Recent Advances in the Empirics of Organizational Economics

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Abstract

We present a survey of recent contributions in empirical organizational economics, focusing on management practices and decentralization. Productivity dispersion between firms and countries has motivated the improved measurement of firm organization across industries and countries. There appears to be substantial variation in management practices and decentralization not only between countries, but also especially within countries. Much of the poorer average management quality in countries like Brazil and India seems to result from a long tail of poorly managed firms, which barely exist in the United States. Some stylized facts include the following: (*a*) Competition seems to foster improved management and decentralization; (*b*) larger firms, skill-intensive plants, and foreign multinationals appear better managed and are more decentralized; (*c*) firms that are both family owned and managed appear to have worse management and are more centralized; and (*d*) firms facing an environment of lighter labor market regulations and more human capital specialize relatively more in people management. There is evidence for complementarities between information and communication technology, decentralization, and management, but the relationship is complex, and identification of the productivity effects of organizational practices remains a challenge for future research.

Decentralization: the degree to which lower levels of the hierarchy have power relative to upper levels of the hierarchy (e.g., a higher degree of autonomy of junior managers from senior managers, a higher degree of autonomy of shopfloor workers from management)

1. INTRODUCTION

Organizational economics has developed rapidly over the past 20 years, but theory has run ahead of measurement. In this review we discuss some recent econometric work that has tried to shed light on organizational theories and their implications for firm productivity. We focus on two specific aspects of firm organization: management quality and decentralization. Management quality is of interest to us both because of its presumed close relation to productivity and because of recent improvements in the measurement of global best managerial practices. Decentralization, or the delegation of power between agents in the firm, has long been a theoretical interest in organizational economics.

Our motivation for analyzing management quality stems from the compelling evidence of heterogeneity in firm sizes and productivity (see Section 2). Economic theory has focused on the fixity of the managerial (or entrepreneurial) resource as a fundamental determinant of dispersion. A firm must have a center in which decisions are ultimately made and coordinated, and this has to be single unit (whether it is the owner-manager, CEO, or corporate headquarters). Indeed, Kaldor (1934) pointed out that the fixity of the managerial input is what determines the firm's size even in a world with homogeneity of the production function (in nonmanagerial inputs) and perfect competition: "[T]here must be *a factor* of which the firm cannot have 'two units' because only one unit can do the job" (pp. 68–69). If some firms are better at making decisions on how to allocate their resources more efficiently than others (i.e., higher managerial quality/better practices), then productivity will systematically differ between companies. Our notion of management is that it is attached to the firm as a whole, rather than being simply a reflection of the skills of the current CEO (although CEO talent will clearly be an important aspect of the firm's overall performance). We examine such theories and why badly managed firms can persist over time in Section 3.

Decisions are not all made at the center, however, and real authority is delegated to some degree throughout the body of the firm. A major issue in organizational economics is the features of the environment that determine the degree of this decentralization. There is no assumption that greater decentralization will lead to higher productivity, which sharply distinguishes the study of decentralization from that of management. Of course, delegation may be more beneficial to firms in certain environments than others, for example, when there are many new innovations in information and communication technologies (ICT) (discussed in Section 4).

In addition to management quality and decentralization, our focus is on econometric studies. The qualitative case studies that have dominated work in this area are valuable in terms of forming theories and understanding mechanisms. But they are necessarily limited in terms of their generalizability owing to heavy selection bias, small samples, and difficulties in constructing credible control groups. In terms of the empirical studies we cover, we do not claim to be comprehensive but rather have sought to focus on exemplar studies and our own recent contributions. Our apologies in advance to authors whose works have not been covered.

We do not deal with the issues of the boundary of the firm—such as vertical integration, mergers, and outsourcing (although we touch on firm size). Nor do we study the spatial distribution of firm activities, e.g., the issue of offshoring within multinational firms (although we discuss the organization of multinational firms in relation to domestic firms).

Finally, we do not focus on how incentive contracts can overcome some of the organizational problems of the firm. In the decentralization discussion, we assume that incentive contracts cannot fully deal with all agency issues. Mookherjee (2006) has a comprehensive review of incentive contracts and decentralization, and Gibbons & Roberts (2010) provide an extensive overview of the theoretical and empirical literature. Owing to space constraints, we take a micro rather than macro perspective (on the latter, see the survey of Aghion et al. 1999).

The structure of this review is as follows. In Section 2 we first motivate the study of organizations by examining the literature on firm heterogeneity, in particular the dispersion of productivity. In Section 3 we discuss the determinants of management practices in terms of measurement, theory, and results. In Section 4 we discuss the same issues for decentralization. In Section 5 we discuss issues in identifying the effects of organization (e.g., management practices and decentralization) on productivity. Section 6 concludes.

2. MOTIVATION: FIRM PRODUCTIVITY DISPERSION

Research on firm heterogeneity has a long history in social science. Systematic empirical analysis first focused on the firm size distribution measured by employment, sales, or assets. Most famously, Gibrat (1931) characterized the size distribution as approximately log normal and sought to explain this with reference to simple statistical models of growth (i.e., Gibrat's Law is that firm growth is independent of size). As data became available by firm and line of business in the 1970s, attention focused on profitability as an indicator of performance (e.g., Kwoka & Ravenscraft 1986). Accounting profitability can differ substantially from economic profitability, however, and may rise because of market power rather than efficiency.

In recent decades, the development of larger databases has enabled researchers to look more directly at productivity. The growing availability of plant-level data from the Census Bureau in the United States and other countries, combined with rapid increases in computer power, has facilitated this development. Bartelsman et al. (2008) offer many examples of the cross-country micro datasets now being used for productivity analysis.

One of the robust facts emerging from these analyses is the high degree of heterogeneity between business units (see Bartelsman & Doms 2000). For example, Syverson (2004b) analyzes labor productivity (output per worker) in U.S. manufacturing establishments in the 1997 Economic Census and shows that, on average, a plant at the 90th percentile of the productivity distribution is over four times as productive as a plant at the 10th percentile in the same four-digit sector. Similarly, Criscuolo et al. (2003) show that in the United Kingdom in 2000, there was a fivefold difference in productivity between these deciles.

Analysis of aggregate productivity growth has shown that a substantial fraction of the change in industry productivity (e.g., approximately half in Baily et al. 1992) results from the reallocation of output from plants with lower productivity to those with higher productivity—i.e., it is not simply incumbent plants becoming more productive. This reallocation effect partly results from the shift in market share between incumbents and partly from the effects of exit and entry. Bartelsman et al. (2008) show that the speed of reallocation is much stronger in some countries (like the United States) than others.

Reallocation: the process through which output tends to be allocated toward the more efficient firms in a competitive marketplace

Total factor productivity (TFP): a measure of the firm's efficiency, empirically measured as the difference between output and the firm's (weighted) inputs

There is also significant sectoral variation. For example, Foster et al. (2006) show that reallocation between stores accounts for almost all aggregate productivity growth in the U.S. retail sector.

What could explain these differences in productivity, and how can they persist in a competitive industry? One explanation is that if we accounted properly for the different inputs in the production function, there would be little residual productivity differences.[1] It is certainly true that moving from labor productivity to total factor productivity (TFP) reduces the scale of the difference [e.g., in Syverson's (2004b) study, the difference falls from 4.1 to 1.9], but it does not disappear.

These differences are clear even for quite homogeneous goods. An early example is Salter (1960), who studied the British pig iron industry between 1911 and 1926, showing that the best practice factory produced nearly twice as many tons per hour as the average factory. More recently, Syverson (2004a) shows that TFP (and size) is dispersed in the U.S. ready-mix concrete industry. Interestingly, the mean level of productivity was higher in more competitive markets (as indicated by a measure of spatial demand density), and this seemed to mainly result from a lower mass in the left tail in the more competitive sector. Studies of large changes in product market competition such as trade liberalization (e.g., Pavcnik 2002) or deregulation (e.g., Olley & Pakes 1996) suggest that the subsequent increase in aggregate productivity has a substantial reallocation element.[2]

A major problem in measuring productivity is that researchers rarely observe plant-level prices, so an industry price deflator is usually used. Consequently, measured TFP typically includes an element of the firm-specific price-cost margin (e.g., Klette & Griliches 1996). Foster et al. (2008) study 11 seven-digit homogeneous goods (including block ice, white pan bread, cardboard boxes, and carbon black) for which they have access to plant-specific output (and input) prices. They find that conventionally measured revenue-based TFP (referred to as TFPR) numbers actually understate the degree of true productivity dispersion (referred to as TFPQ), especially for newer firms as the more productive firms typically have lower prices and are relatively larger.[3]

Higher TFP is positively related to firm size, growth, and survival probabilities. Bartelsman & Dhrymes (1998, table A.7) show that over a five-year period, approximately one-third of plants stay in their productivity quintile. This suggests that productivity differences are not purely transitory, but partially persistent.

In summary, there is substantial evidence of persistent firm-level heterogeneity in firm productivity (and other dimensions of performance) in narrow industries in many countries and time periods. What could account for this?

[1]This is analogous to the historical debate in the macro time series of productivity between Solow, who claimed that TFP was a large component of aggregate growth, and Jorgenson, who claimed that there was little role for TFP when all inputs were properly measured (see Griliches 1996). A similar debate is active in levels development accounting of cross-country TFP (e.g., Caselli 2005).

[2]There is also a significant effect of such policy changes on the productivity of incumbent firms. Modeling the changing incentives to invest in productivity-enhancing activities, such as research and development, is more difficult in heterogeneous firm models, but some recent progress has been made (e.g., Aw et al. 2008).

[3]Foster et al. (2008) show that measured revenue TFP in general will be correlated not only with true TFP but also with the firm-specific price shocks. Hsieh & Klenow (2009) detail a model in which heterogeneous TFPQ produces no difference in TFPR because the more productive firms grow larger and have lower prices, thus equalizing TFPR. In their model, intra-industry variation in TFPR results from distortions as firms face different input prices.

3. MANAGEMENT PRACTICES

3.1. Measurement of Management

Management practices: a subset of organizational practices relating particularly to human resources, monitoring, and targets

Progress in understanding the role of management has been severely limited by the absence of high-quality firm-level data.[4] Recently, Bloom & Van Reenen (2007) developed a survey tool that can be used in principle to quantify management practices directly across firms, sectors, and countries. Fundamentally, the aim is to measure the overall managerial quality of the firm by benchmarking it against a series of global best practices. This series comprises a mixture of practices that would always be a good idea (e.g., considering effort and ability when promoting an employee) and some practices that are now efficient because of changes in the environment. For example, rapid falls in the costs of information technology have made the systematic use of data for monitoring performance much more cost-efficient than before.

Bloom & Van Reenen (2007) use an interview-based evaluation tool that defines and scores 18 basic management practices from one (worst practice) to five (best practice). This evaluation tool was developed by an international consulting firm to target practices they believed were associated with better performance, covering three broad areas:

- Monitoring. How well do companies track what goes on inside their firms and use this for continuous improvement? For example, is product quality regularly monitored so that any production defects are quickly addressed rather than left to damage large volumes of output?
- Target setting. Do companies set the right targets, track the right outcomes, and take appropriate action if the three are incongruent? For example, are individual production targets calibrated to be stretching but achievable, rather than incredibly easy or impossibly hard?
- People. Are companies promoting and rewarding employees based on ability and effort and systematically trying to hire and keep their best employees? For example, are employees who perform well, work hard, and display high ability promoted faster than employees who underperform, are lazy, and appear incompetent?

The management survey tool excludes practices with performance impacts that clearly depend on individual firm's circumstances—for example, setting lower prices or acquiring new firms.

To obtain accurate responses from firms, production plant managers are interviewed using a double-blind technique. One part of this technique is that managers are not told in advance they are being scored or shown the scoring grid. They are only told they are being "interviewed about a piece of work on manufacturing management." To run this blind scoring, open questions are used as these do not tend to lead respondents to a particular answer. For example, the first monitoring question starts by asking "tell me how you monitor your production process" rather than a closed question, such as "do you monitor your production daily (yes/no)." Interviewers also probe for examples to support assertions (see **Table 1**). The other side of the double-blind technique is that

[4]Bertrand & Schoar (2006) show that there is substantial variation in management styles (e.g., in merger and acquisition activity) correlated with management characteristics. For example, older managers that have experienced the Great Depression tend to be more cautious than younger managers with MBA training on the tax advantages of debt leverage. Although this goes beyond TFP, management styles are still identified with the residual fixed effects in their analysis.

Table 1 Management practice interview guide and example responses for four of the 18 practices

Practice 3: Process problem documentation (operations)			
	Score 1	**Score 3**	**Score 5**
Scoring grid	No, process improvements are made when problems occur.	Improvements are made in weekly workshops involving all staff to improve performance in their area of the plant.	Exposing problems in a structured way is integral to individuals' responsibilities, and resolution occurs as a part of normal business processes rather than by extraordinary effort/teams.
Examples	A U.S. firm has no formal or informal mechanism in place for either process documentation or improvement. The manager admitted that production takes place in an environment where nothing has been done to encourage or support process innovation.	A U.S. firm takes suggestions via an anonymous box; it then reviews these each week in section meetings and decide the ones with which it would like to proceed, if any.	The employees of a German firm constantly analyze the production process as part of their normal duty. They film critical production steps to analyze areas more thoroughly. Every problem is registered in a special database that monitors critical processes, and each issue must be reviewed and signed off by a manager.
Practice 4: Performance tracking (monitoring)			
	Score 1	**Score 3**	**Score 5**
Scoring grid	Tracked measures do not indicate directly if overall business objectives are being met. Tracking is an ad hoc process (certain processes are not tracked at all).	Most key performance indicators are tracked formally. Tracking is overseen by senior management.	Performance is continuously tracked and communicated, both formally and informally, to all staff using a range of visual management tools.
Examples	A manager of a U.S. firm tracks a range of measures when she does not think that output is sufficient. She last requested these reports approximately 8 months ago and had them printed for a week until output increased again. Then she stopped and has not requested anything since.	At a U.S. firm, every product is bar-coded, and performance indicators are tracked throughout the production process; however, this information is not communicated to workers.	A U.S. firm has screens in view of every line. These screens are used to display progress to daily target and other performance indicators. The manager meets with the shopfloor every morning to discuss the past day and the one ahead and uses monthly company meetings to present a larger view of the goals to date and the strategic direction of the business to employees. He even stamps napkins with key performance achievements to ensure everyone is aware of a target that has been hit.

(*Continued*)

Table 1 (*Continued*)

Practice 11: Targets are stretching (targets)			
	Score 1	**Score 3**	**Score 5**
Scoring grid	Goals are either too easy or impossible to achieve; managers provide low estimates to ensure easy goals.	In most areas, top management pushes for aggressive goals based on solid economic rationale. There are a few so-called sacred cows that are not held to the same rigorous standard.	Goals are genuinely demanding for all divisions. They are grounded in solid economic rationale.
Examples	A French firm uses easy targets to improve staff morale and encourage people. They find it difficult to set harder goals because people just give up and managers refuse to work people harder.	A chemicals firm has two divisions, producing special chemicals for very different markets (military and civil). Easier levels of targets are requested from the founding and more prestigious military division.	A manager of a U.K. firm insists that he has to set aggressive and demanding goals for everyone—even security. If they hit all their targets, he worries he has not stretched them enough. Each KPI (key performance indicator) is linked to the overall business plan.
Practice 16: Promoting high performers (incentives)			
	Score 1	**Score 3**	**Score 5**
Scoring grid	People are promoted primarily upon the basis of tenure.	People are promoted upon the basis of performance.	Top performers are actively identified, developed, and promoted.
Examples	A U.K. firm promotes employees based on an individual's commitment to the company measured by experience. Hence, almost all employees move up the firm in lock step. Management is afraid to change this process because it would create a bad feeling among the older employees who are resistant to change.	A U.S. firm has no formal training program. People learn on the job and are promoted based on their performance on the job.	At a U.K. firm each employee is given a red light (not performing), amber light (doing well and meeting targets), a green light (consistently meeting targets, very high performer), or a blue light (high performer capable of promotion of up to two levels). Each manager is assessed every quarter based on her succession plans and development plans for individuals.

Any score from 1 to 5 can be given, but the scoring guide and examples are only provided for scores of 1, 3, and 5. Multiple questions are used for each dimension to improve scoring accuracy. The full set of scoring and examples can be found in Bloom & Van Reenen (2006).

interviewers are not told in advance anything about the firm's performance to avoid prejudice. They are only provided with the company name, telephone number, and industry. Because the survey covers medium-sized firms (defined as those employing between 100 and 10,000 workers), this information would not usually be known ex ante by the interviewers. The survey targets plant managers, who are senior enough to have an overview of management practices but not so senior as to be detached from day-to-day operations. The sample response rate was 45%, and this was uncorrelated with measures of firm performance.

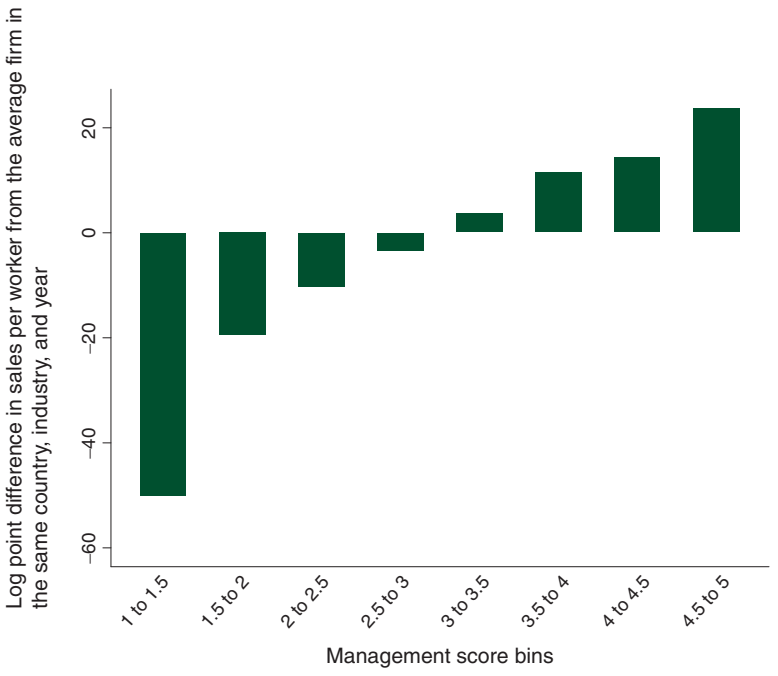

Figure 1

Correlation between firm average management score and labor productivity. Management scores are from 1 (worst practice) to 5 (best practice). The bars represent the difference in sales per employee from the average firm in the same country, industry, and year. Sample of 3803 firms in 13 countries. Revenue productivity is equal to sales/employee. Firms with a management score of 1 to 1.5 have on average 50% lower revenue productivity than other firms in the same country, industry (grouped by 154 three-digit manufacturing cell), and year (2000 to 2008).

One way to summarize firm-specific quality is to z-score each individual question and take an average across all 18 questions.[5] This management practice score is strongly correlated with firm performance (TFP, profitability, growth rates, and Tobin's Q and survival rates) as well as firm size. These data were taken from independently collected company accounts and imply that the managers' responses contained real information. **Figure 1** shows the correlation between the management score and labor productivity, for example. Firms with higher management scores tend to have higher sales per worker relative to the industry and country average. By no means should these correlations be taken as causal, but they do suggest that the management data contain useful information. Other research shows that better management is also associated with more energy-efficient production (Bloom et al. 2008), better patient outcomes in hospitals (Bloom et al. 2009e), and improved work-life balance indicators (Bloom et al. 2009d).

Figure 2 plots the average management practice scores across countries from the 6000 interviews. The United States has the highest average management practice scores, with Germany, Japan, and Sweden below, followed by a block of mid-European countries

[5]Another way to summarize firm-specific quality is to take the principal factor component. This provides an extremely similar result to the average z-score because these are correlated at 0.997.

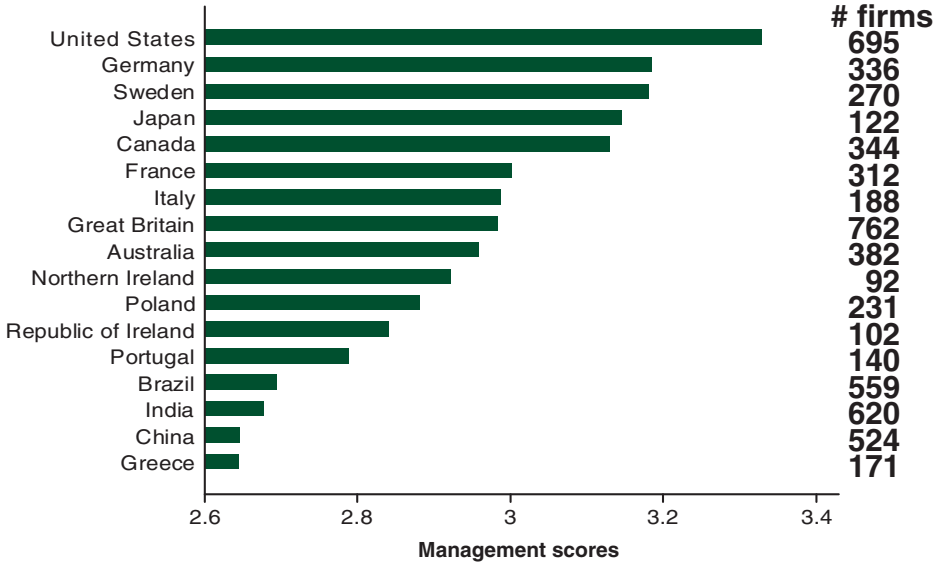

Figure 2

Average management practice scores across countries. Management scores are from 1 (worst practice) to 5 (best practice). Averages taken across all firms within each country, with 5850 observations in total. Figure adapted from Bloom et al. (2009c).

(France, Italy, the United Kingdom, and Poland) and Australia, with Southern Europe and developing countries Brazil, China, Greece, and India at the bottom. In one sense, this cross-country ranking is not surprising as it approximates the cross-country distribution of productivity. But in another sense, it suggests that management practices could play an important role in determining this cross-country productivity distribution.

Broadly, there are two alternative approaches to direct measures of management or, more generally, attempts to measure intangible capital, organizational capital (Prescott & Visscher 1980), or e-capital, of which managerial know-how is one element. First, one could try and infer these as residuals using relatively weak conditions (variants of TFP) or more tightly specified structures (e.g., Atkeson & Kehoe 2005). Second, one can use past expenditures to build up intangible stocks exactly as would be done for tangible capital (e.g., through the perpetual inventory method). This is frequently done for research and development and advertising, but it is far harder to accomplish for management as there is no clear data on such expenditures.[6]

3.2. Theories of Management Quality

The large-scale productivity dispersion described in Section 2 poses serious challenges to the representative firm approach. This has led to a wholesale re-evaluation of theoretical

[6]See Corrado et al. (2006) at the macro level. Lev & Radhakrishnan (2004) use firm expenditures on sales and general and administrative costs, but this too is broad as it often includes advertising, for example.

approaches in several fields. For example, in international trade, the dominant paradigm has already started to shift toward heterogeneous firm models (e.g., Melitz 2003).

Imperfect competition is one obvious element for these models. With imperfect competition, firms can have differential efficiency and still survive in equilibrium. With perfect competition, inefficient firms should be rapidly driven out of the market as the more efficient firms undercut them on price.

Another important element involves frictions, the adjustment costs to reallocation. Melitz (2003), following Hopenhayn (1992), models these frictions analytically by assuming that firms do not know their productivity ex ante, but on paying entry costs, firms receive a draw from a known distribution. Firm productivity does not change over time. One can think of firms as having a distinct managerial culture that is imprinted on them by the founding entrepreneurs, and this culture continues until they exit, so some firms are permanently better or worse managed. Over time, the low-productivity firms are selected out, and the better ones survive and prosper. However, in the steady state, there will always be some dispersion of productivity as the cost of entry limits the number of firms that enter the market and draw a productivity value.

Identifying this permanent productivity advantage as managerial quality is consistent with the tradition in the panel data econometric literature. Indeed, Mundlak (1961) designed his fixed-effects panel data model to control for this unmeasured managerial ability. More recent attempts have tried to measure management directly rather than indirectly.

Modeling the TFP advantage as a fixed factor is a convenient way of introducing frictions in the model. The managerial factor is trapped, as there is no direct market for it because it cannot be transferred between firms. When the firm exits, so does the productivity advantage—entrepreneurs take a new draw if they enter again. In reality, adjustment costs can take more general forms than entry costs and are likely to be important as organizational forms take time to adjust (e.g., to move from centralization to decentralization). Measured TFP will diverge from real TFP if some firms are further away from their long-run equilibrium than others.

The management quality measures in **Table 1** can be interpreted as the permanent draw from the productivity distribution when firms are born. Alternatively, they may reflect that some individuals have superior managerial skill and can maintain a larger span of control, as in Lucas (1978). More generally, management quality could evolve over time owing to investments in training and consultancy, for example.

A common feature of these models is that management is somewhat similar to a technology, so there are distinctly good practices that would universally raise productivity. For example, promoting employees based on performance, effort, and ability (rather than family connections or tenure) is a practice that should be fairly universally associated with higher productivity. This technological element of management practices is important, and the traditional models that seek to understand technological diffusion are relevant for understanding the spread of managerial techniques (e.g., Hall 2003).

An alternative theory is that all management is contingent, so no practice can ever be considered on average to be better or worse. For example, individual performance rewards may reduce productivity in industries with team-based production but may increase productivity in industries with individual production. In these models, firms at every point are choosing their optimal set of management practices, and no firm is more efficient than another based on these. In management science, a similar theory is contingency theory (e.g., Woodward 1958).

PRODUCTIVITY, MANAGEMENT, AND REALLOCATION

Much of the dispersion of productivity is thought to be because of poor management practices causing lower output for a given set of inputs. However, another aspect of poor management is that suboptimal decisions may be made over the correct level of inputs. This could cause some of the large aggregate distortions highlighted by Hsieh & Klenow (2009). For example, Bloom et al. (2009a) find plenty of evidence for bad management leading to the misallocation of capital in Indian textile firms. Many firms had not purchased $10,000 lifts, which would have generated labor savings that would repay the investment within three months. At the same time, other firms held $50,000 of excessive inventory. In all cases, capital misallocation arose from the lack of any formal capital budgeting process—firms had not undertaken cost-benefit calculations on capital investments and were therefore making errors. When firms were helped to carry out capital budgeting by outside consultants, they purchased lifts and reduced inventories. Linking this with the macro work on aggregate productivity is an important aspect of future research.

Any coherent theory of management has firms choosing different practices in different environments, so there will always be some element of contingency. For example, Bloom & Van Reenen (2007) show that firms appear to specialize more in investing in people management (practices over promotion, rewards, hiring, and firing) when they are in a more skill-intensive industry. If we examine the relative scores by country for monitoring and target-setting practices compared with people management, the United States, India, and China have the largest relative advantage in people management, and Japan, Sweden, and Germany have the largest relative advantage in monitoring and target-setting management. The systematic difference in the relative scores of different types of management across countries also suggests that there may be some specialization in areas of comparative advantage, perhaps because of labor market regulation.

An interesting question is whether there really are any universals, i.e., some practices that would be unambiguously better for the majority of firms. That certain management practices are robustly associated with better firm performance suggests there may be. Then why are all firms not adopting these universally good management practices? The answer to this question is identical to that of the adoption of any new technology—there are costs to adoption in the form of information, incentives, regulatory constraints, and externalities. These vary by time and place, and we turn to some of these factors next.

3.3. Some Factors Influencing Management Practices

Without trying to be exhaustive, we discuss some of the main factors influencing the management practices measures.

3.3.1. Product market competition. **Figure 3** plots the firm-level histogram of management practices and shows that management practices, like productivity, display tremendous variation within countries. The variation across firms within a country is far greater than cross-country variation. Some countries (e.g., India) have lower management scores than the United States because of a large density of badly run firms (scores of 2 or less). This immediately suggests, like Syverson (2004a,b), that the tougher competitive conditions in the United States cause greater selection, removing the badly managed firms more ruthlessly than in India and other nations.

Figure 3

Firm-level histogram showing management practices. Figure adapted from Bloom et al. (2009c).

More formally, we can look at the conditional correlation between management score and several measures of competition in **Table 2**. Whether measured by trade openness, the industry inverse Lerner Index, or simply the number of perceived rivals, competition is robustly and positively associated with higher management practice scores. The obvious endogeneity bias here is to underestimate the importance of competition as better managed firms are likely to have higher profit margins and lower import penetration ratios and to drive out their rivals.

3.3.2. Family firms. There has been a lively debate on the relative merits of family firms (e.g., Bertrand & Schoar 2006). Firms that are both owned and run by a family member are common, especially in developing countries. **Figure 4** plots a firm-level histogram of the management scores by ownership category. Firms that are family owned and family managed have a large tail of badly managed firms, whereas the family owned but externally managed firms look similar to those with dispersed shareholders. Government firms are clearly badly managed, whereas firms owned by private equity appear well managed.

Table 2 Management quality

Dependent variable: management quality	1	2	3
Import penetration	0.081* (0.044)		
(1 - Lerner) Index of competition		5.035*** (2.146)	
Number of competitors			0.115*** (0.023)
Observations	2819	2657	2789

***Indicates significance at the 1% level and * at the 10% level. OLS estimates with standard errors (clustered at the same level as the competition term in parentheses below coefficients). The dependent variable is the z-score of the average of the z-scores of the 18 questions in the management grid. Countries are the two cross sections of firms interviewed in the United States, United Kingdom, France, and Germany in 2004 and 2006. Import penetration is the (lagged) value of all imports divided by domestic production in the plant's two-digit by country cell; Lerner is the (lagged) median gross margin across all firms in the plant's two-digit by country cell. "Number of competitors" is the plant manager's perceived number of competitors. All columns include controls for a full set of three-digit industry dummies, country dummies, time dummies, the proportion of employees with a college degree, ln(size), publicly listed dummy, and interview noise controls (interviewer dummies, time, date, and manager characteristics). Table taken from Bloom et al. (2009c).

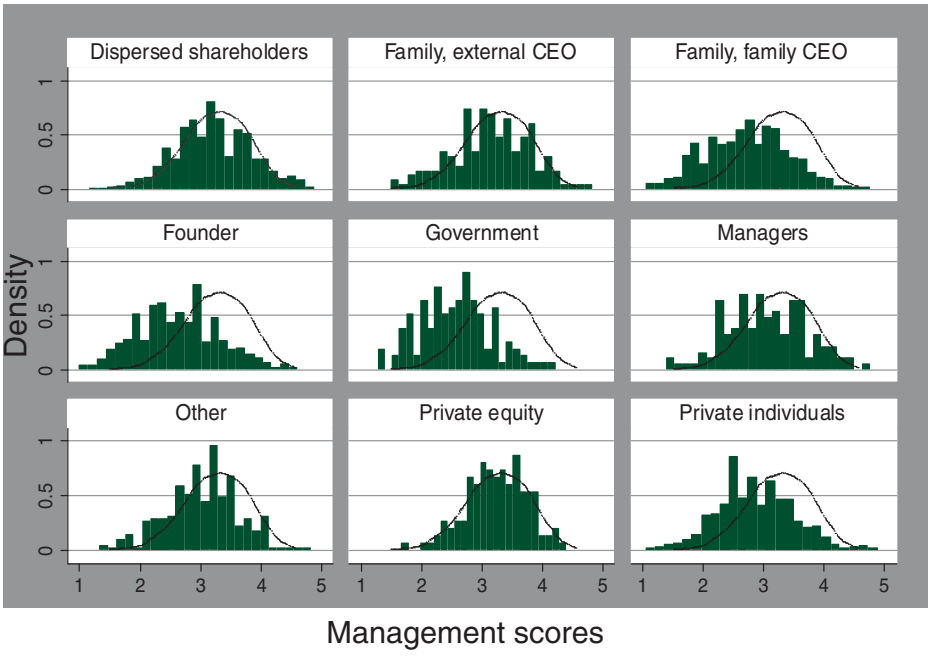

Figure 4

Distribution of firm management scores by ownership group. Overlaid black curves are the kernel density for dispersed shareholders, the most common U.S. ownership type. Figure adapted from Bloom et al. (2009c).

This finding is robust to more systematic controls for other covariates. Family ownership per se is not correlated with worse management practices; it is when family ownership is combined with the CEO being chosen as the eldest son (i.e., primogeniture) that the quality of management appears to be very poor. This is consistent with the idea that limiting the talent pool to a single individual is not the optimal form of CEO selection. It is also consistent with Pérez-González (2006) and Bennedsen et al. (2007), who find that inherited family control appears to cause worse performance.[7]

3.3.3. International trade and globally engaged firms. Consistent with Helpman et al. (2004), there is a pecking order in management scores, with purely domestic firms at the bottom, firms that export but that do not produce overseas next, and multinational firms at the top. In fact, multinational subsidiaries tend to be better managed in every country, consistent with the idea that they can transplant some of their practices overseas. This is important as it suggests that a mechanism for good management practices to diffuse internationally is through the investments of overseas firms.

3.3.4. Education. Education is extremely highly correlated with productivity in a range of studies and with management scores in Bloom & Van Reenen (2007). Interestingly, they find that this is true both for managerial education (proxied by the share of managers with a degree or an MBA) and for nonmanagerial education (proxied by the share of nonmanagers with a degree). One potential explanation is that it is easier to adopt modern management practices around data collection and analysis, economically rational targets, and strong incentives if employees are well educated.

3.3.5. Labor market regulation. The cross-country differences in people management are related to the degree of labor market regulation (lightly regulated countries such as the United States and Canada do better than heavily regulated countries such as France, Brazil, and Greece). This is consistent with heavily regulated labor markets restricting managerial practices around hiring, firing, pay, and promotions.

3.3.6. Summary on determinants of management quality. Although causality is hard to prove, our reading of the evidence is that weak product market competition and family firms reduce management quality, and more human capital and lighter labor regulation improve people management. Although openness to trade and foreign direct investment will help increase average management quality, the fact that multinationals and exporters are better managed is more likely a selection effect, rather than being causal.

4. DECENTRALIZATION

We focus on decentralization as separate from managerial spans of control. These are distinct concepts as the span and depth (number of levels) of a hierarchy are compatible with different power relationships between the levels. Nevertheless, there is some evidence that the move toward delayering over the past 20 years has been associated with decentralization (see Rajan & Wulf 2006).

[7]They use the gender of the eldest child as an instrumental variable for family management because families are more likely to hand management down to sons.

4.1. Measurement of Decentralization

A key question for any organization is who makes the decisions. A centralized firm is one in which decision making occurs at the top of the hierarchy, whereas in a decentralized firm, decision making is more evenly dispersed throughout the hierarchy. An extreme case of a decentralized organization is a market economy in which atomistic individuals make all the decisions and spot contract with each other. Many debates on decentralization originated in the 1930s over the relative merits of a market economy relative to a centrally planned one.

How can this concept be operationalized empirically? One way is to look at the organization charts of firms (i.e., organograms) as graphical representations of the formal authority structure. One of the best studies in this area is Rajan & Wulf (2006), who use the charts of over 300 large U.S. corporations in 1987–1998 to examine the evolution of organizations (e.g., how many people directly report to the CEO as a measure of the span of control). Unfortunately, as Max Weber and (more recently) Aghion & Tirole (1997) stressed, formal authority is not the same as real authority, as the organogram may not reflect where real power lies.

Observing whether a firm is decentralized into profit centers is useful, as this is a formal delegation of power—the head of such a business unit will be performance managed on profitability. If the firm is composed of cost (or revenue) centers, this indicates less decentralization. If the firm does not delegate responsibility at all, this is more centralized. Acemoglu et al. (2007) use this distinction.

Still, using only profit centers as an indicator is rather crude, and it is better to directly survey the firms themselves. Bloom et al. (2009f) measure decentralization between the central headquarters (CHQ) and the plant manager (see **Table 3**). They asked plant managers about their decisions over investment (maximum capital investment that could be made without explicit sign-off from CHQ), hiring, marketing, and product introduction (the latter three on a scale of one to five).

As a summary empirical measure, consider combining these four measures into a single index of decentralization by z-scoring each individual indicator and z-scoring the average. The decentralization index displays considerable variation across firms. There is also a large difference across countries, as shown in **Figure 5**. Interestingly, the U.S., U. K., and Northern European countries are the most decentralized, whereas the Asian countries are the most centralized.

Decentralization extends beyond plant managers and the CHQ of course. At a minimum, there is the autonomy of the workers from the plant manager. Bresnahan et al. (2002) focus on this aspect. Proxies for this include questions on worker control over the pace of work and the allocation of tasks (see **Table 3**).

4.2. Theories of Decentralization

The basic trade-off in decentralization decisions is between the efficient use of local information (see Radner 1993) favoring delegation and the principal-agent problem in which the agent has weaker incentives to maximize the value of the firm than the principal (on the trade-off, see Aghion & Tirole 1997, Prendergast 2002).

The benefits from decentralization arise from at least three sources. First, decentralizing decision making reduces the costs of information transfer and communication. In a hierarchical organization, information processed at lower levels of the hierarchy has

Table 3 Details of the decentralization survey questions

Question D1: "To hire a FULL-TIME PERMANENT SHOPFLOOR worker what agreement would your plant need from CHQ (central headquarters)?" Probe until you can accurately score the question; for example, if they say "It is my decision, but I need sign-off from corporate HQ," ask "How often would sign-off be given?"					
	Score 1	Score 3		Score 5	
Scoring grid	No authority, even for replacement hires	Requires sign-off from CHQ based on the business case; typically agreed (i.e., approximately 80% or 90% of the time)		Complete authority; it is my decision entirely	
Question D2: "What is the largest CAPITAL INVESTMENT your plant could make without prior authorization from CHQ?" Notes: (*a*) Ignore form-filling. (*b*) Please cross check any zero response by asking "What about buying a new computer—would that be possible?" and then probe. . . . (*c*) Challenge any very large numbers (e.g., >0.25 million in U.S. dollars) by asking "To confirm, your plant could spend $X on a new piece of equipment without prior clearance from CHQ?" (*d*) Use the national currency and do not omit zeros (i.e., for a U.S. firm twenty thousand dollars would be 20,000).					
Question D3: "Where are decisions taken on new product introductions—at the plant, at the CHQ, or both?" Probe until you can accurately score the question—for example, if they say "It is complex, we both play a role," ask "Could you talk me through the process for a recent product innovation?"					
	Score 1	Score 3		Score 5	
Scoring grid	All new product introduction decisions taken at the CHQ	New product introductions jointly determined by the plant and CHQ		All new product introduction decisions taken at the plant level	
Question D4: "How much of sales and marketing is carried out at the plant level (rather than at the CHQ)?" Probe until you can accurately score the question. Also take an average score for sales and marketing if they are taken at different levels.					
	Score 1	Score 3		Score 5	
Scoring grid	None; sales and marketing run by CHQ	Sales and marketing decisions split between the plant and CHQ		The plant runs all sales and marketing	
Question D5: "Is the CHQ on the site being interviewed?"					
Question D6: "How much do managers decide how tasks are allocated across workers in their teams?" Interviewers are read out the following five options, with our scoring for these noted above					
	Score 1	Score 2	Score 3	Score 4	Score 5
Scoring grid	All managers	Mostly managers	About equal	Mostly workers	All workers
Question D7: "Who decides the pace of work on the shopfloor?" Interviewers are read out the following five options, with "customer demand" an additional option that is not read out					
	Score 1	Score 2	Score 3	Score 4	Score 5
Scoring grid	All managers	Mostly managers	About equal	Mostly workers	All workers

For questions D1, D3, and D4, any score can be given, but the scoring guide is provided only for scores of 1, 3, and 5. The electronic survey, training materials, and survey video footage are available at **http://cep.lse.ac.uk/management/default.asp**. Table taken from Bloom et al. (2009b).

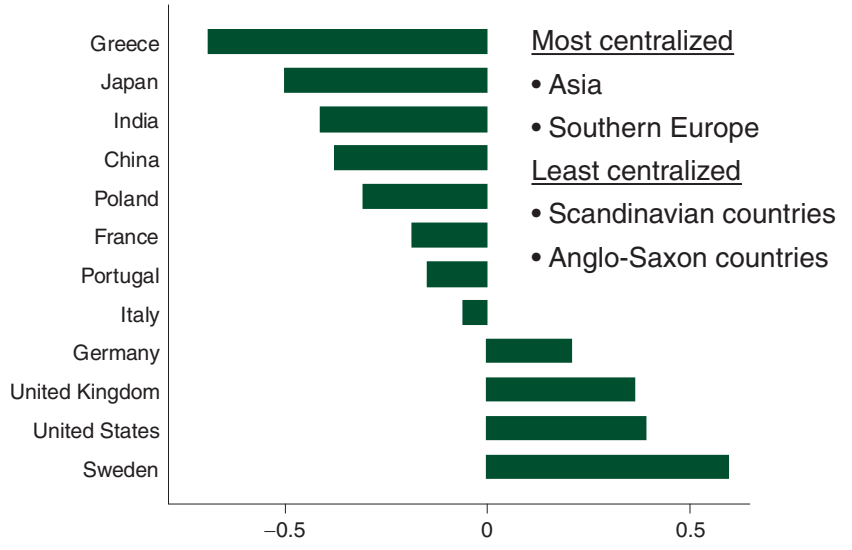

Figure 5

The organization of firms across countries. High values on the decentralization z-score index indicate decentralized organization, whereas low values indicate centralized organization. Figure adapted from Bloom et al. (2009f).

to be transferred upstream. This induces a cost owing to the need for information to be codified and then received and analyzed at various levels (Bolton & Dewatripont 1994). When decision making is decentralized, information is processed at the level at which it is used, so the cost of communication is lower. Second, decentralization increases firms' speed of response to market changes (Thesmar & Thoenig 1999). One reason for this is that hierarchical organizations are characterized by a high degree of worker specialization. Any response to market changes involves the coordination of a great number of activities, so the firm's reaction speed is low. When responsibility is transferred downstream, it is most often delegated to teams of workers, generally involved in multitasking. This allows a quicker reaction to market changes given that coordination involves a limited number of multiskilled workers. Finally, the decentralization of decision making may increase productivity through raising job satisfaction. The delegation of responsibility goes along with more employee involvement, greater information sharing, and a greater participation of lower-level staff.

With regard to the costs of decentralization, we highlight four of them here. First, costs arise from the risk of duplicating information in the absence of centralized management. Workers are now in charge of analyzing new pieces of information. With decentralization, the risk of replication in information processing increases, both across individuals and across teams. A related risk is that of an increase in the occurrence of mistakes as there is less coordination (e.g., plants producing substitutable products will tend to price too low) (see Alonso et al. 2008 for a general discussion). A third cost is that decentralization makes it more difficult to exploit returns to scale (Thesmar & Thoenig 2000). The reason for this is that, as multitasking develops, returns to specialization decrease so that large-scale production becomes less beneficial. Finally, decentralization may reduce workers' efficiency if the increase in responsibility that it implies induces rising stress (Askenazy

2001). In this case, productivity may be directly affected and/or reduced through lower job satisfaction.

4.3. Some Factors Determining Decentralization

We divide our analysis into the examination of three groups of factors that influence decentralization: technology, economics, and culture.

4.3.1. Technological factors. We discuss several technological factors that influence decentralization, such as organizational size, ICT, age, innovation, and heterogeneity.

Firm size and scope. Some basic factors determine decentralization. All else being equal, a larger firm will require more decentralization than a small firm. A sole entrepreneur does not need to delegate because she is her own boss, but as more workers are added, doing everything herself is no longer feasible. Penrose (1959) and Chandler (1962) stress that decentralization is a necessary feature of larger firms, because CEOs do not have the time to make every decision in large firms. Similarly, as firms expand their scope both geographically and in product space, local information will become more costly to transmit, so this will also favor decentralization.

Table 4 illustrates these factors at work from Bloom et al. (2009f), who regress plant manager autonomy on a number of factors. Column 1 shows that doubling firm size increases the decentralization in index by 0.081 of a standard deviation and doubling plant size increases decentralization by 0.125. Plant managers in subsidiaries of foreign multinationals have 0.12 of a standard deviation more autonomy than similar plants that are domestic nonmultinationals.[8]

Information and communication technologies. Garicano (2000) formalizes the idea of the firm as a cognitive hierarchy. There are a number of problems to be solved, and the task is how to solve them in the most efficient manner. The simplest tasks are performed by those at the lowest level of the hierarchy, and the exceptional problems are passed upward to an expert. The cost of passing problems upward is that communication is nontrivial. The benefit of passing the problem upward is that it economizes on the cognitive burden of lower-level employees.

This framework was designed to address the impacts of ICT. Interestingly, information technologies have different implications for decentralization than communication technologies. Consider again the decentralization decision between the CHQ and plant manager. When communication costs fall through the introduction of company intranets, for example, it is cheaper for the plant manager to refer more decisions to the corporate officers. Therefore, communication technologies should cause centralization. By contrast, technologies that make it easier for the plant manager to acquire information (e.g., enterprise resource planning software, known as ERP, like SAP) should increase decentralization. An example in law firms would be Lexis Nexis, which enables junior lawyers to quickly find relevant cases without consulting a more senior associate or partner.

[8]Colombo & Delmastro (2004) also find that complexity-related variables are associated with decentralization in their sample of Italian firms.

Table 4 Decentralization

Dependent variable: decentralization	1	2	3
Ln(firm employment)	0.081*** (0.027)	0.068*** (0.019)	0.066*** (0.018)
Ln(plant employment)	0.125*** (0.023)	0.088*** (0.024)	0.086*** (0.022)
Foreign multinational	0.131*** (0.048)	0.106*** (0.041)	0.115*** (0.042)
Domestic multinational	0.010 (0.059)	−0.004 (0.049)	0.001 (0.043)
Skills	0.080*** (0.018)	0.082*** (0.017)	0.083*** (0.016)
Import penetration	0.183** (0.073)		
(1 - Lerner) Index of competition		1.763** (0.878)	
Number of competitors			0.093*** (0.034)
Observations	2508	3698	3698

***Indicates significance at the 1% level and ** at the 5% level. The dependent variable is the decentralization z-score index, measured by the plant manager's autonomy over hiring, investment, products, and pricing. OLS estimates with standard errors (clustered at the same level as the competition term in parentheses below coefficients). All columns include a full set of three-digit industry dummies and country dummies. Twelve countries included. Import penetration is the (lagged) value of all imports normalized divided by domestic production in the plant's two-digit by country cell; Lerner is the (lagged) median gross margin across all firms in the plant's two-digit by country cell; "Number of competitors" is the plant manager's perceived number of competitors; controls include a publicly listed dummy, a dummy for whether the CEO is on the same site as the plant, and interview noise controls (interviewer dummies, time, date, and manager characteristics). Table taken from Bloom et al. (2010).

Bloom et al. (2009b) test this theory and find considerable empirical support. Computer networks (reducing communication costs) significantly decrease decentralization to plant managers, whereas tools to help managers access more information (like ERP) significantly increase decentralization.

Age, innovation, and heterogeneity. Acemoglu et al. (2007) present a model of decentralization that stresses the need to learn about the best way to use a new technology. This is a special case of the general problem that an organization faces in deciding whether to pursue a new activity without knowing the exact benefits (and perhaps costs). The setup is of a principal (CHQ) deciding whether to delegate to a local agent (plant manager) who is better informed. As usual, the trade-off is between better local information and worse incentives owing to the agency problem.

The natural way to model this example is with the firm attempting to learn from other implementations of the technology. Acemoglu et al. (2007) consider first the problem of learning from other firms in the industry. The profitability of each previous implementation of the technology is a (noisy) signal of the profitability of the firm implementing the technology itself. Firms act as Bayesians updating their priors based on the public history

of other firms. As firms know increasingly more about the success of the new technology, there is increasingly less need to delegate to the better-informed local agent. This immediately generates two results. First, the greater the heterogeneity of the industry is, the less valuable will be the experience of other firms in predicting the outcome for the firm itself. Thus greater heterogeneity (as indicated by the variance of productivity, for example) will be associated with more decentralization. Second, the more recent the technology is, the less will be known, so the more likely the firm is to decentralize to the plant manager. An extension to the model considers learning from oneself rather than from others. In this case older firms that have had more time to learn about themselves should be more centralized than younger firms.

Acemoglu et al. (2007) measure decentralization in several ways using both formal measures of whether firms are organized into profit centers (in French data) and real survey measures of the power managers have over hiring decisions (in British data). In both samples they find econometric evidence consistent with their three theoretical predictions: Decentralization is more likely in industries that are more heterogeneous and for firms that are younger or closer to the technological frontier. These results are illustrated in **Figure 6**, which plots average decentralization by decile for the raw data. **Figure 6*a*** shows a reasonably clear upward slope after the second decile between decentralization and heterogeneity.[9] In **Figure 6*b***, decentralization appears to be higher among firms closer to the technological frontier (as measured by productivity), and in **Figure 6*c*** older firms appear more centralized than younger firms.

4.3.2. Economic factors. We now turn to the discussion of economic factors that influence decentralization, such as skills and competition.

Skills. Many models would predict that human capital should be associated with decentralization. For example, more skilled workers will have greater ability to take on more responsibility. When the environment changes because of new technologies and organizational change is required, skilled workers may be better at learning how to cope with the new organizational structures.

There is generally a robust and positive association of decentralization and skills, as shown in **Table 4**, where we measure skills by the proportion of people who hold a college degree and find this to be significantly correlated with decentralization. Caroli & Van Reenen (2001) examine the relationship between skills and organization in some detail, arguing in favor of skill-biased organizational change. To take on the endogeneity problem, they use information on the differential price of skilled versus unskilled labor in the local market (as indicated by the wage differential between college-educated workers and other individuals). They argue that this skill premium is partially driven by exogenous shifts in the labor supply of unskilled workers. For their sample of U.K. and French firms, they find that regions where skill prices are higher have a lower probability of decentralization/delayering.

Product market competition. Some authors argue that the move to more decentralized and delayered organizations is caused in part by rapid technological change (in information technology, for example). An alternative explanation is that globalization and deregulation have increased the degree of product market competition and stimulated organizational change.

[9]The authors show that the anomalous first decile results from the disproportionate number of older and less productive firms in this decile (this is controlled for in the regressions).

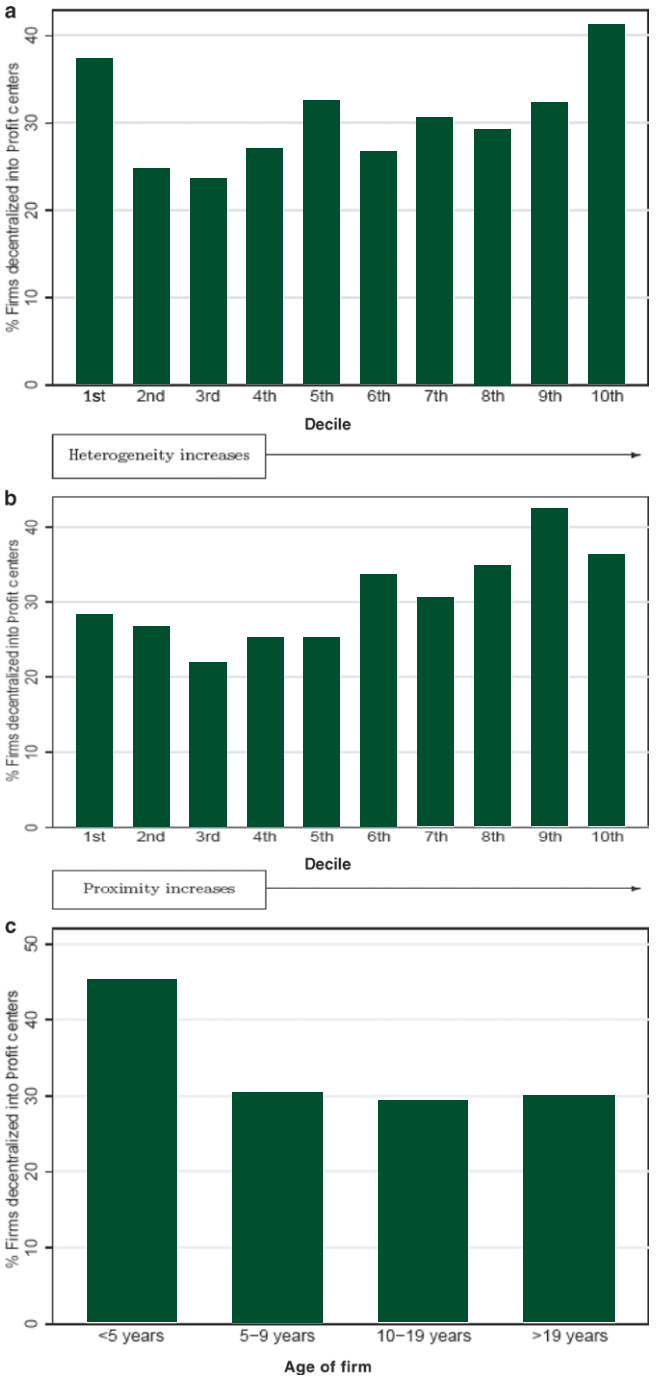

Figure 6

Decentralization to profit centers: (*a*) heterogeneity and decentralization, (*b*) proximity to frontier and decentralization, and (*c*) age and decentralization. Figure adapted from Acemoglu et al. (2007).

Theory is ambiguous here. If competition has made swift decisions more important, then this will have increased the salience of local knowledge, leading to greater decentralization under the framework discussed above (e.g., Aghion & Tirole 1997). Similarly, if competition aligns the incentives of agents more with the principal, then the costs of decentralization may also have fallen. There are countervailing forces, however. For example, a larger number of firms in an industry aids yardstick competition, but it may also help learning, which will reduce the need to decentralize.

The empirical evidence, however, is clear-cut. Bloom et al. (2010) find a robust positive association between competition and decentralization using industry import competition (column 1 in **Table 4**), the inverse industry Lerner Index (column 2), or simply the number of perceived competitors (column 3). A similar positive correlation was reported in Acemoglu et al. (2007) and Marin & Verdier (2008). Both are cross-sectional studies, and the positive coefficient on competition could simply reflect unobserved variables. Guadalupe & Wulf (2010) try to tackle this using Rajan & Wulf's (2006) panel data on the changing organizational structure of firms over time. They argue that the Canadian-U.S. Free Trade Agreement in 1989 constitutes an exogenous increase in competition for U.S. firms in the industries in which tariffs were removed. Exploiting this policy experiment, they find that competition is associated with delayering (increasing span for CEO) and that this is likely to also reflect increased delegation (using wage data).

4.3.3. Cultural factors. In recent years, economists have started to take cultural factors more seriously in determining economic outcomes (Greif 1994, Guiso et al. 2006). Part of this is due to the influence of Putnam (1993) on the importance of social capital and the finding that trust is important in a number of economic dimensions (e.g., on growth, see Knack & Keefer 1997; on foreign trade, see Guiso et al. 2009).

Trust is an obvious candidate for improving delegation incentives as it will relieve the agency problem. It could also be a mechanism to enforce long-term contracts in repeated interactions, particularly in the framework of Baker et al. (1999), in which formal authority always resides with the principal. In their model, the principal decides whether to decentralize after the agent reveals his private information, so it is important that the agent trusts the principal, which will allow him to decentralize after information is revealed. If contracts can be well enforced, this should also help decentralization to take place, and we do observe more delegation in countries where rule of law is strong (see column 5 in **Table 4**).[10] However, contracts are never perfectly enforceable, and this leaves a role for trust to help generate more delegation.

Bloom et al. (2009f) examine the importance of culture. They show that higher levels of trust in the region where a plant is located are associated with a significantly greater degree of decentralization. Trust is measured using the standard indicators in the World Values Survey. The magnitude of this effect is nontrivial. Moving from the region with the lowest level of trust (Assam in India) to that with the highest trust (Norrland in Sweden) is associated with an increase of 0.45 of a standard deviation in the decentralization index.

Bloom et al. (2009f) also exploit the fact that they have many subsidiaries of multinational firms, so they can construct measures of trust in the country of origin (the multinational's headquarters) and location (country where the affiliate is set up). Both these

[10]Laeven & Woodruff (2007) look at the impact of rule of law on firm size across regions within one country, Mexico. They find larger firms in the states where rule of law is better enforced, consistent with our argument that strong rule of law facilitates decentralization, which enables efficient firms to grow.

factors seem to matter for decentralization, but the most powerful factor is the bilateral trust between country pairs, i.e., the degree to which people from the subsidiary's parent country trust people in the country where the plant is located. Multinationals located in countries that are seen to be relatively highly trusted (after country location and origin dummies are removed) are more likely to decentralize. This suggests that trust can affect the internal structures of global firms and that some aspects of organization are transplanted abroad, in agreement with recent theories of international trade (e.g., Helpman et al. 2004).

4.3.4. Summary on decentralization. Larger global firms that are closer to the technology frontier and located in more heterogeneous and competitive industries will, on average, become more decentralized. Improvements in information technology increase decentralization, but improvements in communication technology reduce decentralization. Finally, cultural and legal factors such as lower trust increase decentralization.

5. ORGANIZATIONAL PRACTICES AND FIRM PRODUCTIVITY

How can researchers identify the causal effects of organizational practices in general (in particular, management practices and decentralization) on firm performance?

5.1. Correlations of Performance and Organizational Practices: The Basic Identification Problem

Consider the basic production function as

$$q_{it} = \alpha_l l_{it} + \alpha_k k_{it} + a_{it}, \tag{1}$$

where q is ln(output), l is ln(labor), and k is ln(capital) of firm i at time t. Assume that we can write the TFP term as

$$a_{it} = a_0 + \beta m_{it} + u_{it}, \tag{2}$$

where m_{it} is an organizational feature of the firm (such as the management index discussed in Section 3) and u_{it} is an unobserved error. Therefore,

$$q_{it} = a_0 + \alpha_l l_{it} + \alpha_k k_{it} + \beta m_{it} + u_{it}. \tag{3}$$

Assume that we can deal with the econometric problems in estimating the coefficients on the production function so that we have a consistent measure of TFP (see Ackerberg et al. 2007 for a discussion of recent contributions here). Ordinary least squares (OLS) estimation of Equation 2 will generally be biased as $E(m_{it}u_{it}) \neq 0$.

The traditional strategy is to assume that m is a fixed effect. Therefore, one approach is simply to recover TFP and project it on m. This will indicate whether there is an association between the two measures, but the relationship is by no means causal. For example, Bloom & Van Reenen (2007) show that there is a robust relationship between TFP and their measure of management quality, but they interpret this as an external validity test of the quality of the management data rather than any causal relationship.

If there are time-varying measures of organization, an analogous strategy is to treat all the correlated unobservables as fixed; i.e., $u_{it} - \eta_i + \varepsilon_{it}$ with $E(m_{it}\eta_i) \neq 0$ but $E(m_{it}\varepsilon_{it-s}) - 0$,

$s \geq 1$. Thus the fixed-effect model estimated in differences, for example, would be $\Delta a_{it} = \beta \Delta m_{it} + \Delta \varepsilon_{it}$, which can be consistently estimated by OLS.

There are a large number of studies that have correlated various aspects of the firm's performance on various aspects of its organizational form (see the survey in Lazear & Oyer 2010). The better studies use micro data, pay careful attention to the measurement issues, and control for many covariates. For example, Cappelli & Neumark (1999) and Black & Lynch (2001) examine various aspects of high-performance workplaces mostly relating to employee involvement, teamwork, and meetings. Caroli & Van Reenen (2001) look at organizational changes such as delayering. All three papers look across many industries and find no direct effect of these measures on performance when fixed effects are included (in contrast to many of the case studies).

There remain several serious problems with the literature. First is the data constraint that measuring organization is hard and finding data with time-series variation is even harder. Second, the management proxies are measured with error, so this will cause attenuation toward zero if the measurement error is classical. This bias is exacerbated in first differences. Third, and most seriously, the factors that cause variation in the propensity to adopt organizational practices will also likely be correlated with those affecting TFP, so the assumption that $E(m_{it}\varepsilon_{it}) = 0$ is unlikely to hold in most cases. The bias could be upward or toward zero [e.g., if firms doing badly are more likely to innovate organizationally, as argued by Nickell et al. (2001)].

There is no simple solution to these problems, as we fundamentally need some exogenous identifying variation. The most promising route is through randomized control trials, for example, in which the researchers design an intervention to raise management quality (such as a high-quality management consultancy intervention) and randomize out a control group from the eligible population. The authors are involved with such experiments in India and Eastern Europe and in preliminary analysis are finding large productivity effects when management practices are improved (Bloom et al. 2009a). An alternative to real experiments is to use quasi-experiments on specific interventions, and there is an emerging literature on this.

Most of the quasi-experiments have been in the labor economics field. For example, Lazear (2000) looks at the introduction of a pay-for-performance system for windshield installers in the Safelite Glass Company. Lazear finds that productivity increased by approximately 44%, with approximately half due to selection effects and half to the same individuals changing behavior. More recently, Bandiera et al. (2009) engineered a change in the incentive pay system for managers of a fruit farm. They have no contemporaneous control group but can examine the behavior of individuals before and after the introduction of the incentive scheme. Productivity rose by 21% mainly owing to improved selection (the managers allocated effort toward the ablest workers rather than their friends).[11]

A related literature is on the productivity impact of labor unions, an important human resource policy choice (see Freeman & Medoff 1984). Exactly the same set of issues arises.

[11]Other examples include Shearer (2004), who finds productivity increases from a switch to piece rates of tree planters in British Columbia, and Freeman & Kleiner (2005), who find a loss of productivity when piece rates were removed for a footwear manufacturer. More ambiguous effects are found in Oyer (1998), Asch (1990), Courty & Marshke (2004), and Griffith & Neely (2009).

One recent attempt at an identification strategy here is DiNardo & Lee (2004), who exploit a regression discontinuity design. In the United States, a union must win a National Labor Relations Board election to obtain representation, so one can compare plants just above the 50% cutoff to plants just below the 50% cutoff to identify the causal effects of unions. In contrast to the rest of the literature, DiNardo & Lee (2004) find no effect of unions on productivity, wages, and most other outcomes. The problem, of course, is that union effects may only be large enough to be detected when the union has more solid support from the workforce.

5.2. Complementarities Between Organizational Practices

One of the key reasons why firms may find it difficult to adjust their organizational form is that there are important complementarities between sets of organizational practices. Milgrom & Roberts (1990) build a theoretical structure in which such complementarities (or, more precisely, superadditivities) mean that firms optimally choose clusters of practices that fit together. When the environment changes so that an entrant firm would use this group of optimal practices, incumbent firms will find it harder—they will either switch a large number together or none at all.

This has important implications for productivity analysis. The effects of introducing a single practice will be heterogeneous between firms and depend on what practices they currently use. This implies that linear regressions of the form of Equation 2 may be misleading. As an illustration, consider two practices, m^1 and m^2, and their relationship with productivity is such that TFP increases only when both are used together:

$$a_{it} = a_0 + \beta_1 m^1_{it} + \beta_2 m^2_{it} + \beta_{12}(m^1_{it} * m^2_{it}) + u_{it}. \quad (4)$$

One version of the complementary hypothesis is $\beta_1 < 0$, $\beta_2 < 0$, $\beta_{12} > 0$; i.e., the disruption caused by just using one practice actually reduces productivity. A regression that omits the interaction term may find only a zero coefficient on the linear terms.

The case study literature emphasizes the importance of complementarities. Testing for their existence poses some challenges, however, as pointed out most clearly by Athey & Stern (1998). A common approach is a regression of practice 1 on practice 2 (and more), with a positive covariance (conditional on other factors) indicating complementarity. It is true that complements will tend to covary positively, but this is a weak test. There could be many other unobservables causing the two practices to move together. We need an instrumental variable for one of the practices (e.g., Van Biesebroeck 2007), but this is hard to obtain as it is unclear what such an instrument would be—how could it be legitimately excluded from the second-stage equation? In classical factor demand analysis, we would examine the cross-price effects to gauge the existence of complements versus substitutes; i.e., does demand for practice 1 fall when the price of practice 2 rises (all else equal)? There still remains the concern that the price shocks could be correlated with the productivity shocks, but such an assumption is weaker than the assumption that unobserved shocks to the firm's choice of practices are uncorrelated. Unfortunately, such tests are particularly hard to implement because there are generally not market prices for the organizational factors we are considering.

An alternative strategy is to work straight from the production function (or performance equation more generally). Consider the productivity equation after substituting in multiple practices:

$$q_{it} = a_i + \alpha_l l_{it} + \alpha_k k_{it} + \beta_1 m^1_{it} + \beta_2 m^2_{it} + \beta_{12}(m^1_{it} * m^2_{it}) + u_{it}. \quad (5)$$

In an influential paper, Ichinowski et al. (1997) estimate a version of Equation 5 using very disaggregated panel data on finishing lines in U.S. steel mills using 11 human resource practices (including incentive pay, recruitment, teamwork, job flexibility, and rotation). Their measure of productivity is based on downtime—the less productive lines were idle for longer. They find that introducing one or two practices has no effect on productivity, but introducing a large number together significantly raises productivity. Although the endogeneity problem is not eliminated, the controls for fixed effects, looking within one firm and using performance data, help reduce some of the more obvious sources of bias.

5.3. The Role of Information and Communication Technology

One of the key productivity puzzles of recent years has been why the returns to the use of ICT appear to be so high and so heterogeneous between firms and between countries. For example, Brynjolffson & Hitt (2003) find that the elasticity of output with respect to ICT capital is far higher than its share in gross output (see also Stiroh 2004). One explanation for this is that effective use of ICT also requires significant changes in firm organization. Changing the notation of Equation 5 slightly, we could write

$$q_{it} = a_i + \alpha_l l_{it} + \alpha_k k_{it} + \beta_c c_{it} + \beta_m m_{it} + \beta_{cm}(c * m)_{it} + u_{it},$$

with the hypothesis that $\beta_{cm} > 0$. This is broadly the position of papers in the macro literature in explaining the faster productivity growth of the United States than in Europe after 1995 (e.g., Jorgenson et al. 2008).

Bresnahan et al. (2002) try to test this directly by surveying the organizations of large U.S. firms on decentralization and teamwork (for a cross section) and combining this with data on ICT (from a private company, Harte-Hanks) and productivity from Compustat. They find evidence that $\beta_{cm} > 0$. Bloom et al. (2007) broaden the sample to cover both the United States and firms in seven European countries and find evidence of the complementarity of ICT with people management. They also show that their results are robust to controlling for firm fixed effects. Careful econometric case studies (e.g., Baker & Hubbard 2004, Bartel et al. 2007) also identify the differential productivity effects of ICT depending on organization form.

5.4. The Role of Human Capital

One of the reasons for the renewed interest in organizational change by labor economists was the attempt to understand why technology seemed to increase the demand for human capital and thus contribute to the rise in wage inequality experienced by the United States, the United Kingdom, and other countries since the late 1970s. Many theories have been proposed (see Autor et al. 2003 for a review), but one hypothesis is that lower information technology prices increased decentralization for the reasons outlined in Garicano (2000), Section 4.3., and Garicano & Rossi-Hansberg (2006). Furthermore, decentralization is complementary with skills for at least three reasons. First, skilled

workers are more able to analyze and synthesize new pieces of knowledge so that the benefits of the local processing of information are enhanced. Additionally, skilled workers are better at communicating, which reduces the risk of duplicating information. Second, the cost of training them for multitasking is lower, and they are more autonomous and less likely to make mistakes. Finally, workers who are better educated may be more likely to enjoy job enrichment, partly because they expect more from their jobs in terms of satisfaction.

This has three main implications. (*a*) Decentralization leads to skill upgrading within firms. This is because the return to new work practices is greater when the skill level of the workforce is higher. (*b*) A lower price of skilled labor will accelerate the introduction of organizational changes. (*c*) Finally, skill intensive firms will experience greater productivity growth when decentralizing. Caroli & Van Reenen (2001) find support for all three predictions. They estimate production functions (with the relevant interactions), skill share equations, and organizational design equations. A novel feature of this approach is that because labor is traded in a market, it is possible to use local skill price variation to examine the complementarity issues. They find that higher skill prices make decentralization less likely, consistent with skill-biased organizational change.

5.5. Aggregate Implications and Reallocation

We have argued that countries with stronger competition and greater human capital will have improved management quality and higher productivity. One mechanism is that incumbent firms improve their management quality. However, another mechanism, as discussed in Section 2, is that aggregate productivity will be higher if more output is allocated to the more efficient firms.

Hsieh & Klenow (2009) find much stronger reallocation effects (a correlation between size and productivity) in the United States than in India or China. They suggest this could result from distortions due, for example, to bribery and corruption causing arbitrary variation in the cost of capital and labor across firms. But an alternative explanation is that structural factors, such as low human capital, generate poor management, which leads to greater optimization errors. Good management practices involve the collection and analysis of production information so that firms are less likely to make errors when undertaking new investment or hiring. For example, if badly managed firms make investment decisions without undertaking formal cost-benefit analysis (e.g., capital budgeting), they are much more likely to make investment errors. These optimization errors will lead to a lower correlation between firm size and productivity in countries with bad management practices—such as Brazil and India—than in countries with good management practices, such as the United States.

6. CONCLUSIONS

A growing body of empirical work has shown significant heterogeneity in firm size and productivity, which has only recently been incorporated into mainstream models. Organizational economics has long stressed this phenomenon but has lacked a rigorous empirical basis to measure firm-level management and decentralization across firms and countries. Several recent papers have tried to fill this gap, and we now have (at least in the cross section) much more knowledge. For example, management and decentralization differ

substantially across and between countries. Larger, more skilled, and more globally engaged firms tend to be better managed and more decentralized, as do firms in more competitive markets. Family firms are worse managed. Firms using more information technology in more heterogeneous sectors, and in regions where trust is high, tend to be more decentralized.

SUMMARY POINTS

1. Work in organizational economics has been seriously impaired by the lack of high-quality data across large numbers of firms both nationally and internationally. This is now being rectified.
2. Many of the basic predictions from economic theory receive support from the data (e.g., larger firms are better managed and more decentralized).
3. Product market competition is a key factor in increasing management quality and decentralization.
4. Cultural factors such as trust appear to be important for decentralization.
5. There is much suggestive evidence that management and organization influence productivity, especially in relation to the effects of new technologies.
6. Identifying the causal effect of organizational practices on productivity is a key challenge for future studies.

FUTURE ISSUES

1. Building up panels of data to examine organizational change is a priority (e.g., is the effect of product market competition on management mainly through selection or incumbent responses?).
2. Field experiments are needed that change the managerial and organizational structures of firms differentially across randomly selected treatment and control firms to evaluate their causal impact.
3. There needs to be a closer link between theories and empirical evidence.
4. In terms of economic development, the productivity gap between nations is likely not simply linked to the access to so-called hard technologies such as computers, but also depends more on the ability of developing countries to access and implement some of the organizational practices discussed here. That multinationals can spread better management all over the world suggests that structural factors are not impossible to overcome. Openness to foreign investment and trade (to stimulate competition) should also foster improvements. The evidence that many firms struggle to grow in developing countries may be because of the difficulty of decentralizing, which is necessary for larger firms to operate effectively. Economic, technological, and cultural factors all play a role in distorting the ability of firms to decentralize and grow. Understanding how to alleviate these barriers is an important research and public policy question.

DISCLOSURE STATEMENT

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