	layer 1	layer 2	layer 3	layer 4	S&M	R&D	F&A	ICT & HR	middle man.	top man.
Panel B: Growth rates over [t-2;t+2]: controls for firm growth										
[t-2;t]	−0.045*	0.069	0.15**	0.002 6	0.051	0.013	0.074	0.19***	0.21***	−0.001 3
	(−1.89)	(1.36)	(2.34)	(0.04)	(0.78)	(0.20)	(1.16)	(2.79)	(2.91)	(−0.02)
[t+1;t+2]	0.000 63	0.065*	0.058	0.026	−0.009 9	0.051	0.18***	0.17***	0.023	0.058
	(0.03)	(1.81)	(1.22)	(0.42)	(−0.17)	(1.00)	(3.64)	(3.49)	(0.36)	(0.99)
[t-2;t+2]	−0.053*	0.17***	0.14**	0.089	0.051	0.014	0.26***	0.30***	0.23***	0.100
	(−1.94)	(3.05)	(2.15)	(1.10)	(0.70)	(0.22)	(3.58)	(4.04)	(2.85)	(1.30)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number estab. FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Panel C: Growth rates over [t-2;t+2]: alternative controls for firm growth										
[t-2;t]	n/a	0.24***	0.30***	0.17**	0.099	0.12*	0.22***	0.30***	0.34***	0.15**
	n/a	(4.01)	(4.60)	(2.33)	(1.59)	(1.83)	(3.33)	(4.50)	(4.75)	(2.14)
[t+1;t+2]	n/a	0.087**	0.087	0.042	−0.000 81	0.070	0.20***	0.19***	0.035	0.077
	n/a	(2.15)	(1.61)	(0.66)	(−0.01)	(1.29)	(3.79)	(3.64)	(0.53)	(1.26)
[t-2;t+2]	n/a	0.32***	0.28***	0.19**	0.091	0.13*	0.38***	0.40***	0.33***	0.20***
	n/a	(4.97)	(4.04)	(2.36)	(1.29)	(1.90)	(4.99)	(5.48)	(4.07)	(2.62)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number estab. FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes