THE ORGANIZATION OF FIRMS ACROSS COUNTRIES*

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We argue that social capital as proxied by trust increases aggregate productivity by affecting the organization of firms. To do this we collect new data on the decentralization of investment, hiring, production, and sales decisions from corporate headquarters to local plant managers in almost 4,000 firms in the United States, Europe, and Asia. We find that firms headquartered in high-trust regions are significantly more likely to decentralize. To help identify causal effects, we look *within* multinational firms and show that higher levels of bilateral trust between the multinational's country of origin and subsidiary's country of location increases decentralization, even after instrumenting trust using religious similarities between the countries. Finally, we show evidence suggesting that trust raises aggregate productivity by facilitating reallocation between firms and allowing more efficient firms to grow, as CEOs can decentralize more decisions. *JEL* Codes: L2, M2, O32, O33.

I. INTRODUCTION

Economists have become increasingly aware of the importance of culture on international performance (e.g., Guiso, Sapienza, and Zingales 2006). One influential line of research argues that social capital, usually proxied by measures of social trust, fosters faster growth (e.g., Knack and Keefer 1997; La Porta et al. 1997). The mechanisms through which this might happen are not fully understood, however. In this article, we present evidence

*We would like to thank Larry Katz, Elhanan Helpman, three anonymous referees and Abhijit Banerjee, Luis Garicano, Bob Gibbons, Avner Greif, Oliver Hart, Bengt Holmstrom, Roberto Rigobon, Andrei Shleifer, Julie Wulf, Luigi Zingales, and seminar participants for helpful comments. We are very grateful for the endorsement letters from the Banque de France, Bank of Greece, Bank of Japan, Bank of Portugal, Bundesbank, Confederation of Indian Industry, European Central Bank, European Union, Greek Employers Federation, IUI Sweden, Ministero delle Finanze, National Bank of Poland, Peking University, Peoples Bank of China, Polish Treasury, Reserve Bank of India, Shenzhen Development Bank, Sveriges Riksbank, U.K. Treasury, and the Warsaw Stock Exchange. We would like to thank the Economic and Social Research Council and the International Growth Centre for their financial support. We received no funding from the global management consultancy firm we worked with in developing the survey tool.

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The Quarterly Journal of Economics (2012), 1663–1705. doi:10.1093/qje/qje029.
Advance Access publication on September 7, 2012.

that high social capital in an area increases decentralized decision making within firms, and this decentralization may improve productivity by supporting larger equilibrium firm size.

We develop a model building on Garicano (2000) to analyze how trust affects the organization of firms. The CEO can either solve production problems directly or delegate these decisions to plant managers. When trust is high, plant managers tend to solve problems "correctly" (rather than, for example, stealing from the firm) so that CEOs are more likely to delegate. Furthermore, by delegating, the CEO can leverage his or her ability over a larger team, which leads to larger firm size. We take these predictions to the data and find support from the hypotheses that trust increases decentralization and raises firm size. Although other mechanisms, such as high-powered incentives or stricter monitoring, could also make it more likely for a plant manager to perform correct actions, trust may have an effect over and above these. This aspect of corporate culture is certainly emphasized by many social scientists as critical in fostering autonomy and productivity.

Our article subjects the "organizational" view of social capital to rigorous econometric investigation and concludes that trust is critical to the ability of a firm to decentralize. We show that trust in a region (even after controlling for country dummies and many other factors) is associated with much more decentralized decision making. To probe whether this effect is causal, we exploit the fact that some of our data are drawn from multinational subsidiaries. We find that the level of trust prevalent in the country where the multinational is headquartered has a strong positive correlation with decentralization in the affiliate's foreign location: for example, in California, a multinational affiliate from Sweden (a high-trust country) would typically be more decentralized than a multinational affiliate from France (a relatively low-trust country). We further show that this is driven by the level of *bilateral* trust between countries, which seems to affect not only flows of trade and investment between countries (as in Guiso, Sapienza, and Zingales 2009) but also the internal organization of multinationals. Moreover, the effect of trust on decentralization is present even when we instrument bilateral trust with measures of religious similarity between countries, which are arguably exogenous to the firm.

Countries that find decentralization more costly may suffer lower welfare because it will be difficult for more efficient firms to

grow large. Penrose (1959) and Chandler (1962) argued that decentralization was essential for the creation of large firms because CEOs are time constrained over the number of decisions they can make. As firms grow large and more complex, CEOs need to increasingly decentralize decision making power to their senior management. In our data, we find that larger firms are indeed significantly more decentralized and that high-trust regions are able to sustain firms of large equilibrium size. This is important because for capital and labor to be effectively reallocated across firms, productive firms need to grow large and take market share from unproductive firms. This reallocation is a major factor driving growth in developed countries like the United States.[1] But in emerging economies like India, where firms are typically quite centralized, average firm size is smaller, so that the more productive firms have a relatively smaller market share than in developed economies (see, for example, Hsieh and Klenow 2009).

Our analysis is focused on a novel international data set providing detailed information on the internal organization of firms. The economic theory of organization has made great strides in the past two decades in furthering our understanding of activities within the boundary of the firm (see Gibbons and Roberts 2012), but empirical research on this has lagged far behind because of a lack of organizational data. The few data sets that exist are either from a single industry or (at best) across many firms in a single country.[2] We address this lacuna by analyzing data on the organization of almost 4,000 firms across 12 countries in Europe, North America, and Asia. We designed and collected these data using a new survey tool, and we measure the decentralization of investment, hiring, production, and marketing decisions from the central headquarters (CHQ) to plant managers. These data reveal startling differences in the cross-country decentralization of

1. See, for example, Foster, Haltiwanger, and Krizan (2006) and Foster, Haltiwanger and Syverson (2008), who show that about 50% of productivity growth in the manufacturing sector and about 90% in the retail sector comes from reallocation.

2. On single industry studies, see Baker and Hubbard (2003, 2004) on trucks, Garicano and Heaton (2010) on policing or Garicano and Hubbard (2007) on legal services. For cross-industry studies of firms see, for example, Acemoglu et al. (2007) on France and the United Kingdom; Colombo and Delmastro (2004) and Kastl, Martimort, and Piccolo (2008) on Italy; Marin and Verdier (2008) on Germany and Austria; and Rajan and Wulf (2006) for the United States.

firms: those in the United States and northern Europe appear to be the most decentralized, and those in southern Europe and Asia are the most centralized. The survey also includes detailed questions on management practices modeled as in Bloom and Van Reenen (2007), which enables us to control for managerial ability, a possible omitted variable that could be correlated with both greater decentralization and higher trust.

Our article links to several literatures. First, there are papers examining the impact of social capital. La Porta et al. (1997) found in cross-country regressions that the combined size of the largest 25 public quoted firms was positively correlated to trust. Guiso, Sapienza, and Zingales (2009) examine the role of trust in explaining patterns of economic exchange (including foreign direct investment [FDI] flows) between countries. In a similar spirit, Bottazzi, Da Rin, and Hellman (2010) study the importance of cultural factors in explaining flows of venture capital investments across countries. Although our work builds on this literature, a key distinction is the disaggregation of our analysis. To the best of our knowledge, this is the first article looking at the role of trust on the organizational structure of *firms* across multiple countries, as opposed to country-level relationships.

Second, our article links to an emerging literature in trade on multinationals and comparative advantage. Helpman, Melitz, and Yeaple (2004), Burstein and Monge-Naranjo (2009), and Antras, Garicano, and Rossi-Hansberg (2008) emphasize the importance of firm-level comparative advantage in multinationals. In these models, firms have some productivity advantage, typically deriving from a different managerial or organizational technology, which their multinationals transplant to their overseas affiliates. Our evidence on the transplanting of a multinational's domestic organizational practices abroad provides empirical support for this assumption.

Finally, we link to the literature on the "transportation" of culture by individuals across countries. For example, Fisman and Miguel (2007) show that the parking fine behavior of diplomats in New York is strongly predicted by indices of corruption in their home countries.[3] Our evidence suggests that firms also take part of their home country's "culture" abroad. Interestingly, this holds

3. In the social domain, Fernandez and Fogli (2009) show that fertility rates among second-generation Americans are correlated with fertility in the countries of their parents.

even in multinationals when all the managers come from the country of location, suggesting that firms offer a mechanism for transporting culture across countries in addition to individual migration.

The article is organized as follows. Section II sketches a simple model of trust and organizational structure and its empirical implications. Section III details the data, and Section IV has some descriptive statistics. The empirical results on the effect of trust on decentralization (and firm size) are contained in Section V, and Section VI concludes.

II. THEORY

II.A. A Model of Trust and Decentralization

Our starting point is the models of Garicano (2000) and Garicano and Rossi-Hansberg (2007) on the hierarchical organization of expertise. Firms have to solve production decisions to generate output. Decisions are made at the lowest hierarchical level at which an agent is able to make them. In determining their hierarchical organization firms face a trade-off between *information acquisition costs* (a) and *communication* ("helping") *costs* (h). Making decisions at lower levels implies increasing the cognitive burden of agents at those levels. For example, decentralizing from the CEO to plant managers over the decision whether to invest in new equipment requires training plant managers to discount cash flows using the appropriate cost of capital to compare these to the cost of investment. To the extent that the plant manager is unable to make this decision, it will be passed up to the corporate headquarters. But this increases communication costs in the hierarchy because the plant manager will have to explain some of the details behind the potential investment project, and after solving the problem the CEO will have to explain what the manager must do. Thus, the extent of decentralization depends on the optimal trade-off between *knowing* versus *asking* for directions.

We extend the Garicano (2000) model by adding the idea of trust. The CEO may not trust the manager's decision because of misaligned incentives—for example, she may worry about the plant manager taking bribes from equipment sellers.[4] If the

4. Alternatively, it may be more a question of ability—the plant manager may not be trusted to take the correct decision because even if he has acquired the formal knowledge to do the task (e.g., through training) he might still make a mistake.

CEO does not trust the plant manager to take the right action, there will be less decentralization. This allows us to analyze the effect of trust on firm size. We show that firm size is increasing in the CEO's trust in the plant manager because when she is able to delegate decision making, the CEO needs to spend less time helping any individual plant manager make decisions.[5]

Production. Firms are composed of a CEO and an endogenous set of production plants, each with a single plant manager. These production plants draw management problems z from the interval [0,1] each period. Production at each plant only takes place if all of these problems are solved, otherwise nothing is produced. We normalize to 1 the unit of output per plant per time period if production problems are solved. The frequency of these management problems is denoted by $f(z)$ with a corresponding cumulative distribution of $F(z)$. Optimality requires that the plant managers learn the common problems and asks about the exceptions; we thus reverse sort the problems in frequency order, so $f'(z) < 0$.

Managers. All managers have a priori the same cost of acquiring information, α, which we label "management skill." So, for example, if the firm trains plant managers to solve z_M (where $0 < z_M < 1$) management problems then this costs αz_M. If a plant manager draws a problem he cannot solve, he passes it up to the CEO at a communication cost h per problem denoted in terms of management time. Total costs are reduced if employees are trained to deal with the common problems but pass up the rare problems. This is the "management by exception" model.

Trust. We also assume that even after acquiring formal knowledge plant managers only behave in the "correct way" to perform λ tasks ($0 < \lambda \leq 1$) and fail to correctly perform $(1 - \lambda)$ tasks. Here λ reflects the fact that the plant manager may have private benefits from doing the "wrong" action. Empirically we use measures of trust to proxy shifts in the λ parameter. We view variations in λ across countries as reflecting CEO perceptions of differences in the preferences for taking appropriate actions. For example, we

5. Garicano (2000) shows under general conditions a larger span between the CEO and plant manager will be replicated down the hierarchy, so firm size will be monotonically increasing in the number of plant managers per CEO.

assume that CEOs believe that Swedish plant managers would be less likely to accept a bribe (Sweden is a high-trust country) to buy an overpriced piece of equipment than would Greek plant managers (Greece is a low-trust country). As such, the variations in λ reflect variations in beliefs over individual plant manager's utility functions arising from different levels of social capital.

Firm Organization. The principal hires some agents who must be trained to deal with tasks up to point z_M and pass the remaining (less frequently occurring) management problems up to the principal, which in this two-layer model is assumed to be the CEO. In each particular case, production per problem is as follows:

$$(1) \quad \textit{Production} = F(z_M)\lambda + (1 - F(z_M)) = 1 - F(z_M)(1 - \lambda),$$

where the term $F(z_M)\lambda$ reflects the share of problems solved by the plant manager times the probability that he correctly solves them, and the term $1 - F(z_M)$ reflects the share of problems passed up to the CEO (who we assume without loss of generality can correctly solve all problems). Thus if $\lambda = 1$, the plant manager can be trusted and production proceeds correctly with probability 1.

The CEO takes h units of time to communicate and solve each referred problem. The problem of the principal is to maximize the firm's profits, V, by choosing decentralization (z_M) and the number of plant managers (n):

$$(2) \qquad V = \max_{z_M, n} [(1 - F(z_M)(1 - \lambda))n - \alpha z_M n - \omega n]$$

$$(3) \qquad s.t. \quad (1 - F(z_M))nh = 1,$$

where the CEO is the residual claimant and receives the profits obtained after paying wage ω to the plant managers—their outside utility. Equation (3) follows from the time constraint of the CEO, who has 1 unit of time in total to solve all the $(1 - F(z_M))$ referred problems at a time cost of h per problem. The cost of delegating more problems is twofold: lower level managers need to be trusted, as they may not perform adequately, and they need to be trained to deal with more problems.

Decentralization. Solving the constrained maximization problem gives an equation implicitly defining the optimal degree of decentralization (with * denoting an optimized value):

$$\frac{(\lambda - \omega)}{\alpha} = z_M^* + \frac{(1 - F(z_M^*))}{f(z_M^*)}. \tag{4}$$

From first-order condition (4), we derive the main prediction from our model.

PROPOSITION 1: *Higher trust leads to more decentralization.*

An increase in trust (λ rises) is associated with a higher degree of decentralization (z_M^*),

$$\frac{\partial z_M^*}{\partial \lambda} > 0,$$

where the positive sign is because $f'(z_M^*) < 0$ due to tasks being sorted in reverse frequency order. The intuition for Proposition 1 is straightforward—if the CEO trusts plant managers, she believes that the marginal returns from letting them handle tasks is greater as more problems are solved correctly.

An interesting corollary of equation (4) is that higher plant manager skill (indexed by a lower value of α, the cost of acquiring knowledge) leads to greater decentralization:

$$\frac{\partial z_M^*}{\partial \alpha} < 0. \tag{5}$$

The intuition here is that the more skilled the plant manager is at solving problems, the more decisions the CEO will delegate to him.[6] Although we have no formal test of equation (5) because we do not have an instrument for skill supply, this correlation is present in the data and we generally control for human capital in the estimation of the decentralization equation.

Size. The second key result relates to size. We derive the relationship between the number of plant managers that work with the CEO in equilibrium, which is from equation (3):

$$n^* = \frac{1}{[(1 - F(z_M^*))h]}.$$

6. The complementarity between skills and decentralization is broadly consistent with the findings of Caroli and Van Reenen (2001) and Bresnahan, Brynjolfsson, and Hitt (2002).

By combining this with proposition 1 we can establish our second proposition.

PROPOSITION 2: *Higher trust increases firm size.*

An increase in trust (λ) is associated with a larger firm size n^*:

$$\frac{\partial n^*}{\partial \lambda} > 0$$

The intuition is that higher trust allows the CEO to delegate more decisions, so she is able to spend less time helping any individual plant manager. Thus the CEO is able to employ more plant managers and expand the size of the firm. Trust essentially allows talented CEOs to leverage their managerial ability over a greater number of employees, and is similar to increasing the managerial leverage parameter in Lucas (1978).[7]

This result links with the early literature on firm size, which also focused on the issue of decentralization as the key determinant of firm growth. For example, Penrose (1959) developed the "resource-based" view of the firm, claiming that managerial capacity was a key resource in determining firm size. If senior management time could be leveraged across a larger group of plant managers, then firm size could be increased. Chandler (1962) examined the growth of large U.S. multidivisional firms after the 1850s. He argued that these larger firms were created through setting up "local field units," regional factories or sales outlets, with decentralized power from the headquarters. Again, decentralization was necessary to allow distant units to operate, because limits on communication prevented the CEO from directing managers operating hundreds of miles away. Without decentralization, these firms would have not been able to grow.

We take these two propositions to the data and find empirical support for both of them: all else equal, exogenously high-trust areas will have more decentralized and larger firms.

7. LaPorta et al. (1997) also noted that repeated interactions are a substitute for trust and make large organizations harder to sustain in low-trust environments. Hart and Holmstrom (2010) present a model where plant managers may "shade" if they feel aggrieved by the CHQ, which will also tend to reduce delegation in low-trust environments.

II.B. General Equilibrium Considerations

The model described above applied to the optimization decisions of an individual firm and does not incorporate general equilibrium effects. There are at least three general equilibrium effects that could be a concern: wages, house prices/amenity values, and selection effects.

Equilibrium Wages. We take the wage as fixed, whereas in the context of a regional labor market equilibrium wages will change as trust changes. An increase in trust will increase firm size and mean that more workers are drawn into the labor force. There is an ability cutoff (α_{MIN}) for the marginal individual who is indifferent between being a worker or entrepreneur. To draw more workers in to the (larger) firms, wages must rise, shifting α_{MIN} to the right. Compared to the fixed-wage case, higher wages will make firms smaller and less decentralized as CEOs do more themselves to avoid higher labor costs. Although higher equilibrium wages offset the delegation and size effects in our propositions, since it is a second-order effect it will never completely reverse them.

House Prices. If labor and capital are mobile between regions, there will be equilibrium effects on amenity values, such as housing. If trust increases in one region, what stops all firms migrating there? The standard model has an inelastically supplied local amenity like housing (e.g., Roback 1982). As more workers move into the high-trust region, house prices rise, which offsets the higher nominal wages. Eventually real wages (nominal wages less house prices) equilibrate so marginal workers are indifferent to moving because they receive a higher nominal wage, but suffer higher house prices. Higher housing costs indirectly affect firm size by limiting the number of workers who are prepared to live in the high-trust area. Again, however, this will not completely reverse the positive effect of trust on size and decentralization.

Selection between High- and Low-Productivity Firms. We could allow heterogeneity among firms following Garicano and Rossi-Hansberg (2007) and consider individuals of different abilities. More able workers can more easily solve problems and will sort themselves into the largest firms. This generates a

continuum of firms with firms nearest the cutoff being the lowest productivity and the most centralized, employing workers of lower ability. When trust increases, more productive firms expand and the least productive firms exit (i.e., their managers become workers). This selection effect will mean that the average decentralization in the remaining firms is higher because the least decentralized firms have exited. Thus, the selection effect between firms reinforces the within-firm effect of trust increasing decentralization.

Summary. Although the two general equilibrium effects of rises in wages and house prices will offset the main positive effect of trust on decentralization and size, they will not reverse the effect. Furthermore, the reallocation effect should reinforce our main positive within-firm effect of trust.

II.C. Other Models of Trust and Decentralization

Our model focuses on decentralization in a cognitive model of the firm, but other papers have seen this through the prism of incentive mechanisms (e.g., Aghion and Tirole 1997; Prendergast 2002). Acemoglu et al. (2007) consider delegation in an incentive model with learning where a firm is choosing a new technology with uncertain and heterogeneous returns. The CEO-owner wants to maximize value, but the agent-manager has greater local private knowledge, and this trade-off between information and incentives determines the optimal degree of decentralization. If trust reflects a greater congruence of preferences between principal and agent, this should lead to great delegation. Even where decentralization is efficient, Baker, Gibbons, and Murphy (1999) emphasize that delegation is generally informal because the CEO must usually make a formal sign-off on decisions. The issue is whether the CEO can credibly commit to delegating to the plant manager and to avoid the temptation to override his decisions. Thus, the level of decentralization is the outcome of a repeated game between the CEO and manager,[8] and preferences and beliefs will influence delegation. Trust is emphasized in the social capital and experimental game theory literatures as one

8. Other models, like Rajan and Zingales (2001), focus on the intangible capital view of the firm, with ownership being structured so that employees cannot easily split off to create rival firms.

factor that leads to cooperation (Fukuyama 1995; Glaeser et al. 2000; Putnam 2002). If there are heterogeneous types in the population with some types who are ex ante more likely to cooperate than others, then the cooperative outcome (decentralization) is more likely with higher trust.

In principle, an alternative to trust in sustaining cooperation is rule of law. When the employer (or employee) can successfully sue for breach of contract, this will make contracts easier to enforce and sustainable delegation more likely. This will be particularly important in larger firms (Greif 1993). In the empirical specifications where we do not control for country dummies, we also consider the independent influence of rule of law alongside trust.

Since there are models other than our extension of Garicano (2000) that would predict a positive relationship between trust and decentralization we do not regard our empirical examination the final word on the correct theoretical model but as a useful framework for organizing our thinking.

III. DATA

To investigate the role of trust on decentralization, we first have to construct a robust measure of organizational practices overcoming four hurdles: measuring decentralization, collecting accurate responses, ensuring international comparability, and obtaining interviews with managers. We discuss these in turn. We have also posted online the full anonymized data set and do-files to replicate all results (see http://www.worldmanagementsurvey.com).

III.A. Measuring Decentralization

Our measure of decentralization is obtained through an in-depth interview with a representative plant manager from a medium-sized manufacturing firm, excluding those where the CEO and the plant manager is the same person (this occurred in only 4.9% of our interviews). We asked four questions on plant manager decentralization. First, we asked how much capital investment a plant manager could undertake without prior authorization from the corporate headquarters. This is a continuous variable enumerated in national currency that we convert into dollars using purchasing power parity (PPP). We also inquired on

where decisions were effectively made in three other dimensions: (a) hiring a new full-time permanent shop floor employee, (b) the introduction of a new product, and (c) sales and marketing decisions. These more qualitative variables were scaled from a score of 1, defined as all decisions taken at the corporate headquarters, to a score of 5 defined as complete power ("real authority") of the plant manager. In Online Appendix Table A1 we detail the individual questions in the same order they appeared in the survey.[9]

Because the scaling may vary across all these questions, we converted the scores from the four decentralization questions to z-scores by normalizing each one to mean 0 and standard deviation 1. In our main econometric specifications, we take the unweighted average across all four z-scores as our primary measure of overall decentralization, but we also experiment with other weighting schemes and present regressions using the individual questions as dependent variables.

One issue is over the measurement of decentralization across different types of firms. Figure I provides four examples to help explain how we did this. Example A shows the classic case, where the firm has one CHQ in New York and one production site in Phoenix. The plant manager is defined as the most senior manager at the Phoenix site, with our decentralization measure evaluating how much autonomy he has from his manager in New York. In Example B we depict a firm with multiple plants, in which we would usually survey one plant and assume this represented the degree of decentralization for the firm as a whole (Section III.F discusses how we test this assumption). In Example C we have a firm with the production facilities and CHQ on the same site. In this case, if the plant manager was the CEO we could not define decentralization (so these observations were dropped).[10] If the plant manager and CEO were different people on the same site, we would define decentralization as usual, but we show how our results are weaker in these

9. Some of these four questions are similar to others used in the past to measure decentralization. Acemoglu et al. (2007) use a similar question on hiring in the British WERS data, and Colombo and Delmastro (2004) have a question similar to ours on investment for Italian establishments.

10. As noted, this occurred in less than 5% of our observations. The CEO–plant managers were typically in smaller firms (a mean firm employment of 159 for the CEO–plant manager firms versus 843 for the rest of the sample). There was no significant correlation between the share of firms dropped in each country and its average decentralization measure.

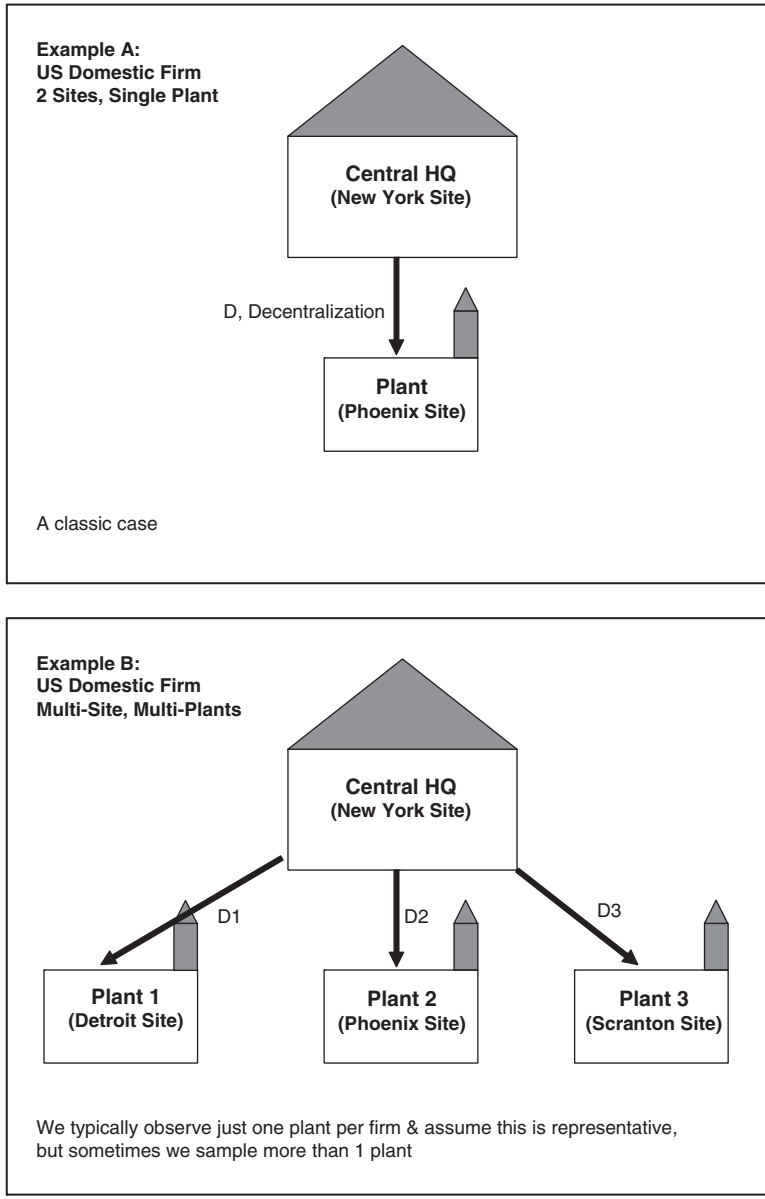

FIGURE I

Examples of Firm Organizational Structures

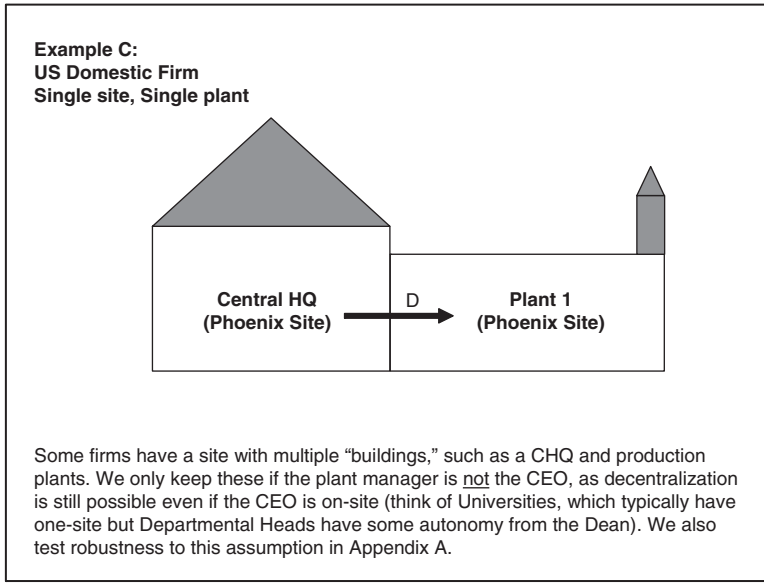

FIGURE I
Continued

"same-site" observations (where trust matters less because direct monitoring is easier).[11] Finally, in Example D we show a multinational subsidiary, which we treat the same as domestic firms, defining decentralization as the autonomy of the plant from the global CHQ. We use the multinationals to get closer to the causal effects of trust on decentralization by using bilateral trust information as explained in Section V.

In the same survey we collected a large amount of additional data to use as controls, including management practice information following the methodology of Bloom and Van Reenen (2007) and human resource information (e.g., the proportion of the workforce with college degrees, average hours worked, and the gender and age breakdown within the firm). During the interview, we also collected ownership information from the managers, which we cross-checked against external databases (see Section III.E for details). From the sampling frame database we also have information for most firms on their basic accounting variables, like sales and capital. This is collected directly from the reported and audited company accounts from private sector data suppliers (Bureau Van Dijk's Amadeus, Icarus and Oriana products, and CMIE FirstSource for India). These are an entirely independent database to the organizational survey (data details are in Online Appendix A).

III.B. Collecting Accurate Responses

To achieve unbiased responses to our questions, we took several steps. First, the survey was conducted by telephone without telling the managers they were being scored on organizational or management practices. This enabled scoring to be based on the interviewer's evaluation of the firm's actual practices, rather than their aspirations, the manager's perceptions, or the interviewer's impressions. To run this "blind" scoring we used open questions (i.e. "To hire a full-time permanent shop floor worker, what agreement would your plant need from corporate headquarters?"), rather than closed questions (e.g., "Can you hire workers without

11. While plant managers with CEOs on site typically have less autonomy (something we control for empirically), it is not the case they have no autonomy. The CEO will typically be involved in a number of other tasks, such as finance, strategy, and sales (which could involve other nonproduction sites), whereas the plant manager runs the daily production process. An example in a university context would be the university dean and the head of the Economics Department—they are usually on the same campus, but the department head still has some autonomy.

authority from corporate headquarters?" [yes/no]). Following the initial question, the discussion continued until the interviewer could make an accurate assessment of the firm's typical practices. For example, if the plant manager responded, "It is my decision, but I need sign-off from corporate HQ," the interviewer would ask "How often would sign-off typically be given?" with the response "So far it has never been refused" scoring a 4 and the response "Typically agreed in about 80% of the case" scoring a 3.

Second, the interviewers did not know anything about the firm's financial information or performance in advance of the interview. This was achieved by selecting medium-sized manufacturing firms and providing only firm names and contact details to the interviewers (no financial details). Consequently, the survey tool is "double blind"—managers do not know they are being scored, and interviewers do not know the performance of the firm. These manufacturing firms (the median size was 270 employees) are too small to attract much coverage from the business media. All interviews were conducted in the manager's native language.

Third, each interviewer ran 85 interviews on average, allowing us to remove interviewer fixed effects from all empirical specifications. This helps address concerns over inconsistent interpretation of categorical responses, standardizing the scoring system.

Fourth, the survey instrument was targeted at plant managers, who are typically senior enough to have an overview of organizational practices but not so senior as to be detached from day-to-day operations.

Fifth, we collected a detailed set of information on the interview process itself (number and type of prior contacts before obtaining the interviews, duration, local time of day, date, and day of the week), on the manager (gender, seniority, nationality, company and job tenure, internal and external employment experience, and location), and on the interviewer (individual interviewer fixed effects, time of day, and subjective reliability score). These survey metrics are used as "noise controls" to help reduce residual variation.

III.C. Ensuring International Comparability

In analyzing organizational and management surveys across countries, we have to be extremely careful to ensure

comparability of responses. To maximize comparability, we undertook three steps. First, every interviewer had the same initial three days of interview training, provided jointly by the Centre for Economic Performance (CEP) at the London School of Economics (LSE) and the international consultancy firm we partnerered with. This training included three "calibration" exercises, in which the group all scored a role-played interview and then discussed scoring of each question together. This was aimed at ensuring that every interviewer had a common interpretation of the scoring grid. In addition, every Friday afternoon throughout the survey period the group met for 90 minutes for training and to discuss any problems with interpretation of the survey.

Second, the team operated from one location, the LSE. The different national survey teams were thus organized and managed in the same way; ran the surveys using exactly the same telephone, computer, and software technology; and were able to directly discuss any interpretation issues.[12] Third, the individual interviewers interviewed firms in multiple countries. The team all spoke their native language plus English, so interviewers were able to interview firms from their own country (as managers were interviewed in their native language) plus the United Kingdom and the United States. As a result the median number of countries that each interviewer scored firms in was three, enabling us to remove interviewer fixed effects even in the cross-country analysis.

III.D. Obtaining Interviews with Managers

Each interview took on average 48 minutes and was run in the summer of 2006. Overall, we obtained a relatively high response rate of 45%, which was achieved through several steps. First, the interview was introduced as "a piece of work," without discussion of the firm's financial position or its company accounts. Interviewers did not discuss financials in the interviews, both to maximize the participation of firms and to ensure our interviewers were truly "blind" on the firm's financial position. Second, the survey began with the least controversial questions (on shop floor operations management), leading on to monitoring, incentives, and organizational structure. Third, interviewers' performance was monitored, as was the proportion of interviews achieved,

12. See http://www.youtube.com/watch?v=HgJXt8KwhA8 for video footage of the survey team.

so they were persistent in chasing firms.[13] Fourth, the written endorsement of many official institutions[14] helped demonstrate to managers that this was an important academic exercise with official support. Fifth, we hired high-quality (mainly M.B.A. student) interviewers,[15] mostly with prior manufacturing experience, which helped signal to managers the high-quality nature of the interview.

III.E. Sampling Frame and Additional Data

Because our aim is to compare across countries, we decided to focus on the manufacturing sector, where productivity is easier to measure than in the nonmanufacturing sector. We also focused on medium-sized firms, selecting a sample of firms that had between 100 and 5,000 workers. Very small firms have little publicly available data. Very large firms are likely to be more heterogeneous across plants. We drew a sampling frame from each country to be representative of medium-sized manufacturing firms and then randomly chose the order of which firms to contact (see Online Appendix B for details). Because we use two different databases to generate the sampling frame (BVD's Orbis for Europe, the United States, China, and Japan; and CMIE's Firstsource for India) we had concerns regarding the cross-country comparisons. Therefore, we include country dummies in most of the specifications. Comparing responding firms with those in the sampling frame, we found no evidence that the responders were systematically different on the observable measures to the nonresponders. The only exception was on size and multinational status, where our firms were slightly larger and more likely to be multinational than those in the sampling frame (details in Online Appendix A).

13. We found no significant correlation between the number, type, and time span of contacts before an interview was conducted and the management score.

14. The Banque de France, Bank of Greece, Bank of Japan, Bank of Portugal, Beijing University, Bundesbank, Confederation of Indian Industry, European Central Bank, European Commission, Greek Employers Federation, IUI Sweden, Ministero delle Finanze, National Bank of Poland, Peoples Bank of China, Polish Treasury, Reserve Bank of India, Shenzhen Development Bank, Sveriges Riksbank, U.K. Treasury, and the Warsaw Stock Exchange.

15. Interviewers were postgraduate students drawn from the following universities: Berkeley, City of London, Columbia, Harvard, HEC, IESE, Imperial, Insead, Kellogg, LBS, LSE, Lund, MIT, Nova de Lisbon, Oxford, Stanford, and Yale.

III.F. Evaluating and Controlling for Measurement Error

Our survey data potentially suffer from several types of measurement error. To quantify this, we performed repeat interviews with 72 firms, contacting different managers in different plants at the same firm, using different interviewers. To the extent that our organizational measure is truly picking up company-wide practices, these two scores should be correlated, whereas to the extent the measure is driven by noise the measures should be independent. The correlation of the first interview against the second interviews was .513 (p-value of .000). Furthermore, there is no obvious (or statistically significant) relationship between the degree of measurement error and the decentralization score. That is, firms that reported very low or high decentralization scores in one plant appeared to be genuinely very centralized or decentralized in their other plants, rather than extreme draws of sampling measurement error.

III.G. Measuring Trust

We build trust measures using the World Values Survey (WVS), a collection of surveys administered to representative samples of individuals in 66 countries between 1981 and 2004. These questionnaires contain information on several social, religious, and political attitudes. The WVS aims at measuring generalized trust, namely, the expectation of the respondent regarding the trustworthiness of other individuals. The wording of this question is: "Generally speaking, would you say that most people can be trusted, or that you can't be too careful in dealing with people?" The trust variable that we use in the regressions is the percentage of people choosing the first option in the trust question ("Most people can be trusted," with the alternative being "Can't be too careful") within the geographical area where CHQ of the plant are located.[16] We thought this was most appropriate, because the decision to decentralize is made at the CHQ level, but we also check for the independent importance of trust in the plant's location when the firms' CHQ is located in a different region or country.

This is the most common measure of trust used in the literature and appears to be correlated with trusting behavior. Fehr

16. For domestic firms and domestic multinationals, this is the region of location of the CHQ. For foreign multinationals this is the country where the parent's CHQ is based (*region* of CHQ is unavailable for most of the foreign multinationals).

et al. (2004) ran a series of experiments suggesting that the WVS question does indeed measure trust, and Johnson and Mislin (2011) present cross-country experimental evidence also suggesting that the WVS question capture trust. Glaeser et al. (2000), by contrast, ran experiments on undergraduates and argued that the WVS trust question better measures the trustworthiness of subjects. Sapienza, Toldra, and Zingales (2007) reconcile these findings: they provide evidence that the WVS question is driven by what they call the "belief-based component of trust." In other words, when you are not extrapolating the trustworthiness of others based on your own trustworthiness (as Fehr et al. 2004), the large-sample WVS really does measure trust rather than trustworthiness. In our context, we want to measure trust of the headquarters (toward the plant manager), so the WVS question seemed appropriate for the task.

Several authors have emphasized the fact that generalized trust may vary quite substantially even within countries (Guiso, Sapienza, and Zingales 2008; Tabellini 2008). To exploit this within-country variation for identification purposes, we identify the specific region where the corporate headquarters of each of the plants included in our survey are located, pool together individual responses from four different WVS waves (1981–1984, 1989–1993, 1994–1999, and 1999–2004), and compute the average level of trust in this area. We take simple averages for each region-country cell over all available years, so that every individual observation has equal weight. The precise level of aggregation of the trust measure at the subnational level varies according to geographical detail included in our own decentralization survey and in the WVS.[17] Through our survey data, we are able to allocate plants belonging to purely domestic firms and domestic multinationals (2,744 observations in total, or about two thirds of our entire sample) to narrowly defined *regions* within countries

17. Regional classifications are fairly stable for most countries in our sample over time, but they vary somewhat over time for WVS interviews conducted in China, France, Portugal, and Sweden. We show in Table B2 in the Online Appendix that the main results of the article are robust to the use alternative aggregation methods based on using just the latest or the largest (in terms of individual observations) WVS wave for each region, and to introducing controls for the specific wave used to build the aggregated trust measures. More details on the WVS coverage by country can be found in the Online Appendix (Section A.4 and Table A8).

(e.g., NUTS3 levels in Europe or individual states in India).[18] However, because the level of geographical detail provided by the WVS varies within countries, we are sometimes forced to work at a higher level of aggregation.[19] In the case of the 881 plants that belong to foreign multinationals, we match the plant with information on the level of trust in the *country* where the global ultimate owner of the plant is headquartered, since the country (but not region) of the global ultimate owner was also collected in the decentralization survey.

Figure II plots the median level of trust by country and its regional dispersion. We view the geographical variation in current levels of trust as driven by some very long-term historical factors. The current level of trust in different Italian regions, for example, seems to depend on crucial events in city-states during the medieval period and earlier (Guiso, Sapienza, and Zingales 2008). Durante (2010) has shown the positive impact of the annual variability of weather conditions (especially precipitation and temperature in the growing season months) over the 1500–1750 period in stimulating trust across regions of Europe today, and Tabellini (2008) argues for the importance of past literacy rates and nondespotic political institutions. It is thus likely that the level of trust in a firm's location is largely exogenous, which is why we use this source of variation (rather than the trust within the firm, which may more sensitively depend on the firm's own endogenous policies). Nevertheless, to examine the plausibility of this exogeneity assumption, we also use long-run cultural and historical instrumental variables, such as religious similarity, to instrument the bilateral trust between the multinational's parent HQ and affiliate plant's country of location.

IV. DESCRIPTIVE STATISTICS

IV.A. Decentralization

Our preferred measure of decentralization is an average across four z-scored measures of plant manager autonomy on

18. In the vast majority of cases the plant is actually located within the same region of the headquarters (93% of the plants belonging to purely domestic firms or domestic multinationals).

19. For example, in the United States and China the WVS only provides broader geographical markers, which correspond to group of states. See Online Appendix B for details.

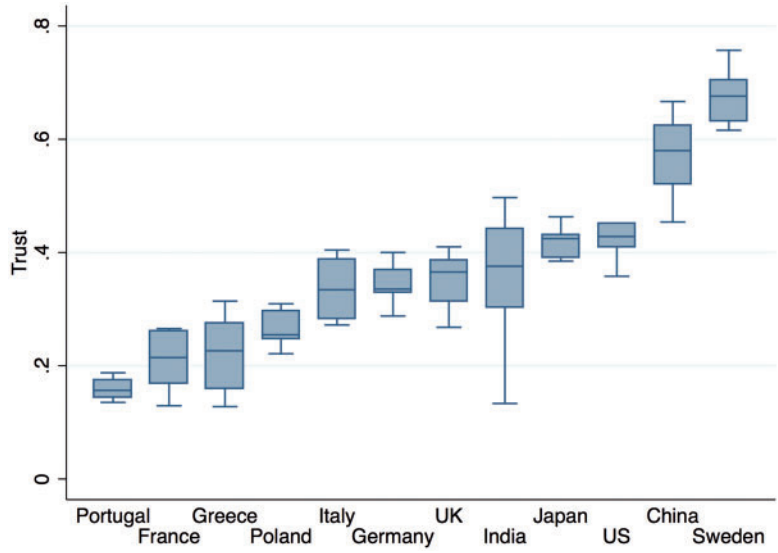

FIGURE II

Trust by Country (across Regions)

The graph shows levels of regional trust by country at the 25th percentile (bottom line of the box), median (middle line of the box), and 75th percentile (top line of the box). Upper and lower adjacent values are also shown. Regional trust measures are computed by pooling four successive waves of the World Values Survey (1981–1984, 1989–1993, 1994–1999, and 1999–2004), with the exception of Greece, for which the trust measure is built from the European Social Survey (all waves between 2000 and 2005). Trust is the percentage of people in the region answering "Most people can be trusted" to the question "Generally speaking, would you say that most people can be trusted or that you need to be very careful in dealing with people?," with the alternative being "Can't be too careful." The number of responses used to generate the trust measure for each country is as follows: Portugal = 2,124; France = 2,499; Greece = 4,972; Poland = 2,768; Italy = 3,877; Germany = 7,870; United Kingdom = 3,434; India = 6,032; Japan = 4,254; United States = 4,410; China = 2,047; Sweden = 1,918.

hiring, capital expenditure, marketing, and product innovations. The resulting variable is what we define as decentralization (or equivalently, autonomy of the plant manager). The cross-country averages of decentralization and the within country dispersion shown in Figure III reveal some interesting patterns. Firms located in Asia (China, Japan, and India) tend to be much more centralized than firms located in Anglo-Saxon and northern European countries (Germany, the United Kingdom, United States, and Sweden). The rest of Europe tends to be in the

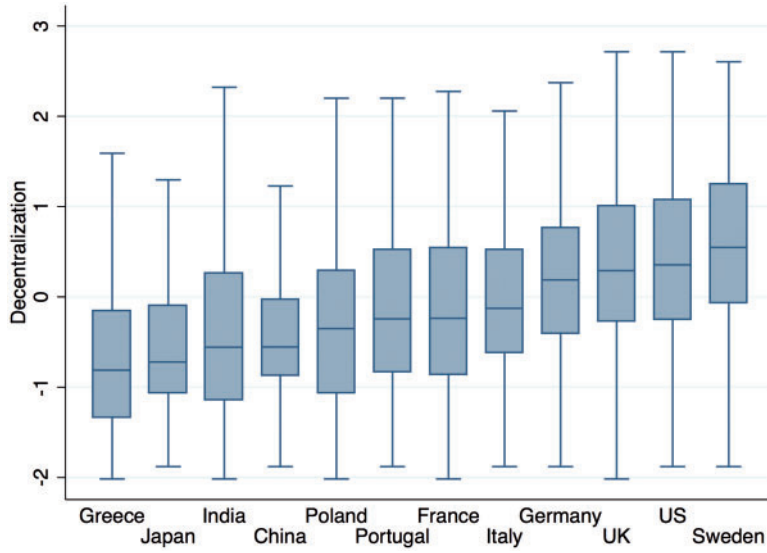

FIGURE III

Decentralization by Country (across Firms)

The graph shows levels of the *z*-scored decentralization index by country, measured as the average plant manager's degree of autonomy over hiring, investment, products, and prices, at the 25th percentile (bottom line of the box), median (middle line of the box), and 75th percentile (top line of the box), as measured in the CEP organizational survey. Upper and lower adjacent values are also shown. The number of firms surveyed in each country is as follows: Greece = 183; Japan = 120; India = 397; China = 537; Poland = 222; Portugal = 145; France = 217; Italy = 96; Germany = 327; United Kingdom = 557; United States = 638; Sweden = 216.

middle of the decentralization ranking—with the exception of firms located in Greece, which appear to be very centralized. The differences between the three groups of countries are statistically significant at the 1% level, even when we include a full set of firm characteristics and survey noise controls. Table A2 in the Online Appendix provides more details behind these cross-country comparisons and reveals that although Sweden, the United Kingdom, and the United States are at the top of the decentralization distribution across all four dimensions, the ranking varies for the rest of the countries. For example, Germany tends to be closer to the other continental European countries included in our sample (i.e., less decentralized) with regard to autonomy of the plant manager in the hiring and firing decisions.

Japanese plant managers have limited autonomy because hiring is very centralized due to lifetime tenure, but they do have more autonomy over capital investment decisions.

From Figure III, it is also clear that there is much firm-level heterogeneity, even within countries. About 15% of the overall variance in our decentralization measure is across countries, 8% is across three-digit industry class, and 81% of the variation is orthogonal to both country and three-digit industry.

IV.B. External Validation

A possible concern is that the cross-country differences in decentralization may reflect the specific characteristics of the firms that participated in the survey (i.e., medium-sized manufacturing firms), rather than more general organizational features. Therefore, to validate our decentralization measure, we compared it to two other cross-country decentralization indices that exist in the literature.

The first is the Power Distance rankings created by Hofstede (2001).[20] The Power Distance Index (PDI) is a measure of interpersonal power or influence between a boss and their subordinate, built out of successive attitudinal surveys conducted on more than 80,000 IBM employees across approximately 50 countries in the 1960s and 1970s, and then supplemented with additional interviews on individuals from other firms and countries over time (see Hofstede 2001 for more details). Our decentralization variable provides a factual description of the average autonomy allocated to the plant managers, whereas the PDI measures the *perceptions* of and the *preferences* for hierarchical relationships among nonmanagerial IBM employees. The PDI measure is based on aggregating questions relating to (1) nonmanagerial employees' perception that employees are afraid to disagree with their managers; (2) subordinates' perception that their boss tends to make decisions in an autocratic or paternalistic way; and (3) subordinates' preference for anything but a consultative style of decision making. High PDI values reflect perceptions of and preferences for self-determination. Figure IV shows that the country-level averages of the PDI and our decentralization measure are extremely similar (correlation .80, significant at the 1% level). This is reassuring because it suggests that our

20. These measures have been used by several economists too, for example, Gorodnichenko and Roland (2011).

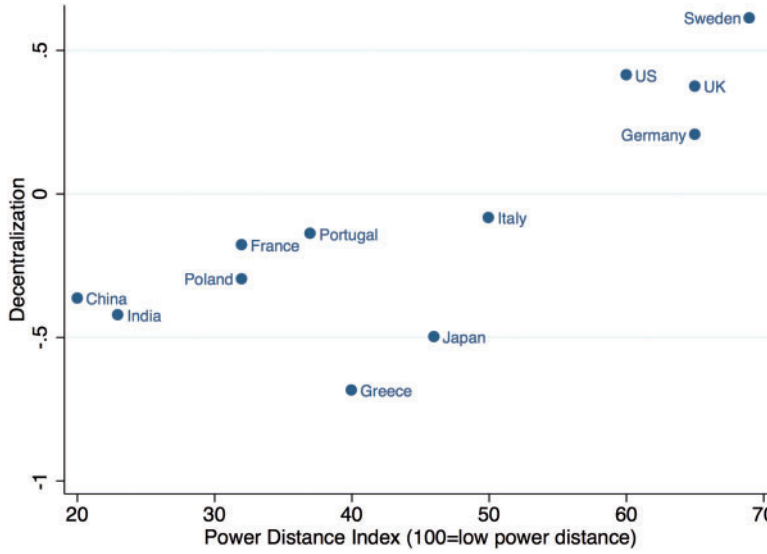

FIGURE IV

Decentralization and Power Distance Index by Country

The *y*-axis denotes levels of the *z*-scored decentralization index by country, measured as the average plant manager's degree of autonomy over hiring, investment, products, and prices by country, as measured in the CEP organizational survey. The *x*-axis is Hofstede's (2001) Power Distance Index downloaded from www.geerthofstede.nl/dimension-data-matrix. The number of firms used to build the decentralization measure in each country is as follows: Greece = 183; Japan = 120; India = 397; China = 537; Poland = 222; Portugal = 145; France = 217; Italy = 96; Germany = 327; United Kingdom = 557; United States = 638; Sweden = 216.

decentralization variable captures long-lived organizational traits across countries, rather than specific characteristics of our sample of firms.

The second cross-country decentralization indices that we use to validate our data are those created by Arzaghi and Henderson (2005) to evaluate fiscal decentralization across countries. They generated an index on a 0 to 4 scale that was summed over scores for decentralization of government structure (unitary versus federal) and the degree of autonomy and democratization of state, province, and municipal governments over taxation, education, infrastructure, and policing. A value of 0 denotes the country is fully centralized across every dimension, and a value of 4 denotes a highly decentralized fiscal structure. This measure was

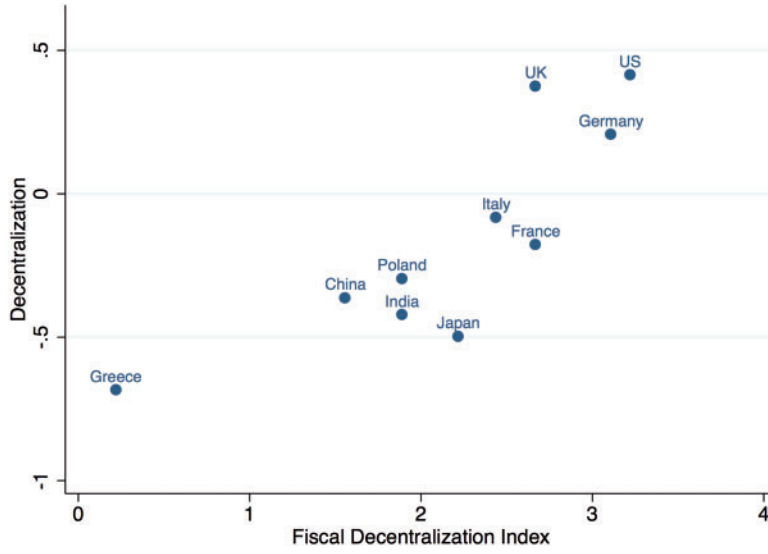

FIGURE V

Firm and Fiscal Decentralization by Country

The *y*-axis denotes levels of the *z*-scored decentralization index by country, measured as the average plant manager's degree of autonomy over hiring, investment, products, and prices by country as measured in the CEP organizational survey. The *x*-axis is Arzaghi and Henderson's (2005) Fiscal Decentralization Index. The number of firms used to build the decentralization measure in each country is as follows: Greece = 183; Japan = 120; India = 397; China = 537; Poland = 222; Portugal = 145; France = 217; Italy = 96; Germany = 327; United Kingdom = 557; United States = 638; Sweden = 216.

calculated for every country with 10 million or more employees in 1995, which includes 10 of our 12 countries. Figure V shows that this fiscal decentralization index is also extremely close to our decentralization index (correlation of .827, significant at the 1% level). Thus, countries in our sample with decentralized firms also tend to have decentralized governments, suggesting this is a more general phenomenon.

V. TRUST AND FIRM ORGANIZATIONAL STRUCTURE

V.A. Trust and Decentralization

Our theory predicts that greater trust of the CEO in the plant manager should lead to increased managerial delegation

(Proposition 1). Column (1) of Table I presents the results of regressing our decentralization measure against average trust in the area where the plant's headquarters are located, with no other controls. The relationship between decentralization and trust is positive and highly significant—a 1 standard deviation in trust (12 percentage points) is associated with about 0.15 a standard deviation increase in decentralization. A concern is that high levels of trust could simply proxy for better law enforcement or higher levels of economic development. Column (2) includes an indicator for country-wide "rule of law,"[21] gross domestic product (GDP) per capita, and population. Rule of law enters with a positive and significant coefficient,[22] but trust also plays an independent role.

Trust may be associated with decentralization because it sustains larger equilibrium firm size or because skill levels are higher (see Section II). Consistent with this, column (3) of Table I shows that larger firms and plants tend to be more decentralized, as do those with more skilled workers.[23] Conditioning on size and skills halves the trust coefficient compared to column (1), but it remains significant. In terms of our other covariates, foreign multinationals are more decentralized relative to both home country multinationals and purely domestic firms. This could reflect the greater complexity of managing across national boundaries and larger global size.

In column (4) of Table I we include a full set of country dummies to address the concern that there might still be many omitted unobserved country-level factors like regulation (Aghion et al. 2010) generating a spurious positive correlation between trust and decentralization. We also include three-digit industry dummies, measures of local development (GDP per capita and population at the regional level), and "noise controls" (for measurement error in the decentralization variable) such as interviewer fixed effects. The coefficient on trust remains

21. This indicator was developed by the World Bank and measures "the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, the police, and the courts, as well as the likelihood of crime and violence" (Kaufmann, Kraay, and Mastruzzi 2006).

22. GDP per capita and population are insignificant at conventional levels. The coefficient (standard error) on ln(GDP per capita) is –0.082 (0.061), and for ln(population) is 0.042 (0.028).

23. The results are unchanged when we include measures of regional skills, which is positive but insignificant.

TABLE I

DECENTRALIZATION AND TRUST

Sample	(1) All	(2) All	(3) All	(4) All	(5) CEO off-site	(6) CEO on-site
Trust	1.231***	0.916***	0.666**	0.596***	0.958**	0.288
Trust measured in CHQ region/country of location	(0.440)	(0.327)	(0.265)	(0.219)	(0.380)	(0.331)
Rule of law (country of plant location)		0.580***	0.556**			
(–2.5 = low, 2.5 = high)		(0.071)	(0.065)			
Plant skills			0.086***	0.122***	0.162***	0.090***
% plant employees with a college degree			(0.030)	(0.030)	(0.038)	(0.030)
Firm size			0.103***	0.047*	0.053	0.024
ln(firm employment)			(0.023)	(0.025)	(0.038)	(0.039)
Plant employment			0.134***	0.098***	0.125***	0.055*
Plant employees as a % of firm			(0.034)	(0.026)	(0.043)	(0.030)
Foreign multinational			0.213***	0.084	0.758	–0.213
Dummy = 1 if firm belongs to a foreign multinational			(0.064)	(0.329)	(0.738)	(0.485)
Domestic multinational			0.014	0.001	0.029	0.054
Dummy = 1 if firm belongs to a domestic multinational			(0.056)	(0.047)	(0.094)	(0.059)
Observations	3,655	3,655	3,655	3,655	1,375	2,280
Country of CHQ location controls (2)	No	Yes	Yes	Yes	Yes	Yes
Country of plant location dummies (11)	No	No	No	Yes	Yes	Yes
Region of plant location controls (2)	No	No	No	Yes	Yes	Yes
Industry dummies (148)	No	No	No	Yes	Yes	Yes
Other controls (57)	No	No	No	Yes	Yes	Yes
Clustering	CHQ location	CHQ location	CHQ location	CHQ location	CHQ location	CHQ location
Number of clusters	146	146	146	146	127	135

Notes: The dependent variable in all columns is the decentralization *z*-score index, measured by plant manager's autonomy over hiring, investment, products, and marketing. Estimation is by OLS with robust standard errors in parentheses. Standard errors clustered by the firm's headquarter region of location (country of origin if the plant belongs to a foreign multinational). "Country of CHQ location controls" is the log of GDP per capita and population in the country of CHQ location. "Region of plant location" controls are the log of GDP per capita and population in the region where the plant is located. "Industry dummies" are three-digit SIC dummies. "Other controls" include a dummy for whether the firm is publicly listed, a dummy for whether the CEO is on the same site as the plant ("CEO on-site"), the fraction of managers native of the country of plant location, and "Noise controls" (these include 44 interviewer dummies, 6 dummies to control for the day of the week the interview took place, an interview reliability score, the manager's seniority and tenure, and the duration of the interview). Regressions weighted by the share of World Values Survey respondents in the region within the country. * significant at 10%; ** significant at 5%; *** significant at 1%.

significant and is similar in magnitude to the simpler specification in column (3).[24]

An implication of our model is that trust should matter more when the CEO is located at a different site from the plant because communication costs will be higher and monitoring is more difficult, so centralization becomes more costly. Column (5) of Table I estimates the regressions on the subsample where the CEO is off site (such as Example B in Figure I), and column (6) on the subsample where the CEO is on site (i.e., the headquarter building is located at the same site as the plant manager we interviewed, such as Example C in Figure I). Although the coefficient on trust is positive in both cases, it is much larger and only significant when the CEO is farther away from the plant manager, as we would expect. When the CEO is on site, presumably monitoring is easier so that trust becomes less important for the decentralization decision.[25]

The magnitude of the association between decentralization and trust is large. As noted, column (1) implies a 1 standard deviation in trust and is associated with 0.15 standard deviation increase in decentralization. Including the full set of covariates in column (4) halves this to 0.07 of a standard deviation. The size of these differences are substantial, for example, moving from the lowest trust region (Assam in India) to the highest trust region (Norrland in Sweden) would be associated with an increase of the decentralization index of 0.37 of a standard deviation.[26] Finally, running instrumental variable regressions, as we do in next, leads to even larger magnitudes.

V.B. Exploiting Differences in the Location of the Plant and Its Headquarters

About a third of our sample (1,094 observations) has headquarters located in a different geographical area (region or

24. Although the coefficient on trust declines monotonically when we add more controls in Table I, this is not always the case. For example, the coefficient (standard error) on trust rises to 0.838 (0.234) when we just add the survey "noise" controls to column (3).

25. This difference is not simply a reflection of size. When we split the sample into firms with more than and less than 250 employees, the trust coefficient was significant in both subsamples and only slightly larger in the smaller firms (0.883 vs. 0.824). See Online Appendix Table B2.

26. This calculation uses the 0.596 coefficient on trust in Table I, column (4), and the trust values in Assam and Norrland of 0.13 and 0.76, respectively.

country) from the plant itself, including 881 affiliates of foreign multinationals. This subsample is interesting for two reasons. First, we can include fixed effects for the regional location of the plant, removing any bias associated with other geographical characteristics spuriously correlated with local trust and decentralization.[27] Second, by focusing on the sample of foreign multinationals, we can study whether country of origin characteristics—such as trust—have an effect on the multinational's structure. This has long been a preoccupation of business case studies and the more recent trade literature on the organization of multinationals.[28] In particular, for 422 of these foreign affiliates we have information on *bilateral* trust between countries, derived from a series of surveys conducted for the European Commission. These surveys asked around 1,000 individuals in each country the following question: "I would like to ask you a question about how much trust you have in people from various countries. For each, please tell me whether you have a lot of trust, some trust, not very much trust, or no trust at all." This question was asked about all other EU countries and a number of non-EU countries like the United States, Japan, and Canada. For our purposes, the bilateral trust variable is ideal because it allows us to analyze the role of trust for decentralization controlling for a full set of region of location *and* country-of-origin dummies.

The results of this analysis are shown in Table II. These regressions are based on the specification of column (4) in Table I, where we test the relationship between decentralization and trust.[29] Column (1) simply shows that the coefficient on trust

27. This also includes any potential language or national bias in the interview process, since multinationals are always interviewed in the local language, with the question on the ownership of the firm only asked at the end of the interview. This means our results for multinationals imply, for example, that even if we interviewed a Japanese subsidiary in Sweden in Swedish, it would still display organizational characteristics of its Japanese parent firm.

28. See, for example, Helpman, Melitz, and Yeaple (2004), Antras, Garicano, and Rossi-Hansberg (2008), or Burstein and Monge-Naranjo (2009).

29. The only difference is that we use two-digit rather than three-digit industry dummies because of the smaller sample size. In the subsample of 422 subsidiaries of foreign multinationals that we analyze in Table II columns (4) to (7), for example, there are 83 distinct three-digit industries, but 20% of them are populated only by a single firm (the median number of observation per three-digit industry is 3). When we move to a specification with two-digit dummies, we can identify only 18 distinct industries, but of these, only one is populated by a single firm (the median number of observations per two-digit industry is 21).

remains positive and significant (0.606 with a standard error of 0.270, compared to 0.596 with a standard error of 0.219) in this subsample where region of plant and CHQ are different. In column (2) we repeat the specification adding fixed effects for the plant's *region* of location. Both the magnitude and the standard error of the trust variable remain similar with the inclusion of the regional dummies. From column (3) onward, we focus exclusively on the subsample of subsidiaries of foreign multinationals. Columns (3) and (4) show that the association between decentralization and trust in the country of origin is still positive and significant in the subsample of 881 subsidiaries of foreign multinationals, and the even smaller sample of 422 foreign multinationals with data on bilateral trust. In column (5) we look at the relationship between trust and decentralization using the bilateral trust measure for our foreign multinational sample. We find that multinational subsidiaries located in a country that their parent country tends to trust (like the subsidiary of a French multinational in Belgium) are typically more decentralized than subsidiaries located in a country that the multinational's parent country does not trust (like a French subsidiary located in Britain). This bilateral trust variable drives the coefficient on general trust at the CHQ level to 0. In column (6) we include both a full set of country location and origin dummies, so that we are only identifying the trust effect of the *pairwise* variation in trust. Even in this demanding specification higher bilateral trust is associated with significantly more decentralization.

One concern is that there could still be an endogeneity bias affecting the coefficient on trust. For example, greater decentralization in multinationals might engender home country trust, or there might be an omitted bilateral variable increasing trust and decentralization. As already discussed, our view is that regional trust is in large part exogenous determined by historical events in the distant past. Nevertheless, to investigate more carefully the causal effect of trust on decentralization columns (7) and (8) we look at the relationship between decentralization and trust using the measure of religious similarity developed by Guiso, Sapienza, and Zingales (2009) as an instrumental variable for bilateral trust.[30] This measure arguably captures long-standing cultural

30. Guiso, Sapienza, and Zingales (2009) measured religious similarities as the product of the fraction of individuals in each country belonging to each religion. They also employed as an additional instrument a measure of genetic distance,

TABLE II

DECENTRALIZATION AND TRUST: EXPLOITING DIFFERENCES IN CORPORATE HEADQUARTERS (CHQ) LOCATION

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Sample	CHQ in different region/country	CHQ in different region/country	Foreign multinationals	Foreign multinationals (bilateral trust data available)	Foreign multinationals (bilateral trust data available)	Foreign multinationals (bilateral trust data available)	Foreign multinationals (bilateral trust data available)	Foreign multinati onals (bilateral trust data available)
Estimation method	OLS	OLS	OLS	OLS	OLS	OLS	IV	OLS
Trust	0.606**	0.579**	0.598*	0.606*	–0.219			
Trust measured in CHQ region/country of location	(0.270)	(0.284)	(0.310)	(0.294)	(0.471)			
Bilateral trust					1.765***	1.669**	3.071**	
Trust of people from country of origin for people in country of location					(0.619)	(0.789)	(1.253)	
Religious similarity								0.491**
								(0.241)
Observations	1094	1094	881	422	422	422	422	422
Country of CHQ location controls (2)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country of plant location dummies (11)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region of plant location controls (2)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies (23)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other controls (57)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region of plant location dummies (111)	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country of CHQ location dummies (32)	No	No	No	No	No	Yes	Yes	Yes
Clustering	CHQ location	CHQ location	CHQ location	CHQ location	CHQ by plant location	CHQ by plant location	CHQ by plant location	CHQ by plant location
Number of clusters	92	92	33	16	97	97	97	97
Instruments							Religious similarity	
First stage *F*-test							28.56	

Notes: Dependent variable is the decentralization *z*-score index, measured by plant manager's autonomy over hiring, investment, products, and marketing. Columns (1) and (2) include all firms whose CHQ is located in a different region within the same country, or in a different country; columns (3)–(8) include only foreign multinationals. Instrument is "religious similarity" between each country pair. Standard errors (in parentheses) are clustered as noted: "CHQ by plant location" indicates clustering within each country origin by country of location cell. TRUST measures the percentage of individuals who agreed with the statement "most people can be trusted" in the geography of firm's CHQ region or country of location. BILATERAL TRUST measures the percentage of people from country of origin who report to "trust a lot" people living in the country of firm's location. "Country of CHQ location controls" is the log of GDP per capita and population in the country of CHQ location. "Region of plant location" controls are the log of GDP per capita and population in the region where the plant is located. "Industry dummies" are two-digit SIC dummies. "Other controls" include a dummy for whether the firm is publicly listed, a dummy for whether the CEO is on the same site as the plant ("CEO on-site"), the fraction of managers native of the country of plant location, and "Noise controls" (these include 44 interviewer dummies, 6 dummies to control for the day of the week the interview took place, an interview reliability score, the manager's seniority and tenure and the duration of the interview). Regressions weighted by the share of World Values Survey respondents in the region within the country in first two columns. * significant at 10%; ** significant at 5%; *** significant at 1%.

differences determined many centuries ago and is plausibly exogenous to other characteristics. It is very significant in explaining variations in bilateral trust between countries (an F-test of 28.56).

When trust is instrumented with religious similarity the coefficient on trust is larger than the ordinary least squares (OLS) coefficient. Column (7) shows that the coefficient on bilateral trust in the two-stage least squares (2SLS) regression, and column (8) shows the presence of a positive and significant relationship between decentralization and religious similarity in the reduced form. This result is suggestive of a causal effect of trust on decentralization in firms and also provides one potential mechanism for the Guiso, Sapienza, and Zingales (2009) FDI results. Multinational firms have a greater need to decentralize to foreign subsidiaries due to the local managers' better private information, but they will be reluctant to do so when they do not trust the local management. Being able to decentralize will increase the attractiveness of these locations for FDI as in Guiso, Sapienza, and Zingales (2009). These results also suggest a cross-country selection mechanism for industrial location. Industries requiring greater levels of decentralization should operate in higher trust countries. In Online Appendix Table B1, we show these patterns of comparative advantage in action. High-trust areas tend to attract industries that are likely to be decentralized (as measured by the degree of decentralization in the United Kingdom or the United States).[31]

Finally, there could still be some concern that religious similarity may proxy for broader measures of cultural interaction

calculated as the somatic gap between countries in terms of differences in hair color, facial shape, and height (see Online Appendix for details). The idea is that countries with different religions and different visual appearances are less likely to bilaterally trust each other. Guiso, Sapienza, and Zingales (2009) showed that these two measures are an important predictor of bilateral trust and are robust to controls for similarities in law, language, and informational overlap. When we include the genetic distance measure in the instrument set, we find very similar results for the first and the second stage shown in column (7). The F-test on the first stage is 18.27, and the coefficient (standard error) on bilateral trust in the second stage is 2.695 (1.078). However, the reduced form in column (6) is weaker: the genetic distance measure appears with a coefficient (standard error) of –0.031 (0.046), and the religious distance has a coefficient (standard error) of 0.413 (0.264).

31. These decentralized industries have higher levels of research and development, investment, and education per employee. This may generate a wider distribution of problems as production is more complex, so that greater decentralization is optimal.

between countries beyond trust, as Guiso, Sapienza, and Zingales (2009) discuss. To investigate this we run a battery of tests in Online Appendix Table B4, including gravity measures like geographical distance, colonial links, a common legal origin, and a common language, and we find the results to be robust.

V.C. Robustness and Extensions

We have extensively tested the robustness of the decentralization and trust relationship, and we report the main experiments in Table III. Column (1) represents the baseline specification of column (4) in Table I. We were concerned that the relationship could represent unobserved management quality, so we used the management practices measure from the CEP survey as detailed in Bloom and Van Reenen (2007, 2010) in column (2). Firms with better management practices appeared to be significantly more decentralized, but the coefficient on trust was essentially unaltered. Could the effect of trust be proxying for some other mechanism, such as incentive pay? Firms adopting high-powered incentives (as measured by the percentage of remuneration linked to individual performance) also appeared to be more decentralized (in line with Prendergast 2002), but this does not affect the coefficient on trust (column (3)). Some authors have stressed the prevalence of family firms (who are usually more centralized) as a result of low trust levels (e.g., Mueller and Philippon, 2011). We do find a negative coefficient on family-run firms, but the coefficient was insignificant when the trust variable is included (see column (4)). Column (5) includes the prevalence of "hierarchical religions," defined following La Porta et al. (1997) as the percentage of the population belonging to the Catholic, Islamic, or Eastern Orthodox faiths, with the idea that hierarchical religion reduces (or reflects) the lower taste for autonomy in the local population and reduces the probability of decentralization. Hierarchical religion does seem negatively associated with decentralization.[32] Column (6) includes a measure capturing the intensity of product market competition (the number of self-reported competitors). Consistent

32. Hierarchical religion could also reduce trust, which would further depress decentralization. Interestingly, religion in the plant's region of location matters, rather than religion in the CHQ: when CHQ religion is used in column (5) it is insignificant. This suggests that what matters is plant managers (and perhaps worker) tastes, rather than CHQ preferences.

TABLE III

DECENTRALIZATION AND TRUST: ROBUSTNESS

Additional controls	(1) None—baseline	(2) Management quality	(3) Individual pay incentives	(4) Family ownership	(5) Hierarchical religion	(6) Competition	(7) All
Trust	0.596***	0.565**	0.606***	0.580***	0.694***	0.585***	0.618***
Trust in CHQ region/country of location	(0.219)	(0.223)	(0.217)	(0.217)	(0.182)	(0.217)	(0.175)
Management		0.179***					0.159***
		(0.041)					(0.038)
Bonus			0.377**				0.419***
			(0.171)				(0.119)
Family management				–0.091			0.034
				(0.063)			(0.045)
Hierarchical religion					–0.004***		–0.004**
					(0.002)		(0.002)
Competition						0.150***	0.068**
						(0.043)	(0.027)
Observations	3,655	3,655	3,655	3,655	3,655	3,655	3,655
Country of CHQ location controls (2)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country of plant location dummies (11)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region of plant location controls (2)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies (148)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other controls (57)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clustering	CHQ location	CHQ location	CHQ location	CHQ location	CHQ location	CHQ location	CHQ location
Number of clusters	146	146	146	146	146	146	146

Notes: Dependent variable is the decentralization *z*-score index, measured by plant manager's autonomy over hiring, investment, products, and marketing. Estimation by OLS with robust standard errors in parentheses. Standard errors clustered by the firm's headquarter region of location (country of origin if the plant belongs to a foreign multinational). TRUST measures the percentage of individuals who agreed with the statement "most people can be trusted" in the firm's headquarter region of location (country of origin if the plant belongs to a foreign multinational). MANAGEMENT is the firm-level Bloom and Van Reenen (2007) management score. BONUS is the percentage of managerial compensation tied to individual, team, and firm performance. FAMILY MANAGEMENT is a dummy equal to 1 if the firm is owned and run by family members. HIERARCHICAL RELIGION is the percentage of people belonging to a hierarchical religion in the region of plant location as recorded by the World Values Survey (see text). COMPETITION is a variable measuring the number of the firm's direct competitors, as perceived by the plant manager (0 = no competitors, 1 = between 1 and 5 competitors; 3 = more than 5 competitors). "Country of CHQ location controls" is the log of GDP per capita and population in the country of CHQ location. "Region of plant location" controls are the log of GDP per capita and population in the region where the plant is located. "Industry dummies" are three-digit SIC dummies. "Other controls" include a dummy for whether the firm is publicly listed, a dummy for whether the CEO is on the same site as the plant ("CEO on-site"), the fraction of managers native of the country of plant location, and "Noise controls" (these include 44 interviewer dummies, 6 dummies to control for the day of the week the interview took place, an interview reliability score, the manager's seniority and tenure, and the duration of the interview). Regressions weighted by the share of World Values Survey respondents in the region within the country. 146 clusters included in the regression. ** significant at 5%; *** significant at 1%.

with other papers, competition is associated with decentralization.[33] Finally, in column (7) we include all the extra variables simultaneously. In all these experiments, trust remains positive and significant with only small changes to its coefficient.

We report a more extensive range of robustness checks in Online Appendix B (see Tables B2–B4). These analyze measurement error in the trust variable and alternative functional forms for decentralization. For example, we show that the trust measure is robust to constructing it from the largest wave of the survey, the latest wave, and dropping the ESS survey completely (see columns (6)–(8) in Table B2). We also include a host of other potentially confounding variables, such as indicators for civic responsibility, personal autonomy, and gravity type variables. In additional results (available on request) we also show the robustness of our results to including collectivist versus individualistic attitudes, population density, and alternative measures of inherited trust (following Algan and Cahuc 2010).

Finally, we examined the interaction between decentralization and information technology and found some suggestive evidence that these are complements at the firm level (see Bloom, Sadun, and Van Reenen 2009). In other words, increases in information technology are more strongly associated with total factor productivity when firms are decentralized (i.e., when trust is higher). The model of Section II could be extended to generate these effects (see Caliendo and Rossi-Hansberg 2012 for the mapping between average variable cost and productivity in the type of Garicano 2000 model we use here).

V.D. Trust and Firm Size

Proposition 2 of our model is that trust should also increase average firm size, since a CEO could manage more plants through increased decentralization. We investigate this idea using information on the population of all public and private firms appearing in the accounting databases which were used to construct the sampling frame of the organizational survey. Online Appendix A provides detailed information on these sources, which are external to our organizational survey.

We begin by using employment data on all domestic firms (i.e., we drop subsidiaries of foreign multinationals) appearing

33. For example, Alonso, Dessein, and Matouschek (2008), Bloom, Sadun, and Van Reenen (2010), and Guadalupe and Wulf (2010).

in the accounting databases to build a measure of average domestic firm size (in the region of the plant's location) and analyze the correlation between this variable and regional trust. In column (1) of Table IV we show that domestic firms in a given region are much larger when trust in the region is higher. This is consistent with the earlier cross-country trust results in La Porta et al. (1997) and Kummar, Raghuram, and Zingales (2005). In column (2) we go beyond the prior literature by including a full set of country dummies and exploiting within-country variations in trust. The coefficient on trust remains positive and significant. In columns (3)–(5) we focus instead on the subsidiaries of foreign multinationals, again finding a strong positive relationship between firm size and trust. To do this, we aggregate by country of location, country of origin pair, and investigate the relationship between the average size of the subsidiaries of foreign multinationals and bilateral trust from the parent firm's country of origin to the subsidiary firm's country of location. Similar to our findings on decentralization in Table II, the association between bilateral trust and average subsidiary size appears to be positive and significant, even after including a full set of dummy variables for the multinational's country of origin and the subsidiary's country of location. In columns (4) and (5) we show that bilateral trust is also positively correlated with total employment and total number of subsidiaries originating from a specific country. This is similar to the result in Guiso, Sapienza, and Zingales (2009) showing that FDI is larger when bilateral trust is higher.

The magnitude of the trust coefficient in column (2) is large—a 1 standard deviation increase in trust (12 percentage points) would be associated with about a 30% increase (exp(2.27 * 0.12) – 1) in firm size. In terms of regions, moving from the lowest trust region (Assam in India) to the highest trust region (Norrland in Sweden) would be associated with a tripling of firm size (exp(2.27 * (0.76 – 0.13)) – 1). Given the importance of large firms for reallocation and aggregate productivity growth, this highlights a potentially important role for social capital and culture in explaining aggregate productivity (e.g., Hsieh and Klenow 2009).[34]

34. This is consistent with recent field experiments on Indian firms showing that improvements in management led to more decentralized decision making, which facilitated growth by allowing firm owners to manage more plants given their fixed supply of time (Bloom et al. forthcoming).

TABLE IV

FIRM SIZE AND TRUST

	(1)	(2)	(3)	(4)	(5)
Dependent variable	Ln(employees)	Ln(employees)	Ln(employees)	Ln(employees)	Ln(subsidiaries)
Measure	Mean	Mean	Mean	Total	Total
Sample	All firms	All firms	Foreign multinational	Foreign multinational	Foreign multinational
Trust (region)	3.267***	2.270**			
Trust measured in firm's region of location	(0.727)	(0.826)			
Bilateral trust			2.260***	5.578***	3.318***
Trust of people from country of origin for people in country of location			(0.965)	(1.477)	(0.826)
Observations	110	110	292	292	292
Country location dummies (11)	No	Yes	Yes	Yes	Yes
Country of origin dummies	n/a	n/a	Yes	Yes	Yes
Clustering	Region	Region	CHQ by plant location	CHQ by plant location	CHQ by plant location
Number of clusters	110	110	292	292	292

Notes: Columns (1) and (2) are based on data reported by all domestic firms (i.e., excluding foreign multinationals) located in a specific region, aggregated at the regional level. The dependent variable in columns (1) and (2) is the log of the mean number of employees reported by all firms in the region. The set of regions included in the sample coincides with that included in the organizational survey sample, and standard errors are clustered at the regional level. Columns (3) to (5) are based on data reported by all multinational subsidiaries located in a specific country, aggregated by country of location-country of origin pairs (i.e., the mean number of employees of Japanese multinational subsidiaries in France would be one observation, the mean number of employees of Japanese multinational subsidiaries in the United Kingdom would be another). The set of country of location-country of origin pairs coincides with that included in the Eurobarometer bilateral trust survey, and standard errors are clustered at the country of origin-country of location level. In column (3) the dependent variable is the log of the mean number of employees by country of location-country of origin pair, in column (4) the dependent variable is the log of the total number of employees by country of location-country of origin pair, and in column (5) it is the log of the count of subsidiaries in every country of location-country of origin pair. Online Appendix A1 provides details on the sources of information used to build the employment measures at the regional level and at the country of location-country of origin level. TRUST measures the percentage of individuals who agreed with the statement "most people can be trusted" in the geography of firm's CHQ region or country of location. BILATERAL TRUST measures the percentage of people from country of origin who report to "trust a lot" people living in the country of firm's location. Regressions weighted by the share of World Values Survey respondents in the region within the country in first two columns. ** significant at 5%; *** significant at 1%.

VI. CONCLUSIONS

We have argued that social capital as proxied by trust enhances aggregate productivity through affecting the internal organization of firms. Higher trust regions are able to sustain more decentralized and larger firms, which aids productivity through reallocation. Trust is even important when we look at subsidiaries of multinational firms—delegation is much more likely for pairs of countries with high bilateral trust. These findings are consistent with a simple model of trust and delegation based on Garicano (2000), which predicts that higher trust leads to increased decentralization, larger firm size, and a higher marginal impact of information technologies on firm performance.

A second contribution of our article is to start to provide data infrastructure for the analysis of firm organization across countries. Despite many theoretical advances, the empirical literature on organizational economics lacks comparable measures of firms' internal organization. By collecting original data on decentralization across many thousands of firms in 12 countries, we start to address this gap.

There are many future directions for this work. One is running field experiments on organizational changes within large firms to obtain further micro organizational evidence. Another is to investigate the role of changes in information and technology. Garicano (2000) and Garicano and Rossi-Hansberg (2007) have stressed that information and communication technologies will increase decentralization. This can be tested using the kind of data developed here (see Bloom et al. 2010). Third, we have considered trust as being exogenously endowed on firms and countries due to long-run effects of history and culture (such as religion). But corporate cultures do change over time, and modeling the endogenous evolution of trust and incentives to invest in it would be a fascinating avenue for future research.

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SUPPLEMENTARY MATERIAL

An Online Appendix for this article can be found at QJE online (qje.oxfordjournals.org).

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