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Dancing With the Stars: How Talent Shapes Firm Performance

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Abstract

The pundits declare that the war for talent is raging and that firms must respond proactively to the fundamental scarcity of talent. In spite of the attention that attracting and retaining talent receives, yet little is known about how firms should manage their portfolios of talent. Should firms focus on developing few highly talented people ? the stars ? that make the less talented shine or should they try to maintain an overall high talent quality of talent? Our paper addresses these questions empirically in study of how management and worker talents influence financial performance in a panel of Danish firms and their employees. The results indicate that high talent managers substitute for high talent workers. Hence star managers add more value in those organizations where workers have less average talent.

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DANCING WITH THE STARS: HOW TALENT SHAPES FIRM PERFORMANCE

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ABSTRACT

In spite of the attention that attracting and retaining talent receives, little is known about effective talent management. What is the impact of talent on firm performance, among which employee types should firms build talent and do complementarities between employee talent and firm resources affect which talent management approach firms should follow? Our paper contributes with two insights using a rich panel of Danish matched employer-employee data. We identify a tradeoff between short term adjustment costs and longer term gains from increasing talent where initial gains appear of offset later benefits. We identify important complementarities between manager and worker talent, and between these and the firm's capital resources and organizational design. These complementarities suggest that firms can create and appropriate rents from talent when their talent acquisition strategy is well aligned with policy and organizational choices.

DANCING WITH THE STARS: HOW TALENT SHAPES FIRM PERFORMANCE

Talent is a scarce resource and many believe that talents have an extraordinary influence on firm performance. Most people are familiar with examples from team sports where a superstar such as Lionel Messi can make or break the performance of the FC Barcelona squad. In the business world, iconic CEO's are also attributed with special abilities that profoundly influence firm performance. The late Steve Jobs was one particularly prominent example of this phenomenon[1]. Even so, the attribution of organizational success to particularly gifted individuals may be the hallmark of individualist western cultures (Groysberg, Lee, & Nanda, 2008). It is nevertheless unclear from extant research how firms should exploit scarce individual talent.

Emerging resource-based perspectives on talent management identify talent as superior individual productivity and argue that talent is particularly important for filling influential roles in the organization. There is nevertheless limited advice in extant research in terms of identifying how talented individuals affect firm performance (Collings & Mellahi, 2009). Talent is seldom exploited in a vacuum. Individuals' impact on organizational performance therefore depends on interactions with other employees. When assembling its portfolio of employees, the firm can leverage potential complementarities among employees' abilities by selecting the appropriate organizational design (Garicano & Hubbard, 2007; Rosen, 1982). Selection of the right organizational design allows firms to leverage scarce talent resources. Exploitation of individual talent may also depend on the firm's capital resources and intellectual property – resources that are complementary to individual talent (Dow & Putterman, 2000). Particularly the nature of the firm's capital resources may shift the most efficient locus of talent because of complementarities between skills and technology where

[1] An example of how much value investors attributed to Jobs was when Apple announced that Jobs was taking a medical leave on January 14. Their stock lost 7.1 percent of its value in after-hours trading that same day (Stone, 2009).

capital intensive firms benefit from increased skill levels at lower organizational levels (Bresnahan, Brynjolfsson, & Hitt, 2002; Goldin & Katz, 1998).

In this study we focus on flows of manager and worker talent and explore how complementarities between these flows and between these and changes in capital-intensity and span of control influence firm performance. In a hierarchical organization, the interaction between manager and worker talent is particularly important because managers' decisions and activities affect the marginal product of their subordinates for example through activities such as monitoring and supervision (Garicano & Hubbard, 2007; Rosen, 1982). But better workers are able to plan and execute their work independently as studies of manufacturing systems demonstrate (Adler & Cole, 1993; Ichniowski & Shaw, 1999; Macduffie, 1995). Employing better workers lessens the need for managerial intervention in worker tasks but empowering workers increases information asymmetry between managers and workers and makes work difficult to monitor. Hence, choices about firm's talent strategy and organizational design interact.

The relative importance of manager and worker talent may also depend on the underlying technological choices firms make. When firms become more capital intensive, the demand for worker skills increase because the nature of their tasks change – skills and capital are complements (Bresnahan et al., 2002; Goldin & Katz, 1998). But the underlying changes in workers' task structure that accompany increased capital intensity also changes manager-worker relations, reducing managers' control over workers, implying a reduction in demand for manager skills.

We explore these dynamics of managing manager and worker talent in a panel study of the financial performance of a large matched panel data set of 3,033 small and medium-sized Danish firms and each of their employees. The matched data allows us to develop a measure of talent based on individual level data we then aggregate to the firm level to examine the

consequences for financial performance. Our study contributes to the emerging research stream on strategic human capital (Coff & Kryscynski, 2011) and demonstrates the importance of heterogeneous human capital resources for firm performance. Consequently, our study contributes with key insights regarding fundamental issues in the resource-based view of the firm.

WHY IS TALENT IMPORTANT?

In the late 1990's McKinsey & Co. declared the war for talent open (Michaels, Handfield-Jones, & Axelrod, 2001)—and according to the pundits that war is still being fought. The key drivers of the war for talent are a presumed scarcity of talent and the assumption that talented individuals have an extraordinary impact on the firm's performance. Although there is far from agreement regarding the meaning of talent and how talent should be managed (Collings & Mellahi, 2009; Lewis & Heckman, 2006), most focus on the challenges of attracting and managing "star" employees (Beechler & Woodward, 2009).

The dictionary definition of talent describes it as an individual's special aptitude in a field, and words such as skill, ability or competence are normal synonyms for talent. Emerging resource-based views of talent management considers individual talent a critical resource, and differences in talent reflect persistent individual productive heterogeneity (Boudreau & Ramstad, 2005; Collings & Mellahi, 2009; Lewis & Heckman, 2006). Talent resources therefore hold potential for creating competitive advantages because talent is persistent, valuable, and rare (Barney, 1991; Barney & Wright, 1998). Further, as Rosen (1981: 846) argues in his paper on the economics of superstars: "Lesser talent often is a poor substitute for greater talent. The worse it is the larger the sustainable rent accruing to higher quality sellers because demand for the better sellers increases more than proportionately." This raises a particularly troublesome paradox. While talent is a valuable economic resource which is difficult to replace, those with talent have high bargaining power and are well positioned to

appropriate any economic rents. Talents may chose to sell their services to another employer or decide to become entrepreneurs in order to appropriate a larger share of the economic rents they create (Coff, 1997, 1999). Adding to these woes, talents expectations regarding work and career are usually high and quite challenging to meet (Trank, Rynes, & Bretz, 2002). For these reasons, it is not entirely obvious that firms should hire talented people – those who are persistently more productive – since they are more expensive to hire and more difficult to satisfy and hold on to.

Does talent exist?

While most would acknowledge that Picasso had extraordinary talent and some would say that of Adam Sandler, the question begs whether there are reasonable grounds for assuming persistent individual productive heterogeneity among individuals in the workforce. Even so, the assumptions inherent in our conceptualization of talent appear to be consistent with the treatment of cognitive abilities and personality in psychology with respect to two facets. The first is time invariance and the second is impact.

Empirical evidence suggests that individual cognitive abilities are stable in the adult population at least until individuals reach a very old age (Deary, 2012). The core of these findings appears to be genetic and studies employing data on twins and adopted children find that cognitive ability is hereditary and that the genetic component, which increases from early childhood through adolescence to adulthood, accounts for as much as 80 percent of variation in cognitive ability test scores (Bartels, Rietveld, Van Baal, & Boomsma, 2002; Deary, 2012; Posthuma, de Geus, & Boomsma, 2001). Related, the genetic component of personality differences also appears to be substantial (Bouchard & Loehlin, 2001).

In terms of their impact on individual performance, measures of cognitive ability and personality are important predictors of job performance (Schmidt & Hunter, 1998; Schmidt, Hunter, & Outerbridge, 1986; Schmidt, Hunter, Outerbridge, & Goff, 1988), career success

(Judge, Cable, Boudreau, & Bretz Jr., 1995; Judge & Higgins, 1999), and earnings (Hanushek & Woessmann, 2008). Particularly studies of cognitive abilities and individual earnings identify robust and positive correlations across different measures cognitive ability. While persistent individual productive heterogeneity may be rooted in other durable personal characteristics, we believe there is a reasonable basis for the assumption that talent heterogeneity is persistent.

Is talent valuable for the firm?

The notion that firms are able to appropriate rents from deploying the resources under their control is at the core of the resource-based view of the firm. But if the firm's resources are mobile, as their employees are, the firm's bargaining power vis-à-vis its employees may be limited. Underpaid individuals may choose to leave the firm in pursuit of better paid opportunities with other employers, and therefore employee mobility may force firms to pay top wages for talent. This argument finds support in recent studies indicating that high skill individuals move to firms that are offer better rewards for their talents (Bidwell & Briscoe, 2010; Elfenbein, Hamilton, & Zenger, 2010).

Because employees are mobile, firms may find it difficult to sustain rents from employing talents because their productivity is fully reflected in their wages. Of course labor markets may not be efficient as models of labor market search argue (Mortensen, 2005). For one, workers have search costs and may not be aware of alternative opportunities in other firms, and since search is costly, employers have opportunities to appropriate economic rents. But even if information about alternative jobs is scarce, salary data is widely available for most types of jobs. Job search engines, labor unions, public employment agencies, and personal networks are sources of inexpensive information that employees can use to evaluate their compensation – and the underpaid are more likely to search for alternative employment. With such learning opportunities, exploitation of individual search costs is unlikely to be a basis

for sustaining competitive advantages. A second perspective is that of inter-firm heterogeneity. When firms are heterogeneous, the economic value of individual skills differs among employers because of differences in firms' capital and intellectual resources as well as their internal organization. Because of their superior brand, technology, and organizational concept, McDonald's creates more value from their low skill employees than rival fast food chains. More specifically, the talents of the entrepreneurs who manage the restaurants are complementary to firm-level resources such as brand, technology, and organization. Consequently, the combination of talented entrepreneurs and McDonald's core assets is rent creating to the extent that both parties are better off by cooperating and sharing the rent.

There is a potential for rent creation when there are complementarities between the other resources under the firm's control and individual talent – and both the firm and its talents may get a share of that rent. From the perspective of the firm, if talent is complementary to other resources, the firm creates more value by hiring employees with more talent. From the perspective of the talented, their second best alternative is less attractive because value is co-created with a "team" of resources in a specific firm. This argument is different from that which emphasizes strictly individual firm-specific human capital. For example, Groysberg et al. (2008) find that when star analysts take their team with them to another firm, their performance is better than when they move alone. In this case, exploitation of the star's skills depends on deploying complementary resources. The talents' ability to appropriate rent therefore depends on access to and deployment of complementary resources. The need to re-create both resource-inputs and their interactions therefore limits full rent appropriation by any one resource-owner. Even in the absence of proprietary resources, recreating a specific resource-combination may be difficult if there is causal ambiguity about how to deploy resources (Lippman & Rumelt, 1982). Hence talents may not have sufficient bargaining power to appropriate the entire economic rent from deployment of teams of resources.

Conceptualizing talent

Wage dispersion among individuals in the labor market is increasing and the key drivers of this appears to be the demand for unobserved ability and not increasing returns to seniority, work experience or education (Autor, Katz, & Kearney, 2008; Juhn, Murphy, & Pierce, 1993). With the assumption from human capital theory that individual productivity differences are reflected in wages, it thus seems that unobserved differences among individuals are gaining importance. Following prior research in labor economics, we conceptualize individual talent in terms of the market price for the time-invariant unobserved component of individual human capital (Abowd, Kramarz, & Margolis, 1999; Iranzo, Schivardi, & Tosetti, 2008; Juhn et al., 1993).

Observable components of individual human capital only explain a modest proportion of the variation in wages. Two distinct explanations for this are that firms pay different wages for similar skills because they are heterogeneous in their productivities and because workers have search costs and are unaware of better opportunities in the labor market (Mortensen, 2005). A third possibility is that wage differences that are not explained by observables reflect unmeasured but economic meaningful productivity differences among individuals and random error. The former error component can be thought of as a reflection of persistent individual traits that enable individuals to sustain an economic rent, for example cognitive ability or personality that we discuss in the above. This view of talent is conceptually similar to the concept of total factor productivity that is widely used in plant- or firm-level studies in the sense that talent is a measure of our ignorance about why some individuals are more productive than others (Syverson, 2011: 330).

Adoption of a human capital view of talent leads to an assumption that talent is portable in a labor market where workers are mobile among employers since talent is reflected in

individual wages[2]. This makes the analysis of talent very interesting since talented employees may trade in their talent for higher earnings with another employer, suggesting that it will be difficult for employers to appropriate rent. Even so, talent may not be fully portable. Some of Groysberg's work on the mobility of Wall Street analysts indicates that while star analysts are mobile (Groysberg & Lee, 2009; Groysberg et al., 2008), their results tend to be less impressive following a mobility event although analysts that take a team of colleagues with them tend to perform better than those who move in isolation. In these examples, star analysts' skills are complementary to those of their co-workers and these complementarities may be difficult to replicate in another organizational setting.

Does talent matter for firm performance?

It is well established that employees' human capital has desirable effects on firm performance in research that examines the influence of observable skill-factors, for example the impact of job-related training (e.g. Bartel, 2000; Ichniowski, Shaw, & Prennushi, 1997; Sepúlveda, 2010). There is a modest amount of empirical work in labor economics that explore how worker talent affects productivity using the conceptualization we advance here. Prior research has shown that the most productive firms have more talented workers (Abowd et al., 1999; Haltiwanger, Lane, & Spletzer, 2007; Haskel, Hawkes, & Pereira, 2005). These studies focus on the average levels within firms, do not include all employees, and consequently do not capture interactions among different employee types.

In contrast to these studies, Iranzo et al. (2008) examine the impact of talent dispersion on productivity in Italian manufacturing firms using a measure of the worker fixed effect as their talent measure. Their analysis makes a distinction between production and non-production workers and concludes that increased talent dispersion within each occupational group

[2] Specifically this results from measuring talent as the individual fixed effect in a wage regression. That part of the regression residual can be separated from firm effects if there is enough mobility among employers, and conditional on mobility, talent measures portable human capital. We discuss this point extensively later in the paper.

correlates positively with firm productivity although differences between these occupational groups are (weakly) negatively correlated with productivity. They argue (p. 291) that their evidence, "… is consistent with a hierarchical organization of the firm in which it is optimal to concentrate skills in individuals with decision-making and supervisory power, on which the firm's performance is heavily dependent." This interpretation suggests the existence of complementarities among employees with different skill levels, although their results may just reflect better allocation of workers to jobs that demand different ability levels. To take one simple example, a dentist that is assisted by a dental assistant instead of another dentist will in most cases be a better allocation of resources since the latter is a more expensive resource to deploy. Skill variation is higher in the former case and performance is also higher, even in the absence of complementarities between the dentist and the dental assistant. More generally, while diversity may be tied to complementarities, the presence of diversity in and of itself is not evidence that complementarities exist.

In the following, we further develop the argument that creating and appropriating value from talent depends on identifying and exploiting complementarities. We identify three different forms of complementarities: Between manager and worker talent, and between manager and worker talent and the firm's decisions about capital resources and organizational design, specifically about the span of control.

HYPOTHESES

We offer the baseline argument that better managers and workers are potentially value creating. Because talent is a resource which is portable, one might suspect that talented employees appropriate the rent that accrues to their talent. But if that rent accrues to the deployment of talent in combination with other resources, we believe that a talented individual is unlikely to be able to claim the entire rent that is created by a "team" of resources. An exception is perhaps if several talents form a coalition to extract rent such as

the cast of the sitcom Friends did several times (Carter, 1996, 2002). Workers may attempt to appropriate rent by bargaining with the firm's owner, for example by forming a strong coalition such as a union. If the coalition is able to appropriate a share of the rent from talent, the distribution of rent among workers is unlikely to reward those with extraordinary talent. Instead the split among workers is more likely to be based on time honored principles among unions such as seniority and equal pay for equal skills. Talented workers therefore have an incentive to avoid firms where unions have strong influence on individual wages because it is less likely they are rewarded based on their superior talent. Some argue that in highly visible industries, talented individuals are likely to command larger salaries because it is fairly clear who are the talented people. But even in industries where talent is portable, the talented individuals are not certain to enjoy the same level of success after moving to another firm, in part because their performance is tied to the skills of their co-workers which may not move when talents move (Groysberg & Lee, 2009; Groysberg et al., 2008).

Increasing talent levels entail hiring new employees, and while talented employees are likely to be more productive, their transition into the firm is unlikely to be a smooth process. For one, even the talented may need to acquire specific knowledge about their new tasks before they are efficient in their new jobs (Dokko, Wilk, & Rothbard, 2009). Second, newcomers are more likely to leave the firm early because of poor fit with the organization and such mistakes can be costly (Weller, Holtom, Matiaske, & Mellewigt, 2009). Third, firms must use effective socialization tactics to integrate newcomers in the organization (Allen, 2006; Bauer, Bodner, Erdogan, Truxillo, & Tucker, 2007). These arguments suggest that entry into the firm entails initial costs before benefits kick in.

In sum, we therefore suggest that initial negative effects of increasing talent are offset by later gains when talents are well integrated into the organization. These effects are nevertheless likely to be conditional upon the nature of complementarities between manager

and worker talent, that is, the benefits of talent acquisition at the managerial level depend on talent acquisition at the worker level. Below we elaborate these arguments further and suggest that the ability to leverage scarce and costly talent is at the core of making an impact on firm performance. Hence the baseline hypotheses are crucially dependent on how firms design their talent portfolio.

Hypothesis 1: Increases in manager talent have initial negative effects on firm performance but eventually become positive conditional on the firm's talent resource mix.

Hypothesis 2: Increases in worker talent have initial negative effects on firm performance but eventually become positive conditional on the firm's talent resource mix.

So how are managers' and workers' talents related? Rosen (1982) explains this by the influence managers that have on the marginal product of their subordinates. A good manager can create value by allocating resources in a sensible way and providing effective supervision and monitoring. In contrast, a bad manager can destroy value by a less sensible allocation of resources and poor supervision and monitoring. In a setup where workers are homogeneous and their abilities are fixed, increasing manager ability leads to increases the marginal product of subordinate workers. But for a given production plan, the implication is that firms should reduce worker quality input if manager and worker ability are substitutes. This is one of Rosen's (1982: 318) key results. Garicano and Rossi-Hansberg (2011) obtain a similar result in slightly different setting. They show that decreases in communication costs drive hierarchical firms to concentrate talent at the top whereas decreases in information processing costs allow firms to increase talent at lower levels. Their notion of information processing costs is analogous to worker abilities, that is, better workers are able to solve problems and

make task related decisions instead of referring those tasks to the hierarchical structure. The implication of this model is that if firms optimally chose their designs, in response to relative communication and information processing costs, manager and worker talents are substitutes. Worker talent will increase when decentralization is optimal, and manager talent will increase when centralization is optimal. In the model of Garicano and Rossi-Hansberg, manager and worker talents are therefore substitutes, conditional on an optimal choice of structure.

Intuitively, these results suggest that when workers become more able, they become capable of making task-related decisions, planning their work schedule, taking responsibility for improvements in work procedures and other tasks that are usually in the domain of managers. In the absence of able workers, managers need to perform these duties and engage in active supervision and monitoring of subordinate workers.

Research on flexible manufacturing demonstrate the effectiveness of team-based approaches to manufacturing, and that the effectiveness depends on employing highly skilled and empowered work teams (Adler & Cole, 1993; Ichniowski & Shaw, 1999; Macduffie, 1995). In fact, worker skill is a core element in the "lean management" approach to organizing production (Hines, Holweg, & Rich, 2004; Holweg, 2007). Ichniowski & Shaw (1999) provide a good empirical example of in their comparative analysis of US and Japanese steel mills. In their study, the role of managers in "traditional firms" is to supervise and direct workers, whereas the role of managers in team-oriented firms is to communicate with workers. Workers in the team-oriented firms are responsible for planning work and solving problems, and the skill requirements are higher. In Ichniowski and Shaw's manufacturing setting, when firms adopt "modern" manufacturing methods, the locus of ability shifts from middle managers to workers. Consequently, we believe that there are both strong theoretical grounds as well as empirical support for the argument that manager and worker talents are substitutes.

Hypothesis 3: Increasing manager talent reduces the efficient level of worker talent (and vice-versa).

Because manager and worker talent are scarce resources which are mobile and have substantial bargaining power, it is unlikely that firms can gain sustainable advantages by taking advantage of arbitrage opportunities that arise in the labor market. Long duration fixed term contracts are unusual, so upon learning their true value, talented employees can renegotiate their compensation. To add to the pain, those with talent are more demanding of their employers (Trank et al., 2002), are usually more visible in the labor market, and are often more likely to leave if their expectations are not met. Hence it is important to identify ways in which to leverage scarce talent to create value which is not fully appropriable by the talented. In a study of law firms, Garicano and Hubbard (2007) show that managers with deeper and more specialized skills (i.e. tax law compared to general law) can leverage their abilities by having more subordinates, and thereby exploit increasing returns from better utilization of their human capital. We argue that a similar mechanism is at work with respect to manager talent: A good manager is able to oversee more subordinates, hence acquiring better management talent allow firms to increase their span of control, thereby leveraging scarce managerial resources.

Hypothesis 4: When firms increase the span of control the efficient level of manager talent increases.

What about worker talent, then? Above we have argued that better workers are able to accomplish more complicated tasks, taking on more responsibilities. This will tend to create a moral hazard problem inside the firm because workers have more information about their tasks than managers do, and if workers tasks are interdependent, their individual productivities may be difficult to ascertain. In Alchian and Demsetz (1972: 780), the salient feature of team production is that the marginal product of the team is observable but,

"…marginal products of cooperative team members are not so directly and separably (i.e., cheaply) observable." Their solution to the team problem is to monitor team members and appoint a residual claimant that has an incentive to monitor the team's effort. When tasks become more complicated and workers are empowered to make decisions, they are more difficult to monitor because managers' insight into workers' tasks are less clear. This is exacerbated if tasks become more interdependent and less transparent for managers and even co-workers. Further to these points, Holmstrom (1982) show that substitution of monitoring for incentives becomes less effective when team size increases, hence larger teams potentially suffer more from free rider problems. For these reasons, we argue that the effectiveness of managers' monitoring of workers declines for a given span of control when workers' abilities increase, which will tend to drive the optimal span of control downwards. The core of the mechanism we propose is the assumption that workers' tasks and the organization of work changes when worker talent increases.

Hypothesis 5: When firms increase the span of control the efficient level of worker talent decreases.

It has long been recognized that worker skills and capital are complements and prior research gives different reasons for why these complementarities arise. One argument holds that the nature of workers' tasks change when firms become more capital intensive (Goldin & Katz, 1998). One example of this shift is from making things using manual labor (say a product) to maintaining and operating automated machinery that makes the product. More concretely, a firm in the metalworking industry that adopt computerized numerical control equipment need workers who are able to program machines for different production batches and also have knowledge about production planning to avoid expensive downtime for their equipment because of too frequent retooling. A related argument is that of skill-biased technical change, namely that adoption of modern (computerized) technologies increase the

relative demand for advanced skills (Bresnahan et al., 2002). In a setting where firms increase their reliance on capital resources, it should therefore be advantageous to acquire better worker talent.

Hypothesis 6: When firms increase capital intensity, the efficient level of worker talent increases.

When firms increase their use of capital resources, we argue that the demand for worker skill increases. But how does this transform the value of managers' ability? Above, we argue that workers' tasks change when firms increase their use of capital (Goldin & Katz, 1998). These changes in worker tasks imply an increase in information asymmetry between managers and workers making work more difficult to supervise and monitor for managers. Such changes in task structure make manager talent an increasingly poor substitute for worker talent which implies a need for disproportionately large increases in manager talent compared to worker talent when firms increase their use of capital resources. Additionally, when firms adopt more capital intensive technologies, workers affect productivity directly and effectively. Ichniowsky and Shaw (1999) identify up-time as a key factor that affect plant productivity in their study of steel finishing plants. In such capital-intensive plants, capacity utilization affects productivity dramatically, and uptime is affected by activities that individual workers or work teams are responsible for implementing, for example daily maintenance, coordination and execution of scheduled maintenance, and retooling. Consequently, as the firm's workers become better its utilization of capital resources will tend to improve. To add to these concerns, the proportion of output that capital and labor account for changes in favor of capital when the firm become more capital intensive, and worker skill therefore become progressively more important. Labor intensive firms, in contrast, tend to rely more on managerial intervention because tasks are less complex, and managers are therefore better able to monitor workers. Since worker skills are likely to be

lower among labor intensive firms, workers need more supervision of their work. Increases in manager talent will furthermore have a more direct effect on output because the relation between managerial intervention in workers' tasks and changes in output are more direct because technology does not mediate to the same extent between work and output.

Hypothesis 7: When firms increase capital intensity, the efficient level of manager talent decreases.

DATA AND METHODS

Data

The data consists of a random sample of Danish manufacturing firms from Statistics Denmark's Integrated Database for Labor Market Research (IDA). IDA contains matched employer-employee data on all work establishments in Denmark and all workers in the Danish workforce. Access to the data is restricted to specially approved researchers and Statistics Denmark masks the identity of firms (and their employees) to prevent identification of firms and individuals. The sample used in this study contains observations of firms and their employees from 1995-2007. The firm level data include economic variables such as value added, investments in plant and equipment, etc. Firms are tracked using their identification number which can be reliably matched to individual employees in IDA from 1995 and onwards. Individuals in the sample are tracked using their unique identification number that all individuals residing in Denmark must have. This identification number was introduced in Denmark in 1968 and is used to register virtually all interaction between the individual and society in Denmark, for example data about the individual regarding tax and income records, employment information, educational achievement and other demographic information. Because income tax is collected at the source of income in Denmark (i.e.

employers pay the employee's income tax directly to the state), it is possible to match employers and employees reliably.

The data were gathered as part of a larger research project that included collection of primary data using telephone and mail surveys. This project took place in 2004 and the archival data used for identification of the sample pertains to 2003. The larger study identified a random sample of 3,048 Danish limited liability manufacturing firms that includes NACE-codes 15.00.00 to 37.00.00 (the European industry classification scheme). The specific codes include all manufacturing sectors but exclude the primary sectors. The firms in the sample are predominantly small and medium sized firms – the panel average is 44.7 employees.

It is possible to match 3,033 of the 3,048 firms to annual confidential micro-level data from Statistics Denmark in two steps. The merger between the external primary data and micro-level data from Statistics Denmark uses the firms' unique identification numbers. The initial step in 2004 only allowed us to match data until 2001. Therefore we obtained additional data in the fall of 2011 and now have a sample of firms that covers 1995-2008. Because of missing observations on some of our variables for 2008 (these data were not available yet) we only analyze 1995-2007. The sample is an unbalanced panel as some firms enter the sample during the period 1995-2003 and some exit the sample 2004-2008.

Because some firms in the sample are small and newly founded, there are a few instances of extreme values in negative or positive financial performance. For that reason, cases with ±300% return on assets were removed from the sample and also firms with extreme values of labor productivity and capital intensity were removed.

Estimation of talent

The conventional approach to measurement and estimation of human capital uses observable measures of human capital to arrive at an estimate of individual human capital.

The econometric method is to specify a Mincer wage regression (Mincer, 1974) that models individual wage as a function of education and experience, that is $ln(w_i) = c + \beta_1 s_i + \beta_2 k_i - \beta_3 k_i^2 + \varepsilon_i$ where the variable w_i is the individual's wage, s_i is a measure of the individual's educational attainment, and k_i is individual's work experience, usually measured in years. The coefficient on the squared term is usually negative, reflecting a declining marginal return to experience. The coefficients for education and experience represent the individual's return to schooling and experience, and in an efficient labor market, these returns reflect increases in individual productivity as the individual obtains education and gains work experience. In the presence of unexplained variance, the error term ε_i includes true random error component, individual heterogeneity due to unobserved individual effects, and other systematic unmeasured error components such as firm effects (Abowd et al., 1999; Juhn et al., 1993). If we for a moment ignore the latter in a panel data setting, then we can think of unobserved individual ability as the time invariant, individual-specific error component u_i, that is, the error component $\varepsilon_{i,t} = u_i + v_{i,t}$, where $v_{i,t}$ is the random time varying error.

Building on prior work in labor economics (Abowd et al., 1999; Iranzo et al., 2008; Juhn et al., 1993), we adopt the interpretation that u_i reflects unmeasured ability and use our estimate of u_i as our measure of individual talent. Consequently, our measure captures the labor market's valuation of the individual's qualities that are not captured by the observables that are included in the wage regression. Specifically Juhn et al. (1993) argue that regression residuals reflect the market price of unobserved ability. The advantage of our measure of talent is that we are able to capture individual talent heterogeneity, hence variation in u_i says something about how the labor market values those individual abilities that are portable among employers and do not vary over time, subject to some qualifications regarding identification that we elaborate in the following.

The first qualification is that to estimate the individual-specific error component reliably, we must account for the variation due to other systematic unmeasured individual and higher level effects such as firm- and economy wide effects. To deal with this issue, we include additional covariates on the individual level and use year dummies to capture economy-wide shocks to wages. We remove variation due to firm-effects by centering individual-level measures around their firm yearly averages, that is, for each $x_{i,t}$ (and $w_{i,t}$) we compute $x_{i,t,-f} = x_{i,t} - \tilde{x}_{f,t}$ where the tilde indicates firm-centered x's[3]. To separate the individual-specific variation from the firm-specific, a significant proportion of individuals must be mobile within the sample (Abowd, Creecy, & Kramarz, 2002; Iranzo et al., 2008). Otherwise it is impossible to statistically distinguish the individual-specific error component from the firm-specific error component. In our sample, we have 1,236,861 moves from one firm in the sample to another firm in the sample, that is, almost one third of the individual-years in the sample move at least once to another firm. That level of mobility should be sufficient to identify u_i reliably. Table 1 summarizes mobility within the sample.

Insert table 1 about here

The second qualification is that our measure of talent may be affected by estimation error due to sampling bias. This can result in bias when we aggregate individual talent to the firm level. Although important, we believe that concern is minor in our analysis. Because we observe all the firm's employees in each year, we do not have sampling bias regarding the individual-level observables. This implies that the remaining source of bias is due to omitted variable bias.

[3] Simultaneous estimation of individual and firm effects is not feasible because of the computational magnitude of the problem (i.e. 3,033 dummies for firms) and the unavailability of standardized or special user-written estimators within the computing environment that Statistics Denmark provides.

To make wages comparable across years, we deflate individual hourly wages to their 1995-level using the annual percentage wage increase to compute the deflator. That removes the effects of wage increases due to general supply and demand conditions in the labor market that might confound the estimates of talent and also make wages comparable over time which is important for the way we conceptualize talent as a time-invariant residual component.

We estimate u_i in a two step procedure. In the first step we compute the logarithm of the deviation of the individual wage from the average wage in the firm at time *t*, that is, we compute $\ln(w_{i,-j,t}) = \ln(w_{i,t}) - \ln(\tilde{w}_{j,t}) = \ln(\frac{w_{i,t}}{\tilde{w}_{j,t}})$ where i indexes individuals and j indexes firms. In the second step, we estimate a wage equation of the form $\ln(w_{i,-j,t}) = c + \beta_1 s_{i,t} + \beta_2 k_{i,t} - \beta_3 k_{i,t}^2 + \boldsymbol{\beta}_j \boldsymbol{x}_{i,t} + Year\ dummies + u_i + v_{i,t}$ using a random effects model where s, k and **x** are centered using firm averages. In this specification the measure of the individual's educational attainment s_i is the number of year of schooling beyond primary school, and k_i is the individual's work experience, measured in years since entering the labor market. The vector **x** consists of additional individual level regressors that include the individual's age, whether the individual is a new entrant into the firm, and whether the individual occupies a managerial position.

From the estimates of the deviation of individual wages from firm averages we predict u_i which constitutes our measure of individual talent. Following this, we aggregate our talent variable into two firm-level variables. The first computes the average talent by firm among those employees that are identified as managers and the second computes the average talent by firm among those employees that are identified as workers. 11.6% or 443,063 of the employee-year observations in the sample are identified as occupying a management position. When there is only one person identified as a manager in a given firm-year, we use the estimate of that individual's u_i.

Estimation of the impact of talent on firm performance

We use a general method of moments (GMM) estimator that removes panel-specific heterogeneity by first differencing the regression equation, accounts for dynamic adjustment in the dependent variable by including lagged dependent variables, and uses the lags of the independent variables as instruments (Arellano & Bond, 1991). This estimator provides consistent estimates under the assumption of no serial correlation in the error term, accommodates unbalanced panels, and allows for specification of endogenous regressors. To reduce potential problems of instrument proliferation as the Hansen test of the joint validity of instruments weakens in the number of instruments, we restrict the number of lags used as instruments to the third, fourth, and fifth lag (Roodman, 2009). We include two lags of the dependent variable in all models because a one period lag does not adequately represent the adjustment process in return on assets sufficiently as there is non-negligible residual serial correlation in the models using one period lags.

Firm level measures

Dependent variables. We measure financial performance is measured as the return on assets. Return on assets is computed from the earnings before interest, tax and depreciation divided by total assets (ROA_{EBITDA}). This measure of ROA eliminates distortions due to the firm's choice of capital structure and depreciation schedule (which may both be optimized for taxation reasons rather than for operational reasons). ROA is frequently employed as a measure of financial performance.

Independent variables and moderators. Our study has two independent variables that measure manager and worker talent. The measurement of these variables we have described in detail above. The important additional aspect is how we aggregate these variables. To distinguish between managers and workers, we use an individual level variable that assigns a person to an occupational category. Two categories describe top-level and senior-level

managers. The remaining categories describe different non-managerial categories. Statistics Denmark has changed the definitions of the non-managerial categories during the time period of our study while the managerial categories are substantially unchanged. We combine the two manager categories into one because there are many small firms in the sample that only have one manager level, and in some cases, only one manager. Hence we designate individuals' status as managers if they belong to the one of the two managerial categories and designate a status as worker for the remaining individuals in a firm.

We measure span of control as the ratio of the number of managers to the number of workers. We measure capital intensity using the capital-labor ratio, which we measure as the ratio of the firm's deflated capital (stock of plant and equipment) and the number of employees for firm *i* in year *t*. Capital intensity is also an important control variable because earlier studies have found that capital intensive firms employ higher skilled workers (Abowd et al., 1999).

Control variables. We control for scale because of its likely effect on financial performance. Scale is captured using data on capital and labor inputs. Capital input is measured as the logarithm to the book value of the stock of plant and equipment in firm *i* in year *t*. That variable is deflated using the annual percentage change prices of manufacturing output as the basis for computing the deflator. Labor input is measured as the logarithm of the number of employees in the firm in firm *i* in year *t*. The study further controls for the net growth rate because size adjustments are likely to affect financial performance. We also include controls for the separation rate and its square because employee turnover has a substantial impact on firm performance and may affect the decision to enter or exit from a firm, and turnover may therefore cause changes in the level of talent in the firm. We use the firm's employees' average years of schooling after completion of primary school and their average work experience in the labor to control for the firm's stock of human capital.

Firms adapt their labor needs in response to economy-wide productivity shocks and consequently the study also controls for the annual number of bankruptcies among manufacturing firms and manufacturing sector total factor productivity growth that are proxies for such external shocks. The source for these data was Statistics Denmark's publicly available firm statistics.

RESULTS

Talent estimates

Table 2 provides descriptive statistics for the variables we use for estimating individual talent and Table 3 show the results of the wage estimates. The returns to schooling are positive, and the returns to experience are positive and decline at the margin. Not surprisingly, older employees and managers earn more while new entrants earn less. Overall, the results of the wage regression conform to expectations.

Insert tables 2-4 about here

The time invariant component of the regression residual from the regression of the deviation of individual wage from the firm average wage on education, experience, and year dummies is then aggregated into two variables by firm-year. The first variable is the average time-invariant residual for employees identified as managers, that is, average manager talent. The second variable is the average time-invariant residual for employees identified as workers, that is, average worker talent. Despite the fact that the individual residual is time invariant, when aggregated to the firm-level, these variables are time varying as a consequence of employee turnover. The average separation rate in the sample is around 21% hence on average 79% of the talent pool is identical between adjacent years.

The impact of talent on financial performance

Table 4 shows the descriptive statistics for the firm-level data. It is interesting to note that the correlation between average manager and worker talent is negative (-0.14). Aggregate worker talent is uncorrelated with financial performance while manager talent is slightly positively correlated. These observations provide some indication that manager and worker talent are substitutes.

Table 5 reports the results of the estimation of the effects of manager and worker talent. In model 1 the sign for the contemporaneous effect of manager talent is positive but changes to negative in Model 2 and Model 3 that includes the interaction. We believe this reflects that exploitation of talent is contingent on the talent mix in the firm. In Models 2 and 3, the contemporaneous main effects of manager and worker talent are negative while the lagged effects are positive. Both the contemporaneous and lagged effects of the interaction between manager and worker talent are strongly negative. To shed further light on the dynamics of talent acquisition processes we compare manager and worker talent coefficients using Wald tests. These show that changes in worker talent have stronger performance effects for both the contemporaneous and lagged coefficient ($p<.001$). We further compare contemporaneous and lagged coefficients, and these test demonstrate that the sum of contemporaneous and lagged talent of both managers and workers do not differ significantly from zero. Hence we conclude that achieving the right balance between acquisition of manager and worker talent adds value but not talent acquisition in and of itself since the net main effects are not different from zero.

Insert tables 5-6 about here

Table 6 reports the results of the estimation of the moderating effects of capital intensity and span of control. We only report the effect of contemporaneous interaction but estimation of lagged interactions yields qualitatively similar results, hence a good (or bad) policy change kicks in immediately with respect to both capital intensity and span of control.

We find that increases in manager talent are complementary to increases in span of control, which suggest that firms can leverage scarce manager talent by increasing the span of control. These results extend the results in Garicano and Hubbard (2007) that demonstrate larger spans of control in law firms where the skills of senior partners are deeper and more specialized skills.

We find that increases in span of control moderate the performance effect of worker talent negatively. This finding is consistent with the increased information asymmetry between managers and workers when workers get more control over their tasks (Alchian & Demsetz, 1972), that monitoring becomes less effective when team size increases, and larger teams suffer more from free rider problems (Holmstrom, 1982). It thus appears that increases in worker talent are associated with lower optimal spans of control.

As predicted, increases in capital intensity moderates the effect of manager talent negatively and moderates the effect of worker talent positively. The results regarding worker talent are consistent with the explanation that skill-demand increases when firms become more capital intensive (Goldin & Katz, 1998) and also the notion of skill-biased technical change (Bresnahan et al., 2002). Consequently, increases in firms' reliance on capital resources lead to advantages from acquiring better worker talent. The finding that increasing capital intensity decreases the effectiveness of acquiring manager talent is consistent with an explanation that emphasizes increased information asymmetry between managers and workers as worker tasks change and workers' impact on capacity utilization increase. Our

finding thus indicates that superior manager talent is complementary to labor intensive technology choices.

DISCUSSION AND CONCLUSION

In this study we identify important performance effects from firms' talent acquisition strategies – but these are nevertheless complicated. Improving performance appears to be more complicated than hiring better employees because there are initial adjustment costs which may not always be fully offset by later gains. Notably, the sum of contemporaneous and lagged parameters is not statistically different from zero. Our results therefore suggest that it may be difficult to acquire talent in the labor market and appropriate rent merely from taking advantage of arbitrage opportunities that arise in the labor market. Gains (and losses) from talent acquisition primarily appear to be due to management of the talent mix in the firm and whether the firm achieves alignment between its talent acquisition on the one hand and its resources and organizational design on the other hand.

Our results point towards a fundamental tradeoff between manager and worker talent in small and medium-sized firms. First, increasing the average talent level of managers and workers increase firm performance but since these are substitutes, the choice seems to be either to hire better manager or better workers. Manager skills become relatively less important for performance when workers' skills increase. We believe the main reason we observe this result is that the nature of work changes as workers' ability improves. Better workers take on more responsibility and engage in more complicated tasks, for example by planning their own work, coordinating within their work unit and with other work units, and making more task related decisions (Adler & Cole, 1993; Ichniowski & Shaw, 1999; Macduffie, 1995). These changes lessen the need for supervision and the use of hierarchical referral as means of coordination and decision-making, activities which are normally the domain of managers.

We believe that changes in worker tasks in part are driven by complementarities between capital and worker skill, hence firms that increase their dependence on capital resources need to upgrade the skills of workers. Our findings support that worker talent is complementary to capital resources and are quite consistent with arguments and findings from previous research (Bresnahan et al., 2002; Goldin & Katz, 1998). But why do increases in manager talent work less well when firms increase their dependence on capital resources? In part we think this finding reflects the fundamental substitution effect we discuss in the above but also that managers become more important in labor-intensive firms.

Our findings suggest that firms can leverage scarce managerial talent by increasing their span of control. This is consistent with Garicano and Hubbard's (2007) study of law firms where increased specialization of law firms allows senior partners to leverage deep expertise by hiring more associates. Achieving leverage is nevertheless likely to be limited to labor intensive firms as we observe the opposite relationship between worker talent and span of control: As workers' talent improves, the effective span of control is reduced. We believe the main reason for this result is a decline in the effectiveness of managerial monitoring of workers when workers' tasks are more independent and complicated. For a given span of control, the costs of efficient monitoring therefore increase, driving down the optimal span of control.

Generalization and implications

The average firm in our sample employs 44.7 persons, and therefore our findings are relevant to small and medium-sized firms that usually do not have elaborate human resource systems or employ sophisticated human resource management practices. Such smaller organizations therefore rely on recruiting talented individuals than on improving employees' skills and abilities by training and other means. Further, smaller firms may offer fewer promotion and long-term employment opportunities, and workers in small firms are more

mobile among firms. Hence the labor market is an important source of human resources for small and medium-sized firms.

It is an open question whether our results apply to large firms as well. It is well documented that large firms have more resources, they are more efficient, and they pay better wages. They also invest more in training, career planning, and other activities that contribute to skill enhancement among their employees. On the other hand, small firms may have a differential advantage in providing individual incentives, and empirical evidence shows that increases in firm size is associated with a weakened relationship between pay and performance (Zenger, 1994; Zenger & Lazzarini, 2004; Zenger & Marshall, 2000). Large firms typically offer more compressed compensation schemes than small firms, and therefore high talent individuals select into smaller organizations that can offer more differentiated rewards that recognize individual talent.

We nevertheless believe our study breaks important new ground for understanding how firms develop competitive advantages from their human resources. In a setting where resources and organizational designs are interdependent, firms can create (and destroy) wealth in their choice of resource combination, and therefore knowledge about how to design the firm's portfolio of resources is important. Our study identifies three important levers for designing an optimal portfolio of talent resources and the findings have important implications for the debate on how human capital can be translated into efficiency-based competitive advantages (Coff & Kryscynski, 2011; Coff, 2010; Hatch & Dyer, 2004). First, creating and appropriating rent does not boil down to acquiring or accumulating superior resources in every resource category and arbitrage does not appear to be a robust way to exploit superior talent. Rather creating and appropriating rent is a matter of exploiting complementarities by combining scarce high-quality human resources with less scarce and

lower quality human resources, and by aligning talent acquisition with organizational design and capital-intensity.

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Table 1. Distribution of movers in the sample

Number of moves within sample	Number individual-years	Percent
0	2,581,606	67.54
1	319,875	8.37
2	222,241	5.81
3	183,006	4.79
4	132,037	3.45
5	100,964	2.64
6	78,563	2.06
7	61,708	1.61
8	52,553	1.37
9	36,706	0.96
10	24,849	0.65
11	16,458	0.43
12	8,439	0.22
13	3,589	0.09

Table 2. Individual level descriptive statistics

	Mean	Std. Dev.	(1)	(2)	(3)	(4)	(5)	(6)
(1) Wage[1)]	-0.07	0.38	1.00					
(2) Schooling[1)]	0.00	2.20	0.36	1.00				
(3) Work experience[1)]	0.00	9.06	0.27	0.08	1.00			
(4) Work experience squared[1)]	0.09	361.05	0.20	0.04	0.96	1.00		
(5) Individual age[1)]	0.00	11.09	0.29	0.08	0.81	0.80	1.00	
(6) Manager[1)]	0.00	0.30	0.37	0.34	0.02	0.02	0.07	1.00
(7) New entrant[1)]	0.00	0.40	-0.17	-0.04	-0.25	-0.21	-0.24	-0.02

[1)] Deviation from firm average

Table 3. Individual wage regression results

	(1)
Years of schooling since primary school[1)]	0.0524***
	0.0001
Years of work experience since entering labor market[1)]	0.0274***
	0.0001
Years of work experience since entering labor market squared[1)]	-0.0008***
	0.0000
Individual age[1)]	0.0125***
	0.0001
Manager[1)]	0.1067***
	0.0006
New entrant[1)]	-0.0237***
	0.0003
Constant	-0.1049***
	0.0006
Year fixed effects	Y
R-squared	0.27
Wald Chi-squared (19)	765,480***
Rho (fraction of variance in e_{it} from u_i)	0.76
Observations	3,818,467
Number of persons	744,731

Standard errors in parentheses

*** p<0.001, ** p<0.01, * p<0.05

[1)] Deviation from firm average

Table 4. Firm-level descriptive statistics

	Mean	Std. Dev.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
1) Return on assets	0.16	0.20	1.00																		
2) ln(Capital)	15.90	1.80	0.03	1.00																	
3) ln(Number employees)	3.79	1.19	-0.01	0.81	1.00																
4) Capital-Labor ratio	323,034	552,156	-0.06	0.50	0.17	1.00															
5) Span of control	0.15	0.42	-0.08	-0.02	-0.03	0.04	1.00														
6) Net employment growth	0.01	0.20	0.11	-0.04	-0.04	-0.02	0.01	1.00													
7) Proportion separations	0.23	0.16	-0.12	-0.10	-0.10	-0.02	-0.03	-0.57	1.00												
8) Proportion separations	0.08	0.14	-0.12	-0.12	-0.14	0.01	-0.01	-0.58	0.92	1.00											
9) Number of mfg. bankruptcies	237.93	44.70	-0.06	0.00	0.00	0.01	-0.01	-0.04	-0.03	-0.01	1.00										
10) Manufacturing TFP growth	1.47	2.82	-0.05	0.00	0.00	0.03	0.02	-0.07	0.05	0.05	-0.14	1.00									
11) Average schooling	2.60	1.00	-0.16	-0.04	-0.04	0.09	0.39	-0.01	-0.10	-0.03	0.10	0.14	1.00								
12) Average work experience	19.52	3.89	-0.11	0.11	0.09	0.11	-0.02	-0.19	-0.17	-0.09	0.01	0.20	0.28	1.00							
13) Average work experience squared	396.13	151.70	-0.11	0.08	0.05	0.11	-0.02	-0.19	-0.14	-0.06	0.00	0.21	0.26	0.99	1.00						
14) Manager talent	0.19	0.25	0.03	0.21	0.22	0.04	-0.06	-0.02	-0.07	-0.07	-0.01	0.00	-0.10	0.10	0.09	1.00					
15) Worker talent	0.01	0.06	0.00	-0.03	-0.04	-0.02	-0.16	0.02	-0.05	-0.02	0.02	-0.01	-0.05	0.13	0.13	-0.14	1.00				
16) Manager talent x worker talent	0.00	0.02	-0.01	0.02	0.03	0.01	-0.07	0.01	0.00	0.03	0.00	0.00	-0.03	0.05	0.06	-0.07	0.50	1.00			
17) Capital-Labor ratio x manager talent	68,551	168,689	-0.03	0.42	0.21	0.68	-0.01	-0.03	-0.06	-0.04	0.00	0.02	0.00	0.12	0.11	0.45	-0.06	-0.05	1.00		
18) Capital-Labor ratio x worker talent	2,770	48,834	0.00	-0.01	-0.04	-0.02	-0.09	-0.01	0.00	0.02	0.01	0.00	-0.06	0.06	0.07	-0.04	0.46	0.23	0.02	1.00	
19) Span of control x manager talent	0.02	0.05	-0.03	0.05	0.02	0.08	0.59	0.00	-0.06	-0.03	-0.01	0.01	0.27	0.06	0.06	0.30	-0.32	-0.15	0.19	-0.15	1.00
20) Span of control x worker talent	0.00	0.08	0.02	0.01	0.01	-0.01	-0.28	0.01	-0.01	-0.01	0.00	-0.01	-0.07	0.01	0.01	-0.01	0.39	0.11	-0.01	0.17	-0.33

Table 5. Financial performance and talent

	(1)	(2)	(3)
L.roa	-0.291***	-0.381***	-0.401***
	(0.0202)	(0.0146)	(0.0163)
L.roa	-0.0350***	-0.115***	-0.110***
	(0.00403)	(0.00736)	(0.00808)
ln(Capital)	0.682***	0.404***	0.146***
	(0.0267)	(0.0249)	(0.0279)
ln(Number employees)	-0.0914	-0.127*	0.0848
	(0.0589)	(0.0585)	(0.0638)
Capital-Labor ratio	-4.80e-07***	-4.00e-07***	-3.13e-07***
	(2.76e-08)	(2.80e-08)	(2.68e-08)
Span of control	0.751***	0.341***	0.422***
	(0.0960)	(0.0979)	(0.0934)
Net employment growth	0.378***	-0.542***	-0.556***
	(0.0680)	(0.0621)	(0.0683)
Proportion separations	-3.033***	-2.495***	-3.094***
	(0.340)	(0.266)	(0.329)
Proportion separations squared	3.247***	0.659*	1.095***
	(0.293)	(0.266)	(0.281)
Number of mfg. bankruptcies	-0.000401**	-0.000275*	-0.000152
	(0.000125)	(0.000137)	(0.000150)
Manufacturing TFP growth	-0.00916***	-0.00525	0.000565
	(0.00259)	(0.00294)	(0.00319)
Average schooling	-0.0706**	-0.159***	-0.135***
	(0.0219)	(0.0252)	(0.0253)
Average work experience	-0.261***	-0.465***	-0.547***
	(0.0369)	(0.0470)	(0.0618)
Average work experience squared	0.00618***	0.0117***	0.0137***
	(0.000915)	(0.00114)	(0.00153)
Manager talent	0.282**	-0.497***	-0.605***
	(0.105)	(0.149)	(0.137)
Worker talent	-4.107***	-3.584***	-1.855***
	(0.345)	(0.369)	(0.345)
Manager talent x worker talent		-28.88***	-25.72***
		(1.520)	(1.310)
L.Manager talent			0.534***
			(0.119)
L.Worker talent			1.457***
			(0.272)
L. Manager talent x worker talent			-27.59***
			(1.207)
Wald Chi-squared	1,823.03***	2,324.54***	2,948.39***
df	16	17	20
Hansen J-test, Chi-squared	18.27	187.22	192.65
df	165	232	211
Arellano-Bond test for AR(2), z	1.17	1.24	0.93
Arellano-Bond test forAR(3), z	-1.79	-1.56	-1.73
Observations	24,550	24,550	24,495
Number of firms	2,999	2,999	2,998

Standard errors in parentheses
*** p<0.001, ** p<0.01, * p<0.05

Table 6. Effects of capital intensity and span of control on the financial performance-talent relation

	(1)	(2)	(3)	(4)
L.roa	-0.403***	-0.408***	-0.398***	-0.396***
	(0.0165)	(0.0181)	(0.0165)	(0.0166)
L.roa	-0.111***	-0.117***	-0.110***	-0.110***
	(0.00844)	(0.00993)	(0.00806)	(0.00825)
ln(Capital)	0.119***	0.105***	0.140***	0.134***
	(0.0309)	(0.0286)	(0.0277)	(0.0272)
ln(Number employees)	0.183**	0.182**	0.0701	0.123
	(0.0580)	(0.0628)	(0.0598)	(0.0651)
Capital-Labor ratio	-6.61e-08*	-1.07e-07**	-2.76e-07***	-2.51e-07***
	(3.09e-08)	(3.34e-08)	(2.84e-08)	(2.69e-08)
Span of control	0.502***	0.379***	0.650***	0.599***
	(0.0854)	(0.0873)	(0.0851)	(0.101)
Net employment growth	-0.523***	-0.672***	-0.599***	-0.521***
	(0.0920)	(0.0741)	(0.0656)	(0.0770)
Proportion separations	-2.663***	-3.385***	-2.893***	-3.210***
	(0.442)	(0.382)	(0.332)	(0.362)
Proportion separations squared	0.437	1.373***	0.719*	1.189***
	(0.377)	(0.335)	(0.287)	(0.331)
Number of mfg. bankruptcies	-0.000140	-0.000229	-0.000166	-0.000178
	(0.000154)	(0.000149)	(0.000152)	(0.000145)
Manufacturing TFP growth	0.000415	0.00140	0.000216	-0.000213
	(0.00336)	(0.00323)	(0.00320)	(0.00310)
Average schooling	-0.120***	-0.122***	-0.134***	-0.139***
	(0.0249)	(0.0257)	(0.0252)	(0.0262)
Average work experience	-0.572***	-0.563***	-0.550***	-0.560***
	(0.0597)	(0.0658)	(0.0624)	(0.0638)
Average work experience squared	0.0143***	0.0139***	0.0139***	0.0140***
	(0.00150)	(0.00161)	(0.00155)	(0.00159)
Manager talent	-0.227	-0.680***	-0.296*	-0.667***
	(0.157)	(0.138)	(0.150)	(0.146)
Worker talent	-2.526***	-1.915***	-2.630***	-2.883***
	(0.343)	(0.515)	(0.400)	(0.500)
Manager talent x worker talent	-22.94***	-26.36***	-25.29***	-25.95***
	(1.443)	(1.406)	(1.371)	(1.557)
L.Manager talent	0.440***	0.430***	0.620***	0.520***
	(0.125)	(0.123)	(0.124)	(0.118)
L.Worker talent	1.825***	1.605***	1.848***	1.739***
	(0.272)	(0.270)	(0.274)	(0.276)
L. Manager talent x worker talent	-27.82***	-26.44***	-27.63***	-26.94***
	(1.212)	(1.215)	(1.194)	(1.158)
Capital-Labor ratio x manager talent	-1.17e-06***			
	(1.23e-07)			
Capital-Labor ratio x worker talent		1.23e-06***		
		(1.91e-07)		
Span of control x manager talent			-3.929***	
			(0.534)	
Span of control x worker talent				1.403**
				(0.538)
Wald Chi-squared	3401.12***	2651.97***	2960.47***	2918.29***
df	21	21	21	21
Hansen J-test, Chi-squared	192.2	191.0	190.4	191.98
df	210	210	210	210
Arellano-Bond test for AR(2), z	0.96	0.98	0.92	0.91
Arellano-Bond test forAR(3), z	-1.65	-1.67	-1.58	-1.67
Observations	24,495	24,495	24,495	24,495
Number of firms	2,998	2,998	2,998	2,998

Standard errors in parentheses
*** p<0.001, ** p<0.01, * p<0.05