Trade in Tasks and the Organization of Firms

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August 2018

Abstract

In this paper, we incorporate trade in tasks into Marin and Verdier (2012) to examine how offshoring affects the way firms organize. We show that offshoring of production tasks and of managerial tasks can lead to more decentralized management and to larger executive wages in open economies. We study the predictions of the model with original firm level data and find that offshoring firms are 18% more decentralized than non-offshoring firms. We also find that offshoring of managers increases the level of decentralized management in open industries, but reduces the level of decentralized management in sufficiently closed industries.

   Keywords: international trade with endogenous organizations, the rise of human capital, theory of the firm, multinational firms, CEO pay

   JEL classification: F12, F14, L22, D23

1 Introduction

In the last two decades the world economy has been characterized by several new features. First, firms have organized their production in international value chains to cut costs. At the same time, they have decentralized their system of command in flatter corporate hierarchies to incentivize workers. Third, human capital has become a new stakeholder within firms in response to a competition for talent. Finally, firms have started to compensate their executives with skyrocket earnings. In this paper, we ask: have offshoring and "trade in tasks" been the driving forces behind these observed changes in the corporation?[1]

In an international value chain or "trade in tasks", firms geographically separate different production stages across the world economy to exploit differences in production costs.[2] According to an estimate, such vertical specialization accounts for a third of the increase in world trade since 1970 (see Hummels et al. (2001)) and intrafirm imports account between 22 to 69 percent of total imports between Western and Eastern Europe (see Marin (2006)).[3]

Data on the changing nature of the corporation have become available only recently. Rajan and Wulf (2006) and Marin and Verdier (2014) document that firms in the US, Germany, and Austria shifted to a more decentralized organization over time. Marin (2008) and Marin and Verdier (2014) show that firms in the larger economy, Germany, are more decentralized compared to firms in the smaller economy, Austria. Bloom et al. (2010) report that firms in the US, UK, and Northern Europe have the most decentralized organization, while firms in Asian countries are most centralized.

In Figure 1, we document the pattern of decentralization in corporate decision-making, offshoring of production and management activities among multinational firms. Based on original survey data of German and Austrian multinationals with direct investments in Eastern Europe, we find that there is a substantial variation across all three dimensions and make the following observations. First, the majority of multinationals has an organization with at least partially decentralized decision-making between CEO/owners and middle managers inside the firms. Second, while the majority of multinationals ($> 60\%$) do not report any intrafirm imports from their East European affiliates, roughly 10% of the firms import more than 10% in terms of the parent firm's sales.[4] Third, the majority of multinational firms also offshore managerial tasks by hiring managers on local labour markets in affiliate countries.

To study the interplay between firm organization and offshoring, we construct a model that incorporates trade in tasks à la Grossman and Rossi-Hansberg (2008) (hereinafter referred to as GRH) into a small open economy version of the theory of firm organization of Marin and Verdier (2012) (hereinafter referred to as MV). Using our model, we then explore how offshoring of production and managerial tasks affects the internal organization of Northern firms. We assume that a firm in the North consists of an owner and a manager. The skilled manager performs two different activities. As in Aghion and Tirole (1997), the manager can participate in running the firm by searching for projects that can be

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[1]For the new corporation, see Economist (2006) and Marin (2008).

[2]Trade in tasks is also discussed in the literature under the heading "slicing the value chain", "vertical specialization", "fragmentation", or "offshoring".

[3]For the new features of globalization, see Hummels et al. (2001), Feenstra (1998), and Grossman and Rossi-Hansberg (2008). For the new international division of labour in Europe, see Marin (2006). For a recent estimate on global value added chains, see Johnson and Noguera (2017).

[4]Also Atalay et al. (2014) find for US firms that roughly 50% of upstream establishments report no shipments to downstream establishments within the same firm.

Figure 1: Decentralization and Trade in Tasks in Multinational Firms
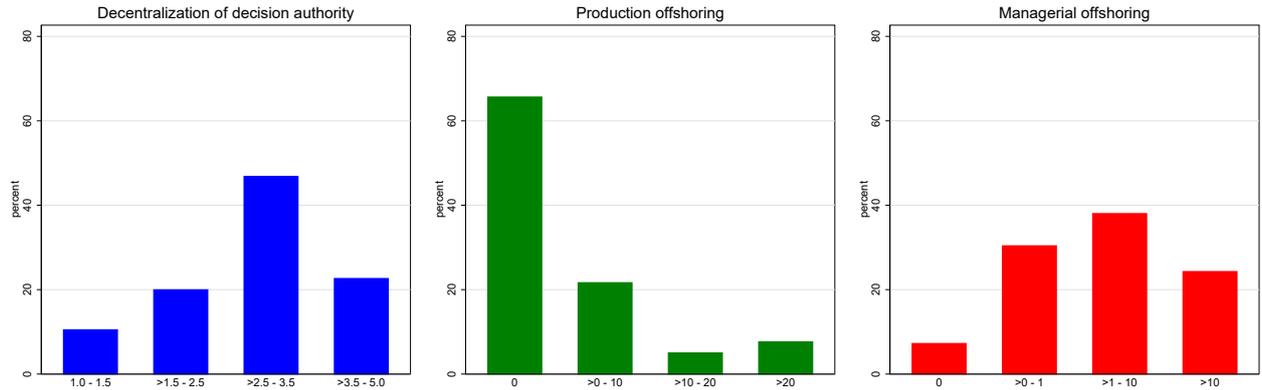
Notes: The figure shows the distribution of *(i) decentralization of decision authority, (ii) intrafirm imports* and *(iii) managerial offshoring* for a sample of German and Austrian multinationals with foreign direct investments in Eastern Europe. *(i)* The variable *Decentralization of decision authority* is an index that measures the degree of decentralization in decision making, with values between 1 (decisions are taken by the CEO) and 5 (decisions are taken at the divisional level). *(ii)* The variable *Sum of intrafirm imports / parental sales* is defined by the sum of intrafirm imports that a parent firm sources from its affiliates normalized by the parent's domestic sales multiplied by 100%. *(iii)* The variable *Managerial offshoring* is measured by the *Sum of # offshored managers / parent firm employment* which corresponds to the total number of offshored managers relative to employment within the parent. See Tables 1 and 9 and Subsection 4.1 for more details on the data.

implemented by the firm. In addition, we assume that there are a number of managerial tasks that have to be conducted to keep the firm active. Finally, the firm employs unskilled labour to produce. The owner decides whether to decentralize authority to the manager and faces the following trade-off. On the one hand, keeping formal authority crowds out the manager's effort to search for projects. On the other hand, in a decentralized firm where the manager has the formal authority to make decisions, there is the possibility that the second best project is implemented. This trade-off between a centralized organization and a decentralized organization depends on the firm's profits. In the paper, we assume that production and managerial tasks can be offshored. While, as in GRH, offshoring of production tasks reduces firms' marginal costs of production, offshoring of managerial tasks reduces the mass of tasks that need to be performed by the Northern manager to keep the firm active. In both cases, offshoring affects profit levels and, thereby, the owner's decision regarding decentralization.

We gain several insights from merging GRH with MV. First, we show that the offshoring of production tasks by Northern firms to the South unambiguously increases firms' profits and, thereby, induces firms to reorganize to decentralized management, in which power is allocated to the skilled manager in Northern firms.[5] The offshoring of production workers has two opposing effects on profits. On the one hand, it lowers the marginal costs of production. On the other hand, it induces firm entry, increasing competition, which then lowers the firms' revenues and profits. We show that in an open economy, the positive productivity effect is always stronger than the negative competition effect and, as a result, profits unambiguously increase. When profits rise in the North, principals in firms start

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[5]In GRH this effect is absent, as they do not consider firms' choice of organizational form. However, relocating tasks to other countries typically involves major reorganization in offshoring firms resulting in productivity gains that go above and beyond the mere discovery of cheap production opportunities in the South. The latter effect is considered by GRH, which they call labour-augmenting technological change. Marin (2009) shows that the discovery of cheap labour in Eastern Europe by German multinational firms has allowed German affiliate firms in Eastern Europe to cut unit labour costs relative to German parent firms by over 70 percent. Amiti and Konings (2007) and Halpern et al. (2015) quantify the productivity effect from offshoring for Indonesia and Hungary, respectively.

to monitor more inside the firm potentially destroying the initiative of skilled managers. When the increase in offshoring is sufficiently large, profits rise and the trade-off between control and initiative in the firm moves in favor of keeping the initiative of the skilled manager alive. As a result, principals delegate decision power to the skilled manager.

Second, we find that Northern firms gain market shares from foreign rivals as a result of the productivity gains from offshoring. The improved competitiveness of Northern firms has been an important argument in the empirical literature on the labour market effects of offshoring. This literature argues that offshoring to the South has not led to major job losses in the North, because it has helped Northern firms to gain market shares increasing the demand for labour in Northern firms. Improved competitiveness as a result of offshoring has so far not been shown in the literature, neither theoretically nor empirically. In GRH such a change in competitiveness in the North cannot arise, because they consider a framework with perfect competition.[6]

Third, we find that offshoring of skilled managers to the South has an ambiguous effect on the organization of firms in the North and relative managerial compensation. On the one hand, offshoring of managerial tasks lowers the demand for managers in the North which relaxes the resource constraint on managers, lowering their relative wages (the labour market effect). On the other hand, the lower start-up costs of a firm (each firm has to hire a manager to start a firm) induce firm entry into the market, which increases competition and raises the demand for managers, resulting in a rise in the relative wage of managers (the "war for talent" effect). We show that when the economy is sufficiently open to international trade the "war for talent" effect dominates the labour market effect, making it more likely that Northern firms decentralize management and pay their managers higher wages. The offshoring of managerial tasks to Eastern Europe may explain why the rise in executive compensation in Germany has been less pronounced than in the US.[7] In the empirical part of this paper, we show that offshoring of managerial tasks to Eastern Europe has occurred frequently and has been substantial (in 57% of German and Austrian foreign direct investments with on average 2.63 managers offshored per investment project).

We analyze the predictions of the model empirically using original firm level data we designed and collected of 660 Austrian and German multinational firms with 2200 subsidiaries in Eastern Europe. We find that offshoring firms are 18% more decentralized than non-offshoring firms when we exploit variation in the effective tax rate faced by affiliate firms in the host country to instrument for trade in tasks. We find further that an increase in the fraction of managers offshored by the sample mean reduces the level of decentralized management in sufficiently closed industries but increases decentralized management in sectors with a level of openness above the 40th percentile of the import penetration distribution. Lastly, we find empirical support for a "war for talent" effect since managerial offshoring is associated with higher executive relative wages in more open industries.

The literature on organization and trade has so far examined how international trade in final goods affects the internal organization of firms. Marin and Verdier (2012, 2014) and Caliendo and Rossi-Hansberg (2012) show based, respectively, on a Krugman (1980) model, a Melitz and Ottaviano (2008) model, and on a Melitz (2003) model of international trade, that North-North trade induces firms to reorganize their production by decentralizing decision-making power to lower management levels or by increasing the number of management layers. Marin and Verdier (2012) examine the organizational

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[6]For the labour market effects of offshoring, see Brainard and Riker (1997), Muendler and Becker (2010), Marin (2009).

[7]For the stylized features of the rise in CEO pay in Germany, see Fabbri and Marin (2016).

implications of trade integration within a framework of a Helpman and Krugman (1985) model of North-South trade in which countries differ in factor endowments. They show that North-South trade leads to the emergence of the talent firm in which human capital becomes the new stakeholder in firms. Manasse and Turrini (2001) show that trade integration can redistribute incomes towards high-skilled agents and thus lead to superstar effects.[8] All these papers do not consider how offshoring or trade in tasks affects the firm organization of offshoring firms. As the above figures show, however, trade in tasks and intrafirm trade have increased much stronger than final goods trade in the last two decades making offshoring an important candidate as a driver of organizational change. This will be particularly the case, if one takes into account that the relocation of firm activities to other countries typically involves a major reorganization of the activity that remains in offshoring firms in the North. Thus, offshoring and the reorganization of firms appear to occur hand in hand.[9]

The paper is related to the recent literature on offshoring in a global economy. Antràs and Helpman (2004, 2008) and Antràs et al. (2006); Antràs et al. (2008) examine the organization of offshoring in a global economy. Antràs and Helpman (2004, 2008) consider the conditions under which the activity is offshored inside the firm rather than delegated to an independent foreign input supplier. Antràs et al. (2006) determine the formation of international teams in multinational firms. In this paper, we abstract from the issues related to the boundaries of a firm. We examine instead how trade in tasks - irrespective of whether tasks are offshored or outsourced - affects the organization of firms in the North, whether they decentralize or centralize decision making power between the headquarters and the divisional managers in Northern firms.[10]

The paper is organized in the following sections. Section 2 describes the model. Section 3 theoretically examines how offshoring of production workers and managerial tasks affects the way firms organize. Section 4 describes the firm survey and the empirical results. Section 5 concludes.

2   The Model

We consider a small open economy with two goods and two factors of production: skilled and unskilled labour. The utility function of a representative consumer is given by

$$U(X,Y) = X^a Y^{1-a}, \ a \in (0,1), \tag{1}$$

where Y is a homogenous good and X is a differentiated good:

$$X = \left[\int_{i \in \Omega} x(i)^\rho di + \int_{i' \in \Omega_m} x_m(i')^\rho di' \right]^{1/\rho} \text{ and } 0 < \rho < 1.$$

Here Ω and Ω_m represent the set of domestic and foreign varieties, respectively. The homogenous good is produced in a perfectly competitive environment with a linear technology that requires only unskilled labour. Domestic varieties of the differentiated good are produced under monopolistic competition with free entry.

2.1 Firm Organization

In modeling the internal organization of a firm producing a variety of the differentiated product in an international market, we follow Marin and Verdier (2012). In particular, we consider a firm that consists of an owner (the principal P) and a manager (the agent A). Within the firm, the skilled manager performs two different activities. First, the manager can participate in running a firm by putting some effort into searching for projects that can be implemented by the firm. The incentives for the manager to put this effort are determined by non-pecuniary benefits that the manager can receive, if the "right" project is implemented. Second, there are a number of managerial tasks that have to be done to keep the firm active. Later, we assume that some of these tasks (but not all of them) can be offshored abroad (where the cost of managerial labour is lower). Finally, the firm employs unskilled workers to produce.

As discussed above, we assume that there are a number of alternative ways to run the firm, that differ in terms of production costs and, therefore, payoffs. However, only two of them are worth doing from the perspective of the principal and the manager. One project has the lowest cost of production and, thereby, yields the highest possible profit B. The other project is the "best project" for the manager, yielding the highest possible non-pecuniary benefit b for the manager (e.g. perks or career concerns). Thus, there is a potential conflict of interest between the principal and the manager. We denote by αB ($\alpha \in [0,1)$) the principal's benefit when the best project for the manager is implemented. To simplify the analysis, we assume that the manager's benefit when the best project for the principal is implemented is zero. Here, α captures the degree of conflict between the principal and the manager. B and b are supposed to be known ex ante, but the parties do not know ex ante which project yields which payoff.

To gather information on the payoffs of the projects, the principal uses a low skilled labour monitoring technology. Specifically, by investing some amount of unskilled labour L, the principal learns all the payoffs with probability $E = \min(1, \sqrt{L})$ and remains uninformed with probability $1 - E$. Similarly, by exerting some effort ke ($k < b$), the agent learns the payoffs of all projects with probability $e \in [0, \bar{e}]$ and remains uninformed with probability $1 - e$. We assume that the principal is risk neutral and that the agent is infinitely risk averse with respect to income. As a result, the agent is not responsive to monetary incentives and receives only a fixed payment, the size of which depends on the number of managerial tasks performed by the agent for the firm.

We also assume that, among the available projects, there are some with very high negative payoffs to both the principal and the agent. This assumption implies that choosing a random project without being informed is not profitable. In particular if the principal and the agent do not know the payoffs, there is no production. Thus, private information about the payoffs gives control over the decision to the informed party that, in this case, has "real power" rather than "formal power" in the firm.

In the X-sector, the principals in firms choose between three modes of organization, to maximize utility: P-organization, A-organization, and O-organization. In P-organization, the principal has formal power. In A-organization, the principal delegates formal power to the manager. Finally, in O-organization, the principal also has formal power, but the manager puts zero effort into learning the payoffs of the available projects (one can think of O-organization as P-organization with zero effort put in by the manager).

2.1.1 P-organization

Under P-organization, the principal has formal power. In this case if the principal is fully informed about the payoffs, then the best project for the principal is implemented and the principal's monetary payoff is B, while the manager receives zero. If the principal is uninformed and the manager is informed, then the manager has real power and suggests her best project (which is accepted by the principal). The principal receives a monetary payoff αB and the manager receives the private benefit b. If both the parties remain uninformed, there is no production.

Hence, the expected payoffs of the principal and the agent are

$$
\begin{aligned}
u_P &= EB + (1 - E)e\alpha B - wE^2, \\
u_A &= (1 - E)eb - ke.
\end{aligned}
$$

Here, w is the wage rate of unskilled labour (wE^2 is the principal's cost of learning the project payoffs). The first order conditions of the parties with respect to efforts E and e highlight the trade-off between control and initiative in the firm. They are

$$
\begin{aligned}
\text{Principal:} \quad & B(1 - \alpha e) = 2wE, \\
\text{Agent:} \quad & \begin{cases} e = \bar{e} & \text{if } k \le b(1 - E), \\ e = 0 & \text{otherwise.} \end{cases}
\end{aligned}
$$

The principal invests in more monitoring the higher the monetary payoff B, the larger the conflict of interest between the principal and the manager (the lower α), and the lower the manager's effort e. The agent puts in more effort the higher her benefit b from the project and the lower the principal's interference (lower E). Thus, the principal's control over the firm comes at the cost of less initiative on the part of the agent.

Marin and Verdier (2012) show that the equilibrium levels of effort under P-organization are

$$
\begin{aligned}
E_P^* &= \frac{B(1 - \alpha\bar{e})}{2w}, \; e_P^* = \bar{e} \quad \text{if } B/w \le \tilde{B}_P \\
E_P^* &= \frac{B}{2w}, \; e_P^* = 0 \qquad\qquad \text{if } B/w > \tilde{B}_P,
\end{aligned}
\tag{2}
$$

with the cutoff level of profits at which the initiative of the agent is killed being

$$
\tilde{B}_P = \frac{2(1 - k/b)}{1 - \alpha\bar{e}}.
$$

Note that the case with zero effort put in by the manager corresponds to O-organization.[11] Thus, it is straightforward to show that the expected utility of the principal under P-organization is

$$
u_P^* = w\left(E_P^*\right)^2 + e_P^*\alpha B.
\tag{3}
$$

---

[11]O-organization can be thought of a firm with P-organization, where the skilled agent only performs the necessary managerial tasks to keep the firm active.

2.1.2 A-organization

Under A-organization, the principal delegates formal power to the manager. If both parties are informed, then the best project for the manager is implemented. When the principal is informed and the agent is uninformed, the principal suggests her preferred project and, thereby, has real power. The expected payoffs of the principal and the agent are

$$
\begin{aligned}
v_P &= e\alpha B + (1-e)EB - wE^2, \\
v_A &= eb - ke.
\end{aligned}
$$

The first order conditions of the parties with respect to the efforts E and e are

$$
\begin{aligned}
\text{Principal:} \quad & B(1-e) = 2wE, \\
\text{Agent:} \quad & e = \bar{e},
\end{aligned}
$$

as b is assumed to be greater than k.

The advantage of delegating formal power to the manager is that the manager has more incentives to become informed. Specifically, under A-organization, the manager always puts in the maximum effort $\bar{e}$. In contrast, the principal has fewer incentives for investing in monitoring the projects and, as a result, the principal loses not only formal power, but also real power. The equilibrium values of E and e are

$$
E_A^* = \frac{B(1-\bar{e})}{2w}, \; e_A^* = \bar{e}.
$$

Hence, the expected utility of the principal under A-organization is

$$
v_P^* = w\left(E_A^*\right)^2 + e_A^*\alpha B. \tag{4}
$$

2.1.3 The Choice of Decentralized Management

We now explore how the decision whether to delegate formal power to the manager or not depends on the firm's real payoff B/w. In particular, the following proposition holds (see Marin and Verdier (2012) for details).

Proposition 1. *Assume that*
$$
\tilde{B}_P = \frac{2(1-k/b)}{1-\alpha\bar{e}} < \bar{B} = \frac{4\alpha}{2-\bar{e}}.
$$

It follows that, for $B/w < \tilde{B}_P$, the principal chooses P-organization. For $\tilde{B}_P \leq B/w < \bar{B}$, the principal prefers A-organization. Finally, for $B/w \geq \bar{B}$, O-organization (P-organization with zero effort put in by the manager) yields the highest utility to the principal.

Proof. For convenience, we reproduce the proof of the proposition in the Appendix. □

Intuitively, a trade-off between control and initiative arises only at intermediate levels of profits: the trade-off disappears at low and high levels of profits. At $\tilde{B}_P \leq B/w < \bar{B}$, the principal delegates formal power to the manager to maintain the initiative. As a result, A-organization is optimal. At high levels of profits ($B/w \geq \bar{B}$), the principal's stakes are so high that the principal puts a lot effort

into monitoring the projects, which in turn leads to zero effort put in by the manager under any type of firm organization. As a result, O-organization is optimal. At low levels of profits ($B/w < \tilde{B}_P$), the principal's stakes are small and, therefore, the principal does little monitoring or intervening, and does not depress the initiative of the manager although keeping control. The manager puts in the maximum effort, and P-organization is optimal.

2.2 Product Markets and the Trade Environment

In the previous section, the profits of firms were exogenous. We now endogenize profits by introducing product market competition and trade into the model. In particular, we consider a small open economy where the number and the prices of foreign varieties are taken as given.[12] In addition, we assume that there is some exogenous foreign demand for domestic varieties, given by $A_m/p(i)^\sigma$ (where A_m is a parameter).

The domestic demand for the home and foreign varieties of the differentiated good X is

$$
\begin{aligned}
x(i) &= \frac{aRP^{\sigma-1}}{(p(i))^\sigma}, \\
x_m(i') &= \frac{aRP^{\sigma-1}}{(p_m(i'))^\sigma},
\end{aligned}
$$

where R is the total expenditure in the economy, $p_m(i')$ is the price of an imported variety i', and P is the CES price index given by

$$
P^{1-\sigma} = \int_{i \in \Omega} p(i)^{1-\sigma} di + \int_{i' \in \Omega_m} p_m(i')^{1-\sigma} di'.
$$

Here, σ is the elasticity of substitution. Without loss of generality, we assume that $p_m(i') = p_m$ for any i'. Then,

$$
P^{1-\sigma} = \int_{i \in \Omega} p(i)^{1-\sigma} di + n^* (p_m)^{1-\sigma}, \tag{5}
$$

where n^* is the number of foreign varieties in the market (which is exogenous). To simplify the notation, we denote the level of import penetration, $n^* (p_m)^{1-\sigma}$, by IM.

Demand for the homogenous product is

$$
Y = \frac{(1-a)R}{p_Y},
$$

where p_Y is the world price of the good. It is assumed that the homogenous good is produced with a linear one-to-one technology (requiring only unskilled labour). Hence, the wage rate of unskilled labour is pinned down by the world price:

$$
w = p_Y.
$$

We assume that the marginal cost of production of a firm producing variety i is $wc(i)/Z_X$, where $c(i)$ stands for the part of the cost that depends on which project is implemented. If the best project for the principal is implemented, then $c(i) = c_B$, otherwise, $c(i) = c_b$ with $c_b > c_B$. The idea here is that when the agent has "real power" in the firm, the agent does not necessarily pick the cost-minimizing

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[12]Modeling a large open economy adds unnecessary complexity to the analysis. Moreover, under certain assumptions, we do not expect that the implications will be qualitatively different from those derived in the present framework.

project, but rather that which increases the agent's perks. This is how the conflict of interest between the principal and the agent translates to the production side of the firm. The variable Z_X, in turn, describes the "productivity" gains from offshoring some production tasks. Specifically, Z_X is strictly more than one if some part of the production is offshored, and equal to one if the firm does not offshore (we specify Z_X in the next section). Thus, given the demand for domestic varieties, the price of variety i is

$$p(i) = \frac{\sigma}{\sigma - 1} \frac{w}{Z_X} c(i),$$

This implies that the firm's total profits (taking into account sales abroad) are

$$\pi(i) = C \left(aRP^{\sigma-1} + A_m \right) \left(\frac{w}{Z_X} c(i) \right)^{1-\sigma},$$

where $C = \frac{1}{\sigma} \left(\frac{\sigma-1}{\sigma} \right)^{\sigma-1}$.

2.3 Trade in Tasks

To model the offshoring of labour tasks, we adopt the framework of Grossman and Rossi-Hansberg (2008). In particular, we assume that production in the differentiated sector involves a continuum of tasks (of measure one) and performing each task requires $c(i)$ units of labour. Production of each task can be offshored abroad. The cost of offshoring task $j \in [0, 1]$ is $\gamma t(j)$, where $t(j)$ is increasing and continuously differentiable, implying that it is more costly to offshore high-indexed tasks.

It is profitable to offshore task j if and only if the cost of producing it domestically is higher than the cost of offshoring. That is,

$$wc(i) > \gamma t(j) w^* c(i),$$

where w^* is the cost of unskilled labour abroad. The latter implies that tasks with index $j \in [0, I_X]$ are offshored, while the other tasks are performed domestically. Here I_X solves[13]

$$w = \gamma t(I_X) w^*. \tag{6}$$

Given the possibility of offshoring, the marginal cost of a firm producing variety i is

$$MC_i = wc(i) \left(1 - I_X \right) + w^* c(i) \int_0^{I_X} \gamma t(j) dj.$$

Taking into account (6), we have

$$MC_i = wc(i) \left(1 - I_X + \left(\int_0^{I_X} t(j) dj \right) / t(I_X) \right).$$

---

[13]Note that to guarantee the existence of an interior solution of (6), we need to assume that

$$\frac{1}{t(1)} < \gamma \frac{w^*}{w} < \frac{1}{t(0)}.$$

This condition states that the cost of offshoring tasks with lower indexes should be sufficiently low, while the cost of offshoring tasks with higher indexes should be sufficiently high. In this case, only a certain positive fraction of tasks is offshored.

From the definition of Z_X,

$$MC_i = \frac{w}{Z_X}c(i).$$

This means that the productivity gains from offshoring represented by Z_X are

$$Z_X = \frac{1}{1 - I_X + \left(\int_0^{I_X} t(j)dj\right)/t(I_X)} > 1.$$

As can be seen, Z_X is increasing in I_X. The more tasks are offshored, the more productive are the firms. If there is no offshoring ($I_X = 0$), then Z_X is equal to one and the marginal cost is $wc(i)$.

In the same spirit, we consider the offshoring of managerial tasks as a continuum of tasks (of measure one) performed by a manager, where some tasks may be offshored abroad. Performing each task requires one unit of managerial labour. Tasks that are not offshored are performed by a domestic manager who is paid according to the number of performed tasks. Note that the only role of the "foreign" manager is to perform some offshored managerial tasks. That is, we assume that the foreign manager does not participate (puts zero effort) in searching for projects. The idea behind is that, being located abroad, the foreign manager does not receive any non-pecuniary benefits from implemented projects. Alternatively, one can assume that the cost of searching for projects is so high for the foreign manager that she puts zero effort into searching.

We assume that the fraction of tasks that can be offshored is exogenously given by I_S.[14] Offshoring managerial tasks is profitable only if the cost of foreign managers is less than the cost of a domestic manager: i.e., $q > q^*$ (where q and q^* are the costs of skilled managerial labour at home and abroad, respectively). We assume that q^* is sufficiently low that the constraint on the number of tasks that can be offshored is binding: domestic firms find it profitable to offshore all the tasks they can offshore. In this case, the cost of entry into the market is given by $q(1 - I_S) + q^*I_S$.

2.4 The Equilibrium

Recall that the profits of a firm producing variety i are

$$\pi(i) = C\left(aRP^{\sigma-1} + A_m\right)\left(\frac{w}{Z_X}c(i)\right)^{1-\sigma}.$$

When the principal picks the project and has real power in the firm, the marginal cost of production is c_B and the principal's benefit is

$$B = C\left(aRP^{\sigma-1} + A_m\right)\left(\frac{w}{Z_X}c_B\right)^{1-\sigma} \tag{7}$$

with

$$\alpha = \left(\frac{c_b}{c_B}\right)^{1-\sigma} < 1.$$

Depending on the parameters in the model, there are three types of equilibria (under P-organization, A-organization, and O-organization). Each equilibrium is characterized by the free entry condition and the factor market clearing conditions. The free entry condition means that the expected principal's

---

[14]Endogenizing I_S does not substantially change the qualitative results, but makes the analysis more cumbersome.

profits are equal to the cost of starting a firm. Remember that the expected principal's profits are given by $w(E_k^*)^2 + e_k^* \alpha B$ where k represents the type of the organizational equilibrium: $k \in \{P, A, O\}$. Thus, the free entry condition can be written as follows:

$$w(E_k^*)^2 + e_k^* \alpha B = q(1 - I_S) + q^* I_S. \tag{8}$$

Let us denote by n the number of firms in the market. Then, under k-organization, $E_k^* n$ firms implement projects that are best for their principals, $(1 - E_k^*) e_k^* n$ firms implement projects that are best for their managers, and the rest leave the market (as both the principal and the manager remain uninformed). Hence, taking into account that some tasks are offshored (specifically, only $1 - I_X$ tasks are performed domestically), the demand for unskilled labour in the differentiated sector at k-equilibrium is

$$L_X^k = n(1 - I_X) * \begin{cases} [E_k^* c_B x_B + (1 - E_k^*) e_k^* c_b x_b] & \text{if } k = P, O \\ [E_k^* (1 - e_k^*) c_B x_B + e_k^* c_b x_b] & \text{if } k = A \end{cases} ,$$

where x_B and x_b are the outputs of firms with marginal cost c_B and c_b, respectively. Then, the unskilled labour market clearing condition is

$$L_X^k + Y^S + n(E_k^*)^2 = L, \tag{9}$$

where Y^S is the production of good Y, $n(E_k^*)^2$ is the labour used by principals to monitor projects, and L is the total endowment of unskilled labour.

Finally, the demand for skilled labour is equal to the number of firms entering the market multiplied by the number of managerial tasks performed at home. Thus, the market clearing condition for skilled labour is

$$H = n(1 - I_S), \tag{10}$$

where H is the endowment of skilled labour in the economy. Hence, the number of domestic firms in the economy is exactly determined by the endowment of skilled labour and the number of managerial tasks offshored.

Note that if I_S is close to unity, the number of firms, n, is close to infinity. This, in turn, means that firms' expected profits can be sufficiently low. At the same time, however, firms' expected profits are pinned down by the cost of managerial labour abroad, q^*, and are therefore not necessarily as low as required to clear the skilled labour market. As a result, it is possible that for sufficiently high values of I_S, no equilibrium in the model exists (this happens when the demand for skilled labour is lower than the supply). To avoid problems with the existence of an equilibrium, we impose an upper bound on I_S. Specifically, we assume that

$$I_S \leq \frac{wL}{wL + q^* H}.$$

In the Appendix, we show that this condition is sufficient to guarantee the existence of an equilibrium in the model. Notice that if q^* tends to zero, the upper bound tends to one.

As the wage rate of unskilled labour w is pinned down by the world price of the homogenous good and Z_X is exactly determined by the relative wage w/w^* and the cost of offshoring $t(j)$, the equilibrium values of q and B can be found from (7) and (8). Finally, the amount produced in the homogenous sector is determined by (9). Thus, we can find all the endogenous variables in the model.

To be consistent with the k-organization equilibrium, the equilibrium values of B/w must belong to the proper interval. Specifically, in order for P-organization to take place, the parameters in the model must be such that the solution of the equilibrium system of equations (for $k = P$) results in an equilibrium value of B/w less than $\tilde{B}_P$ (see Proposition 1). Similarly, in order for A-organization to take place, the solution of the equilibrium equations (for $k = A$) needs to result in a B/w between $\tilde{B}_P$ and $\bar{B}$. Finally, for the occurrence of O-organization, the equilibrium value of B/w implied by the equilibrium equations for $k = O$ needs to be higher than $\bar{B}$.

When studying how offshoring affects the equilibrium outcomes (B/w and q/w), we focus on a situation, where the economy is either in a P-, A-, or O-equilibrium. In particular, in the next section, we formulate a number of predictions for a P-equilibrium and then show that they hold for A- and O-equilibria as well. In the Appendix, we explore under which conditions a certain type of equilibrium can take place in the model. In general, depending on the parameters, the model allows for multiple equilibria (for instance, with P- or A-organization) or no equilibrium in pure strategies.

3 Decentralized Management and Offshoring

We now explore how the offshoring of production and managerial tasks affects the type of firm organization chosen by the principals. In particular, we examine how changes in I_X and I_S affect real profits B/w. The idea behind this exercise is the relation between the type of firm organization and real profits as stated in Proposition 1. In particular, Proposition 1 suggests that the level of firm decentralization (the level of formal power delegated to a manager) has a hump shape as a function of real profits. Thus, understanding the relation between offshoring and real profits sheds light on the connection between offshoring and firm organization.

Since the results we formulate below hold in any type of equilibrium (see Subsection 3.3 for details), without loss of generality, we consider the equilibrium under P-organization. The free entry condition at P-equilibrium is given by

$$w \left(E_P^*\right)^2 + e_P^* \alpha B = q(1 - I_S) + q^* I_S.$$

Taking into account the expressions for E_P^* and e_P^* (see (2)), the free entry condition can be rewritten:

$$\frac{(1 - \bar{e}\alpha)^2}{4} \left(\frac{B}{w}\right)^2 + \bar{e}\alpha\frac{B}{w} = \frac{q(1 - I_S) + q^* I_S}{w}. \tag{11}$$

Recall from (7) that the principal's benefit from picking the project is

$$B = C \left(aRP^{\sigma-1} + A_m\right) \left(\frac{w}{Z_X}c_B\right)^{1-\sigma},$$

where R is the total expenditure of the economy given by $wL + qH$. Thus, we have

$$\frac{B}{w} = C \left(\frac{w}{Z_X}c_B\right)^{1-\sigma} \left(aP^{\sigma-1}\left(L + \frac{q}{w}H\right) + \frac{A_m}{w}\right).$$

The price index in the economy is given by

$$P^{1-\sigma} = \int_{i\in\Omega} p(i)^{1-\sigma} di + IM.$$

As at P-equilibrium, $E_P^* n$ domestic firms implement projects with cost c_B and $(1 - E_P^*) e_P^* n$ firms implement projects with cost c_b, the price index can be written

$$P^{1-\sigma} = n \left(\frac{1}{\rho} \frac{w}{Z_X} c_B \right)^{1-\sigma} (E_P^* + (1 - E_P^*) e_P^* \alpha) + IM,$$

where $\rho = (\sigma - 1)/\sigma$. Moreover, using the expressions for E_P^* and e_P^* in (2), it is straightforward to show that

$$E_P^* + (1 - E_P^*) e_P^* \alpha = \bar{e}\alpha + \frac{(1 - \bar{e}\alpha)^2}{2} \frac{B}{w}$$

and the price index is equal to

$$P^{1-\sigma} = n \left(\frac{1}{\rho} \frac{w}{Z_X} c_B \right)^{1-\sigma} \left(\bar{e}\alpha + \frac{(1 - \bar{e}\alpha)^2}{2} \frac{B}{w} \right) + IM.$$

Taking into account that the supply of skilled labour is equal to H (implying that $n = H/(1 - I_S)$), the skilled labour market clearing condition can be written as

$$B/w = C \left(\frac{w}{Z_X} c_B \right)^{1-\sigma} \left(\frac{a \left(L + \frac{q}{w} H \right)}{\frac{H}{1-I_S} \left(\frac{1}{\rho} \frac{w}{Z_X} c_B \right)^{1-\sigma} \left(\bar{e}\alpha + \frac{(1-\bar{e}\alpha)^2}{2} \frac{B}{w} \right) + IM} + \frac{A_m}{w} \right). \tag{12}$$

Thus, we have two conditions that determine the equilibrium values of B/w and q/w: the free entry condition (11) and the skilled labour market clearing condition (12), from which we solve for B/w and q/w. In the Appendix, we show that a solution of (11) and (12) exists and is unique. Hence, a P-organizational equilibrium exists if and only if the B/w that solves (11) and (12) is less than $\tilde{B}_P$.

Figure 2 (left quadrant) illustrates the equilibrium. The HH curve depicts the market clearing condition for skilled labour from (12), which equates the number of firms n requiring a manager to the supply of skilled managers $H/(1 - I_S)$. The HH curve is upward sloping because larger q/w requires larger B/w to satisfy (12). When q/w is large, too many firms are looking for a manager. In order for (12) to hold, the number of firms n has to decline and thus B/w increases. The EE curve shows the free entry condition from (11). It equates expected profits to the fixed costs of market entry. It is upward sloping as well, because as B/w rises, firms want to enter the market. Firms can enter the market only by hiring a skilled manager. Since the number of firms is fixed by the resource constraint on skilled managers, q/w rises: entering firms try to lure away managers from incumbent firms, thus pushing up q/w. For this reason, the EE curve may be called the "war for talent" curve.

A Change in the Level of Openness

Next, we want to explore how a change in openness IM affects the labour market conditions for managers as given by (12). We illustrate an increase in the level of openness with the help of Figure 3. A rise in IM has two effects on the HH curve. First, it shifts the HH curve downwards as tougher foreign competition reduces firms' profits for any q/w. Second, with a rise in IM, the slope of the HH

Figure 2: Equilibrium and Offshoring of Production Tasks
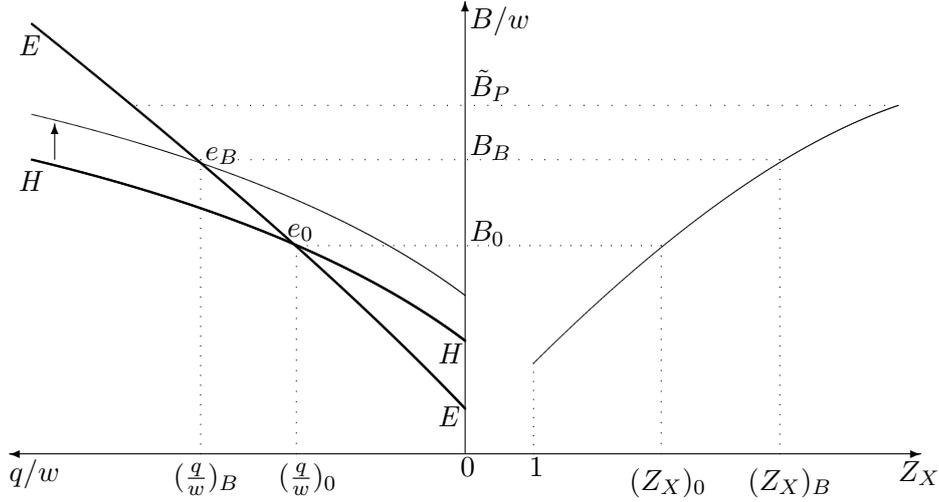
Figure 3: An Increase in the Level of Openness
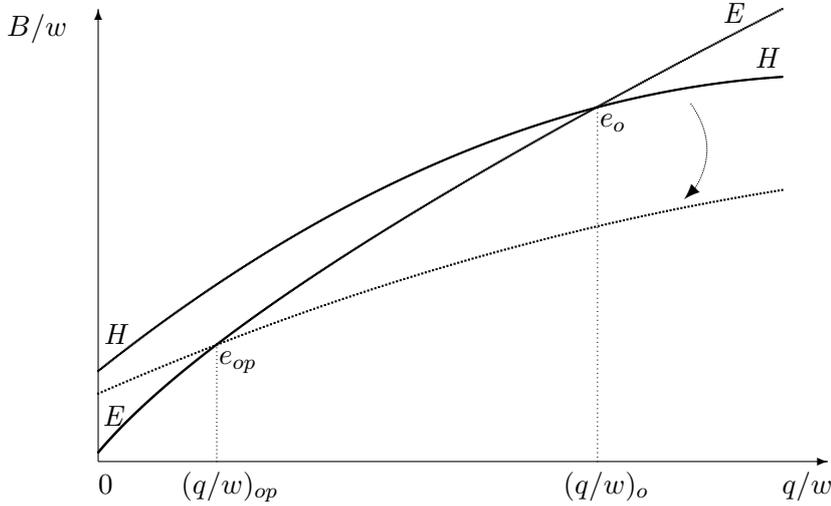
curve becomes flatter. To illustrate this, we take the derivative of B/w with respect to q/w. Taking into account (12), this derivative is given by

$$\frac{dB/w}{dq/w} = \frac{C\rho^{1-\sigma}aH}{\frac{H}{1-I_S}\left(\bar{e}\alpha + (1-\bar{e}\alpha)^2\,\frac{B}{w} - \frac{(1-\bar{e}\alpha)^2}{2}\,\frac{A_m}{w}C\left(\frac{w}{Z_X}c_B\right)^{1-\sigma}\right) + IM\left(\frac{1}{\rho}\frac{w}{Z_X}c_B\right)^{\sigma-1}}.$$

As can be seen, a rise in IM decreases the value of the derivative for any B/w and q/w. In an economy with more foreign firms, there are relatively fewer domestic firms active in the market as there is less of an incentive for domestic firms to enter (the downward shift of the HH curve). An increase in q/w requires the number of firms to decline (in order for the labour market condition for managers (12) to hold), which increases B/w by less when the economy is more open to trade, as only domestic firms' profits increase. Consequently, the HH curve flattens when the economy becomes more open. Figure 3 shows that an increase in the level of openness reduces the relative wage for managers as there are more foreign firms in the market who do not require a domestic manager. Foreign firms employ foreign managers when they deliver goods to the domestic market. Therefore, an increase in openness eases the demand for local managers.

3.1 Offshoring of Production Tasks

We now explore how changes in the scale of offshoring of production tasks, I_X, affect the equilibrium value of B/w. Recall that

$$Z_X = \frac{1}{1 - I_X + \left(\int_0^{I_X} t(j)dj\right)/t(I_X)},$$

where I_X is determined from $w = \gamma t(I_X)w^*$. As w is pinned down by the world price of the homogenous good, the only effect of I_X on B/w is through changes in Z_X. In particular, a larger I_X results in higher productivity gains Z_X. Thus, we need to explore how a rise in Z_X affects real profits. The following proposition holds.

Proposition 2. *In P-organizational equilibrium, a rise in Z_X leads to a higher value of real profits B/w and to a rise in q/w in equilibrium.*

Proof. The proof follows directly from (11) and (12). $\square$

We illustrate the intuition with the help of Figure 2. A rise in Z_X shifts the HH curve upwards, while the free entry curve EE does not change (left quadrant). As a result, the equilibrium values of B/w and q/w rise. There are two opposing effects of a rise in Z_X on real profits: it lowers marginal costs $wc(i)/Z_X$ and increases firms' real profits for any q/w (the productivity effect); at the same time, all other domestic firms become more productive as well, lowering firms' revenues and profits through a decrease in $RP^{\sigma-1}$ (the revenue effect). Note that the number of firms entering the market does not change as it is given by the resource constraint on managers $n = H/(1 - I_S)$. As can be seen from Proposition 2 and Figure 2, the positive productivity effect dominates the negative revenue effect and, as a result, real profits B/w unambiguously rise with the offshoring of production tasks Z_X (right quadrant). This is because we consider an open economy. When the domestic market is open to foreign competition (as captured by IM), a rise in Z_X affects only the productivity of domestic firms but leaves those of their foreign rivals unchanged. The improved competitiveness of domestic firms weakens the negative revenue effect. Moreover, the presence of export markets (given by A_m) enhances the effect of lower marginal costs on profits.[15]

In a closed economy (when $A_m = 0$ and $IM = 0$), the system of equations (11) and (12) changes to

$$\begin{cases} \frac{q(1-I_S)+q^*I_S}{w} = \frac{(1-\bar{e}\alpha)^2}{4}\left(\frac{B}{w}\right)^2 + \bar{e}\alpha\frac{B}{w}, \\ \\ B/w = \frac{Ca\rho^{1-\sigma}\left(\frac{L}{H}+\frac{q}{w}\right)(1-I_S)}{\bar{e}\alpha+\frac{(1-\bar{e}\alpha)^2}{2}\frac{B}{w}}. \end{cases} \quad (13)$$

and the two opposing effects on real profits exactly cancel out. Thus, in a closed economy, a rise in B/w (due to lower marginal costs) is exactly compensated by the decline in B/w (due to the smaller revenue when all other domestic firms serving the market become more productive as well) and the offshoring of production tasks does not change real profits and the way firms organize.

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[15]Actually, in the small open economy we consider here, the foreign market share IM is exogenous and does not change when domestic firms become more competitive due to an offshoring of production tasks. As a result, the foreign market share IM prevents revenues $RP^{\sigma-1}$ from falling proportionally to the rise in Z_X (as prices for foreign varieties do not fall when domestic firms become more productive). In a fully developed general equilibrium North–South model of offshoring, IM falls in response to a rise in Z_X, as domestic firms take some of the domestic market from foreign rivals.

When the increase in Z_X is sufficiently large, B/w rises and exceeds the cutoff $\tilde{B}_P$ (see Proposition 1). As a result, firms switch from P-organization to A-organization and decentralize formal power to the skilled manager to foster that manager's initiative.

3.2 Offshoring of Managerial Tasks

In this section, we consider the offshoring of managerial tasks. In particular, we examine how the offshoring of managerial labour affects firm's real profits, their level of decentralization, and the relative wages for managers. As in the previous section, we analyze the P-equilibrium in the model. Recall that offshoring managerial tasks takes place only if the cost of a foreign manager is lower than the cost of a domestic manager, i.e., $q > q^*$. In the model, q is endogenously determined and affected by offshoring. To guarantee $q > q^*$ for any value of I_S, we assume that q^* satisfies

$$C \left(\frac{w}{Z_X} c_B \right)^{1-\sigma} \frac{A_m}{w} > 2 \frac{\sqrt{(\bar{e}\alpha)^2 + \frac{q^*}{w} (1 - \bar{e}\alpha)^2} - \bar{e}\alpha}{(1 - \bar{e}\alpha)^2}. \tag{14}$$

Note that the latter inequality holds when q^* is sufficiently small. In this case, the equilibrium value of q is strictly greater than q^* for any size of the domestic market (for details, see the Appendix). Proposition 3 examines how changes in the number of managerial tasks offshored affect real profits and the relative wages for managers.

Proposition 3. *At P-equilibrium, there exists a cutoff level of openness of the economy, denoted by IM_P, such that for $IM > IM_P$: B/w and q/w are increasing in I_S; and for $IM \leq IM_P$: B/w is declining in I_S, while the impact of I_S on q/w is ambiguous.*

Proof. See the Appendix. $\square$

We explain the intuition behind Proposition 3 with the help of Figures 4 and 5. The left quadrant of Figures 4 and 5 gives the free entry curve EE and the market clearing curve HH, while the right quadrant shows the real profits B/w as a function of the offshoring of managerial tasks I_S. The offshoring of managerial tasks has three distinct effects on the equilibrium outcome. First, a rise in I_S lowers the cost of market entry and shifts down the free entry curve EE, increasing B/w and q/w (the war for talent effect: a move from e_0 to e_T). The lower costs of entry make it attractive for firms to enter the market. However, firms can enter only if they hire a manager. As the number of firms is fixed by the resource constraint for managers, firms compete with the incumbent firms for the available pool of managers in the economy, pushing up the relative costs of managerial labour q/w and the level of profits firms require to enter the market B/w.

Second, a rise in I_S lowers the demand for skilled managers in the North and shifts the HH curve down, decreasing the skill premium for managers q/w and real profits B/w (the labour market effect: a move from e_T to e_L). This relaxes the resource constraint on skilled managers in the North, allowing more domestic firms to find a manager. As the number of domestic firms rises, competition in the domestic market intensifies and firms' real profits B/w decrease (the competition effect).

The overall effect on B/w and q/w depends on the relative sizes of these effects (the war for talent effect, the labour market effect, and the competition effect). This depends on the exposure to international trade IM. When openness to trade is sufficiently high ($IM > IM_P$), the positive war for talent effect

Figure 4: Offshoring of Managerial Tasks: $IM > IM_P$

prevails over the negative competition effect and, as a result, real profits unambiguously rise with an increase in I_S (see Figure 4). To understand why, recall from the previous section that the derivative $\frac{dB/w}{dq/w}$ becomes smaller with larger IM. When the trade exposure is large, the number of foreign firms is large in the domestic economy and, thus, fewer domestic firms have an incentive to enter, reducing real profits only a little. As a result, a rise in I_S shifts the HH curve down only a little. Otherwise, when the level of import competition is sufficiently small ($IM \leq IM_P$), the competition effect dominates the war for talent effect and profits decline in response to a rise in I_S. As a result, an increase in I_S results in a large downward shift of the HH curve (see Figure 5).

The impact of a rise in I_S on q/w remains ambiguous, as the war for talent effect pushing up q/w and the labour demand effect lowering q/w cannot be ranked in magnitude. For $IM > IM_P$, a rise in I_S leads to an unambiguous rise in q/w as the war for talent effect prevails over the labour market effect. In an economy with many foreign firms, fewer domestic firms demand a manager, as fewer firms find it profitable to enter the market (see Figure 3 for an increase in openness IM). As the number of entrants is smaller in an open economy, changes in their demand for managers affect the relative wage for managers only a little. As a result, the labour market effect is small for $IM > IM_P$ (see Figure 4).

For $IM < IM_P$, the direction of the change in q/w cannot be signed. On the one hand, a lower IM makes the downward shift of the HH curve larger, with a stronger negative impact on q/w via the labour demand effect. On the other hand, a lower IM makes the slope of the HH curve steeper (for $IM < IM_P$, changes in the demand for managers have a large effect on the relative wages of managers), which in turn makes the positive effect on q/w stronger through the war for talent effect (as a rise in the number of entrants pushes up the relative cost of skilled managers). Hence, for sufficiently low IM, we cannot determine the overall impact on q/w.

Proposition 3 suggests that the impact of the offshoring of managerial labour on firm organization depends on the level of openness to foreign competition. If the economy is sufficiently open, an offshoring of managerial labour results in firm decentralization (the P-equilibrium becomes "closer" to the A-equilibrium). Otherwise, an offshoring of managerial labour leads firms to recentralize power with their top management.

Figure 5: Offshoring of Managerial Tasks: $IM < IM_P$

3.3 Offshoring under A- or O-organization

In this section, we argue that Propositions 2 and 3 hold for A- and O-equilibria as well. Remember that the O-equilibrium is a special case of the P-equilibrium with $\bar{e}$ being equal to zero. In particular, the O-equilibrium is described by

$$
\begin{cases}
\frac{q(1-I_S)+q^*I_S}{w} = \frac{1}{4}\left(\frac{B}{w}\right)^2, \\
\\
B/w = C\left(\frac{w}{Z_X}c_B\right)^{1-\sigma}\left(\frac{a\left(L+\frac{q}{w}H\right)(1-I_S)}{H\left(\frac{1}{\rho}\frac{w}{Z_X}c_B\right)^{1-\sigma}\left(\frac{1}{2}\frac{B}{w}\right)+(1-I_S)IM} + \frac{A_m}{w}\right).
\end{cases}
\tag{15}
$$

An O-equilibrium exists if the value of B/w determined by the above system of equations is greater than $\bar{B}$. As the proofs of Propositions 2 and 3 hold for any non-negative value of $\bar{e}$ including the zero value, they obviously hold in case of an O-equilibrium as well. The only difference from a P-equilibrium is the threshold value of the level of foreign competition in Proposition 3, IM_P. In O-equilibrium, it is different (as $\bar{e} = 0$). We denote it by IM_O.

The equations for an A-equilibrium are

$$
\begin{cases}
\frac{q(1-I_S)+q^*I_S}{w} = \frac{(1-\bar{e})^2}{4}\left(\frac{B}{w}\right)^2 + \bar{e}\alpha\frac{B}{w}, \\
\\
B/w = C\left(\frac{w}{Z_X}c_B\right)^{1-\sigma}\left(\frac{a\left(L+\frac{q}{w}H\right)(1-I_S)}{H\left(\frac{1}{\rho}\frac{w}{Z_X}c_B\right)^{1-\sigma}\left(\bar{e}\alpha+\frac{(1-\bar{e})^2}{2}\frac{B}{w}\right)+(1-I_S)IM} + \frac{A_m}{w}\right).
\end{cases}
\tag{16}
$$

As can be seen, the equilibrium equations in an A-equilibrium are very similar to those in a P-equilibrium. As a result, it is straightforward to check that the proofs of Propositions 2 and 3 can be applied to an A-equilibrium as well, resulting in the same qualitative results. Again, at an A-equilibrium, the threshold value of the level of foreign competition in Proposition 3 is different from those at P- and O- equilibria. We denote this value by IM_A.

Notice that to guarantee that the cost of foreign skilled labour is lower than the cost of domestic

skilled labour in an equilibrium of any type (see (14)), we need to assume that

$$C \left(\frac{w}{Z_X} c_B \right)^{1-\sigma} \frac{A_m}{w} > \max \left(2 \frac{\sqrt{(\bar{e}\alpha)^2 + \frac{q^*}{w}(1-\bar{e}\alpha)^2} - \bar{e}\alpha}{(1-\bar{e}\alpha)^2}, 2 \frac{\sqrt{(\bar{e}\alpha)^2 + \frac{q^*}{w}(1-\bar{e})^2} - \bar{e}\alpha}{(1-\bar{e})^2}, 2\sqrt{\frac{q^*}{w}} \right).$$
(17)

Note that the function, $\left(\sqrt{(\bar{e}\alpha)^2 + \frac{q^*}{w}x} - \bar{e}\alpha \right) / x$, is decreasing in x. Since $(1-\bar{e})^2 < (1-\bar{e}\alpha)^2$, this implies that

$$2 \frac{\sqrt{(\bar{e}\alpha)^2 + \frac{q^*}{w}(1-\bar{e})^2} - \bar{e}\alpha}{(1-\bar{e})^2} > 2 \frac{\sqrt{(\bar{e}\alpha)^2 + \frac{q^*}{w}(1-\bar{e}\alpha)^2} - \bar{e}\alpha}{(1-\bar{e}\alpha)^2}.$$

Hence, the inequality in (17) can be rewritten as follows:

$$C \left(\frac{w}{Z_X} c_B \right)^{1-\sigma} \frac{A_m}{w} > \max \left(2 \frac{\sqrt{(\bar{e}\alpha)^2 + \frac{q^*}{w}(1-\bar{e})^2} - \bar{e}\alpha}{(1-\bar{e})^2}, 2\sqrt{\frac{q^*}{w}} \right).$$

4 Empirical Analysis

In this section, we test the predictions of the model using a unique survey of firm level data of Austrian and German multinational firms with subsidiaries in Eastern Europe. We start with a description of the data.

4.1 The Data

We conducted a survey of 660 multinational corporations in Austria and Germany with 2200 affiliate firms in Eastern Europe, Russia, the Ukraine, and other former Soviet Republics. The sample is an unbalanced panel of 1200 German and 1000 Austrian foreign direct investments and it covers 80% of total German investment and 100% of total Austrian investment to Eastern Europe in 1990–2001 (the actual numbers are from the 1997–2000 in Germany and 1999–2000 in Austria). In 1998–1999, about 90% of the total outgoing foreign direct investment of Austria was reoriented to Eastern Europe, while in Germany, Eastern Europe accounted for only about 4%–5% of total outgoing foreign direct investment. This explains why the sample consists of relatively more Austrian multinational investments in spite of Austria being much smaller than Germany (with 8 million people, Austria's population is 10% of Germany's). Since foreign direct investment activity in Eastern Europe began with the fall of communism in 1990, having been prohibited during the period of central planning, we were able to obtain a representative sample of foreign direct investment in spite of collecting detailed information on the internal organization of these firms.

4.1.1 Decentralized Management

As a measure of the *level of decentralization of authority* in an offshoring firm, we employ the allocation of decision authority within the *parental* multinational firm.[16] This measure is obtained from the question: "Who decides the following issues concerning your corporation, top CEO/owner or the

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[16]Note that, in accordance to our theory, we examine variation in the level of decentralization within parental firms but not between parent firms and their subsidiaries.

Table 1: Selected Summary Statistics

| Variable	Obs.	Mean	Min.	Max.	Std. Dev.
Decentralized Management:					
level of decentralization of authority	1,161	2.83	1	5	0.87
Offshoring of Production Tasks:					
intrafirm imports	1,995	0.39	0	1	0.49
intrafirm imports in % of parent firm sales	1,957	8.37	0	560.00	34.72
Offshoring of Managerial Tasks:					
offshored managers	809	0.57	0	1	0.49
# offshored managers / mother empl.	786	0.19	0	4.53	0.61
# offshored managers / aff. managers	789	0.74	0	1	0.30
Human Resources:					
CEO compensation (in thd. EUR)	767	869.76	17.77	5,066.67	906.16
avg. firm wage (in thd. EUR)	1,586	57.66	1.82	566.87	45.81
CEO compensation / average firm wage	561	15.00	0.29	143.12	21.02
Firm Size:					
parental sales (in mio. EUR)	1,752	1,530.47	0.56	57,985.61	5,752.32
parental employment	1,993	6,970.20	1	233,000	25,233.78
affiliate sales (in mio. EUR)	1,722	29.39	0.002	3,118.88	135.51

divisional manager, please rank between 1 (*centralized* decision taken at the top CEO/owner level) and 5 (*decentralized* decision taken at the divisional level)?" The survey lists 13 corporate decisions for Austrian parent firms and 16 corporate decisions for German parent firms. The categories of corporate decisions include decisions over acquisitions, finance, the budget, new strategies, transfer pricing, new products, R&D expenditures, firing and hiring of personnel, changes of suppliers, product pricing, and wage increases. We then calculate a simple average of the available scores of these corporate decisions. The average level of decentralization in the sample is 2.83. Furthermore, Figure 6 shows that larger firms tend to be more decentralized on average. Figure 9 in the Appendix plots the average level of decentralization for each decision individually.

4.1.2 Offshoring of Production Tasks

To proxy the level of offshoring of production tasks, we use information in the survey on intrafirm trade flows between affiliate firms and the parent firm. The idea here is that the multinational firm is an offshoring firm if it imports some intermediate inputs from its affiliates in Eastern Europe. In particular, we use the dummy variable *intrafirm imports* to capture whether or not the multinational firm is offshoring production labour at all. As an alternative, we consider the variable *intrafirm imports in percent of parent firm's sales* as a proxy for the number of production tasks offshored by a firm. This variable is defined as the sum over all intrafirm imports of intermediate inputs of one particular multinational firm from all its affiliates in Eastern Europe relative to the domestic sales of this multinational firm. Figure 8 in the Appendix shows the regional variation of intrafirm imports in our data.

To help identify causal effects, we look for instrumental variables which on the one hand affect the

Figure 6: Decentralization of Corporate Decisions and Firm Size
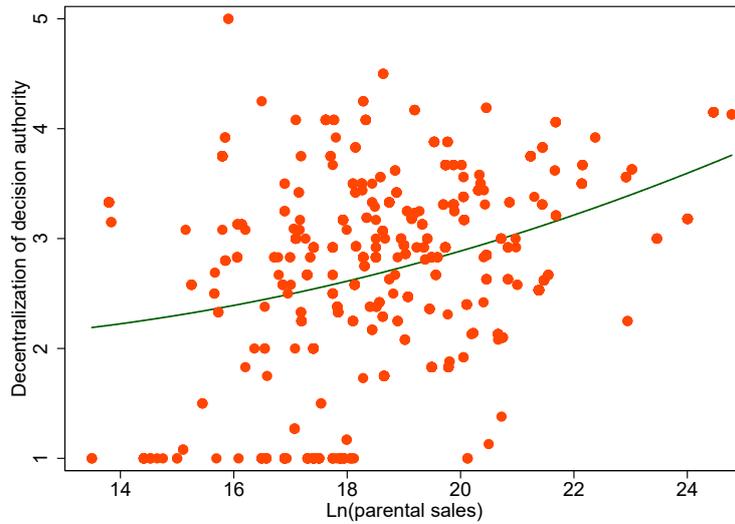
Notes: The figure shows a scatter plot of *decentralization of decision authority* and *ln(parental size)*. The included line plots the quadratic fit.

decision to offshore production tasks to Eastern Europe but which are on the other hand orthogonal to the organization of the parental firm in Austria or Germany. As instrumental variables we use average affiliate effective tax rates in the the host country. We define these as the natural logarithm of taxes less subsidies, normalized by industry value added. The data are at the *affiliate* country-industry level (ISIC 2 digit) and obtained from the World Input Output Database Rev. 2 (WIOD) for the year 2000. As an additional instrument, we introduce average relative unit labour costs between affiliates and parent firm industries which we also obtain from WIOD. We discuss the instrumental variables in greater detail when we describe the empirical results in the next section.

4.1.3 Offshoring of Managerial Tasks

To proxy the level of offshoring of managerial tasks, we use information derived from the survey question: "How many managers of your parent company have been sent to the affiliate firm?" Specifically, we assume that if the affiliate firm hires the manager from the local host country market (that is, the manager is *not* sent by the parent company), then some managerial tasks are considered to be offshored by the parental firm to the local host country. Based on this logic we construct the following proxy for the offshoring of managerial tasks. We sum over all managers in the multinational firm's affiliates in Eastern Europe that have not been sent by the parent company, and express this as a fraction of the sum of parental employment. We also express this sum of offshored managers as a fraction of affiliate managers. As an alternative proxy, we use the dummy variable *offshored manager dummy*, which captures whether or not the multinational firm is offshoring one or more managers to its subsidiary in Eastern Europe. This dummy is equal to one if the multinational firm does not send managers to its affiliate, and to zero if it sends one or more managers.

As can be seen from Table 1, in 57% of the investment to Eastern Europe, multinational firms from Austria or Germany have not sent managers to the affiliate firm in Eastern Europe. On average,

the multinational firms have offshored 2.63 managers per investment project with a maximum of 39 managers. Figure 8 in the Appendix shows the regional variation of managerial offshoring in our data.

4.1.4 Competition and Trade Openness

In order to measure trade openness, we rely on two different proxies for foreign competition. First, we construct the dummy *foreign competition* which is a subjective firm level measure of foreign competition as perceived by the firm. It is constructed using information from the survey question: "How many competitors do you face in your local (Austrian or German) market and worldwide, respectively?" The dummy variables take the value 1 if the parent firm states that it faces *"many or very many"* competitors for their product in their local markets or worldwide, rather than *"no or few"* competitors. In some cases, we average the survey responses at the industry level (ISIC 2 digit) in order to obtain an industry-specific measure of foreign competition. The main advantage of the subjective competition proxy is that it describes how the sample firms perceive their competitive position. On the other hand, an objective measure of foreign competition might be less prone to idiosyncratic differences in perceived competition. Therefore, as a second measure for openness, we calculate import penetration, defined as imports normalized by domestic absorption, at the country-industry level of the parent firm (ISIC 2 digit) using WIOD data.

4.1.5 Human Resources

Our survey also includes information on the human resource policies of the multinational firms in the sample. Information on the compensation of executives in our multinational firms is based on two sources. First, we obtained executive payment data from Kienbaum Management Consulting. Kienbaum is a management consultancy specializing in remuneration policies, which collects annual information on the executive compensation at large German firms. The Kienbaum data allow us to calculate the average compensation per executive, since the data contain information on the total compensation of the executive board and the number of executive board members. Since Kienbaum provides information only for the largest German firms, we additionally hand-collected this information from the annual reports of the remaining firms whenever available. Likewise, we divided the aggregate earnings of executives by the number of executives working for the firm to obtain the average compensation of board members. All average executive payments are expressed relative to the average wage of the firm in logarithms. The latter information comes from our firm survey.

4.2 Empirical Results

We start with a cross-industry analysis. Our theory predicts a relationship between the average level of firm decentralization and the level of offshoring at the sectoral level.

4.2.1 Cross-Industry Results

To examine the cross-industry variation in the data, we aggregate information on decentralized management and offshoring at the country-industry cell level, where the country is the location of the multinational parent (i.e. Austria or Germany) and industries are broad ISIC industries at the 2

digit level. Since our data virtually cover the full population of foreign direct investment projects made by German and Austrian multinationals with Eastern Europe, we consider our aggregations at the country-industry level as a fairly accurate representation of the variation at the industry level.[17] Overall, we end up with information on 41 country-industry cells (30 for managerial offshoring) that aggregate information on 30 multinational investment projects on average.

According to Proposition 2 and Figure 2, an increase in the offshoring of production tasks leads to an increase in profits. Empirically, we suppose that our sample contains firms that can be described best as P- or A-organizations since our sample firms are large multinationals and the case of a fully owner-managed firm does not fit the description of a firm, here. Furthermore, Figure 6 suggests that firms with higher revenues in our data are more decentralized on average. According to Proposition 1, the increase in profits ultimately induces firms to switch from a centralized P-organization to a decentralized A-organization. Thus, we can formulate

Prediction 1a: *In a cross-section of industries in an economy open to trade, industries will have more decentralized management on average when there is more offshoring of production tasks to low wage countries.*

In order to study Prediction 1a, we consider the following empirical model for decentralized management:

$$dec_{cs} = \partial_0 + \partial_1 offsh_{cs} + \partial_2 X_{cs} + \varepsilon_{cs}, \tag{18}$$

where dec_{cs} denotes the average level of decentralization in country c and sector s, $offsh_{cs}$ is the average level of offshoring of production tasks (see Subsection 4.1.2), X_{cs} is a set of controls, and ε_{cs} is the error term. According to Prediction 1a, we expect $\partial_1 > 0$.

Furthermore, according to Proposition 3 and Figures 4 and 5, an increase in the offshoring of managerial tasks leads to an increase in profits when the effect of the lower costs of market entry on profits (the "war for talent" effect) outweighs the effect of the increase in the number of firms on profits (the competition effect, which lowers profits). This is the case when the economy is sufficiently open to foreign competition. This increase in profits, in turn, induces firms to switch from P-organization to A-organization, as stated in Proposition 1. Thus, we can formulate

Prediction 2a: *In a cross section of industries in an economy open to trade, industries which offshore more managerial tasks to low wage countries and are sufficiently open to trade will have more decentralized management on average.*

We specify the following model for decentralized management to study Prediction 2a:

$$dec_{cs} = \partial_0 + \partial_1 offm_{cs} + \partial_2 offm_{cs} \times foreign_{cs} + \partial_3 foreign_{cs} + \partial_4 X_{cs} + \varepsilon_{cs}, \tag{19}$$

where $offm_{cs}$ is the average level of offshoring of managerial tasks at the 2 digit ISIC industry level in country c (see Subsection 4.1.3), $foreign_{cs}$ is a proxy for the openness of the sector, X_{cs} is a set of controls, and ε_{cs} is an error term. The explanatory variable $offm_{cs}$ captures the lower demand for managers as a result of managerial offshoring (the labour market effect), lowering the level of

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[17]A comparison between our data and the OECD FDI data yields a correlation coefficient of 0.82 when comparing average FDI stocks in Eastern European countries from Austria or Germany between 1997-2000. Our levels of FDI stocks are on average larger compared to the OECD data because we also included investment projects with an ownership share between 10 and 20%.

Table 2: Offshoring and Decentralized Management across Industries

Dependent variable: **Decentralization of decision authority**	(1)	(2)	(3)
Intrafirm Trade			
Sum of intrafirm imports / parental sales	0.00894** (0.00359)		0.0124** (0.00463)
Share of parental firms with intrafirm imports		0.458 (0.302)	
Managerial Offshoring * Foreign Competition			
Managerial offshoring * Foreign competition			19.38** (7.443)
Managerial Offshoring			
Sum of # offshored managers / parent employment			-18.72*** (5.925)
Foreign Competition			
Foreign competition (industry average)	0.361 (0.322)	0.434 (0.308)	-0.0521 (0.478)
Firm Size			
Ln(parental sales)	0.133 (0.0828)	0.0966 (0.0756)	0.148 (0.114)
Ln(affiliate sales)	-0.0486 (0.108)	-0.0183 (0.0996)	-0.0361 (0.144)
Home Country FE	yes	yes	yes
Observations	41	41	30

Notes: * significant at 10%; ** significant at 5%; *** significant at 1%. Estimation by OLS with robust standard errors in parentheses. All variables are aggregated to the parent firm country-industry level (ISIC 2 digit). The dependent variable *Decentralization of decision authority* is an index that measures the country-industry average of the degree of decentralization in decision making, with values between 1 (decisions are taken by the CEO) and 5 (decisions are taken at the divisional level). Intrafirm trade is measured by (i) the country-industry average of the *Sum of intrafirm imports / parental sales* in columns (1) and (3) or by (ii) the country-industry fraction of parent firms with intrafirm imports from at least one of its affiliates in column (2). Foreign competition is the country-industry average of the subjective survey dummy = 1 if the firms face *many* or *very many* foreign competitors. *Managerial offshoring* is the *Sum of # offshored managers / parent employment* defined as the country-industry average number of offshored managers normalized by parent firms employment. *Home Country FE* controls if the parental firms are German or Austrian.

profits that firms require to enter the market. These lower profits, in turn, induce firms to switch back to *P*-organization, resulting in more centralized management. Thus, we expect $\partial_1 < 0$. The interaction term $offm_{cs} \times foreign_{cs}$ is supposed to account for the prediction of the theory that profits and the level of decentralization will increase in response to managerial offshoring only when firms are sufficiently exposed to foreign competition. Hence, we expect $\partial_2 > 0$.

Our industry-level findings are presented in Table 2. In column 1, we regress the average level of decentralization across multinational parent firms within a country-industry cell on the average intrafirm imports relative to domestic parental firms' sales within the same country-industry, controlling for average parental sales and affiliate sales, the average level of foreign competition and a dummy for industries in Germany. Consistent with Prediction 1a, we find a positive association between intrafirm imports and decentralized decision making which is significant at the 5% level. In column 2, we consider an alternative measure of offshoring of production tasks, which is the share of parental firms with positive intrafirm imports. The coefficient for this share is positive, however not significant (p-value is 0.14).

In column 3, we include the average number of offshored managers relative to the parental firms' employees to proxy for managerial offshoring at the country-industry level. The coefficient for managerial offshoring turns out negatively and is significant at the 1% level. As predicted by our theory, the coefficient on the interaction term $offm_{cs} \times foreign_{cs}$ is positive and significant at the 5% level, where $foreign_{cs}$ is the fraction of firms within a country-industry cell that faces (very) many foreign competitors. Furthermore, the coefficient for $offm_{cs}$ turns out negative and is significant at the 1% level.

4.2.2 Cross-Firm Results

Offshoring of Production Tasks and Decentralized Management

In the cross-industry analysis of the previous subsection we assumed away heterogeneity in offshoring across firms. However, taking into account that our data set is firm-level, we examine now in more detail the data pattern for the cross-firm variation. We expect that firms which offshore more tasks will face a larger increase in profits and thus, they are more likely to decentralize decision making power. Therefore, we modify Prediction 1a in the following way:

Prediction 1b: *In a cross-section of firms in an economy open to trade, multinational firms will have more decentralized management when they are offshoring more production tasks to low wage countries.*

In order to study Prediction 1b, we consider the following modification of (18):

$$dec_i = \partial_0 + \partial_1 \, offsh_i + \partial_2 X_i + \varepsilon_i, \tag{20}$$

where dec_i denotes the level of decentralization within a parental firm i, $offsh_i$ is a proxy for the level of offshoring of production tasks of parental firm i (see Subsection 4.1.2), X_i is a set of controls, and ε_i is the error term. According to Prediction 1b, we expect $\partial_1 > 0$. We include a home country dummy for German parent firms, host country dummies and a set of industry dummies. Furthermore, we additionally include a set of survey noise controls to control for systematic differences in the survey responses in some specifications. These survey controls comprise a dummy that indicates if the survey was sent via mail, a dummy that indicates if the respondent was a chief executive manager and a dummy that indicates if the respondent was a middle manager (the remaining respondents had technical roles or were assistants of the top management). Furthermore, we add further parent firm control variables in some specifications which comprise a dummy for stock companies, a dummy that indicates if there is a technical relation between the divisions within the parental firm and a dummy that indicates if the affiliate firm is controlled directly by the parent firm instead of a distinct global ultimate owner. Note, that the unit of observation in all following regressions is an investment project i, comprising a parent firm together with one of its affiliate firms. Therefore, multinational firms with more affiliates get a larger weight in the regression and have a stronger influence on the parameter estimates. Thus, standard errors are also likely to be correlated between foreign direct investments of identical parental firms. To take this into account, we use cluster-robust standard errors with clustering at the parental firm level when we calculate the significance of the estimated parameters.[18]

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[18]Abadie et al. (2017) study the optimal unit of clustering and suggest to correct for clustering at the treatment unit level if the treatment is likely to be correlated and not fully random across observations.

Our findings are given in Table 3 which presents ordinary least squares estimates of Equation (20). In the upper Panel A of Table 3, we use the dummy variable *intrafirm imports* to see if offshoring firms are more decentralized on average. As predicted by the theory, the estimated coefficients are positive and significant at the 5%–10% level. In column 1, we include the ISIC 2 digit level of foreign competition to proxy the openness of the industry to which the firm belongs (see Subsection 4.1.4). We also control for parental firm sales, the home country and host countries. In column 2, we rerun the regression of column 1 with the firm level measure of foreign competition and also include a set of industry dummies and the survey noise controls. The estimated coefficient of 0.392 in column 2 is significant at the 1% level and means that firms with positive intrafirm imports are on average 9.8% more decentralized.[19] In column 3, we rerun the regression of column 2 but alternatively use parental firm employment to control for firm size. The coefficient estimate of 0.324 is significant at the 5% level. In column 4, we exchange our proxy for openness and use *import penetration* as an alternative control for foreign competition and obtain qualitatively similar results. In column 5, we additionally include our set of parent firm controls and the coefficient of interest remains positive at the 5% level.

In the lower Panel B of Table 3, we use *intrafirm imports in percent of parental sales* as the proxy for the number of production tasks offshored and then replicate the regressions from columns 1 to 5 in the upper panel. The estimated coefficients are also positive and significant at the 1%-5% level. The coefficient estimate of 0.00244 in column 5 suggests that an increase in the share of intrafirm imports in parental sales by 8.4% (which is the mean of the sample) is associated with a 0.51% higher level of decentralized management.[20]

In Table 4, we deal with potential endogeneity. Reversed causality might be present if firms that are more decentralized also choose to offshore more production tasks abroad which would bias our OLS estimates upwards. Another potential source of endogeneity could arise from omitted variables. General corporate culture could be a driver of both, offshoring decisions and decentralized management. Thus, omitted variables could bias the estimates towards any direction. Lastly, since our data are obtained from survey interviews, respondents might be doubtful in their assessments such that the survey answers are measured with some error. A classical measurement error would bias our estimates towards zero.

To assess the robustness of our measured positive association between intrafirm imports and decentralized management, we follow an instrumental variable strategy. A valid instrument needs to be relevant for intrafirm imports but also has to satisfy the exclusion restriction such that the instrumental variable only affects decentralized management in the parent firm via changes in intrafirm imports. Furthermore, we need to rely on cross-sectional variation that we have in our survey data. As our main instrumental variable, we consider *effective affiliate tax rates.* We define these as the average of $Ln((taxes - subsidies)/value\ added)$ measured at the affiliate country-industry level (ISIC 2 digit) and averaged across the parent firm's affiliates.[21] The idea of the instrument is the following. First, to be relevant, higher effective tax rates must lead to higher production costs in the South and thus make offshoring less attractive for multinational firms. Second, to be exogenous, tax rates in the

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[19]We obtain this number by dividing the coefficient 0.392 by 4, the total scale of the decentralization index since it ranges between 1 and 5: *(0.392 / 4 = 0.098).*

[20]We obtain this number by multiplying 0.00244 by the mean of intrafirm imports in parental sales of 8.4 *(0.00244 × 8.4 = 0.0205). 0.0205* corresponds to an increase in the decentralization index of 0.51%. As can be seen from Table 1, *intrafirm imports in percent of parental sales* is skewed ranging from 0% to 560% which may explain the smaller estimated effect compared to the upper panel.

[21]The data for the instrument come from the WIOD database.

Table 3: Offshoring of Production Tasks and Decentralized Management

Dependent variable: **Decentralization of decision authority**	(1)	(2)	(3)	(4)	(5)
Panel A					
Intrafirm Trade					
Dummy=1 if intrafirm imports >0	0.297**	0.392***	0.324**	0.342**	0.318**
	(0.145)	(0.139)	(0.128)	(0.140)	(0.129)
Foreign Competition					
Foreign competition (industry average)	1.311***		1.293**		1.099**
	(0.498)		(0.588)		(0.538)
Dummy=1 if many foreign competitors		0.430**			
		(0.191)			
Import penetration				2.063	
				(2.240)	
Firm Size					
Ln(parental sales)	0.127***	0.115**			
	(0.0364)	(0.0528)			
Ln(parental employment)			0.146***	0.152***	0.138***
			(0.0409)	(0.0418)	(0.0385)
Observations	640	614	680	680	680
Number of Parent Clusters	143	130	159	159	159
Panel B					
Intrafirm Trade					
Sum of intrafirm imports / parental sales	0.00296***	0.00228**	0.00317***	0.00233**	0.00244**
	(0.00112)	(0.000945)	(0.00101)	(0.00108)	(0.00117)
Foreign Competition					
Foreign competition (industry average)	1.269**		1.491**		1.290**
	(0.509)		(0.613)		(0.568)
Dummy=1 if many foreign competitors		0.369*			
		(0.197)			
Import penetration				1.585	
				(2.461)	
Firm Size					
Ln(parental sales)	0.154***	0.135**			
	(0.0440)	(0.0614)			
Ln(parental employment)			0.163***	0.163***	0.152***
			(0.0481)	(0.0506)	(0.0479)
Observations	640	614	676	676	676
Number of Parent Clusters	143	130	156	156	156
Home Country FE	yes	yes	yes	yes	yes
Host Country FE	yes	yes	yes	yes	yes
Industry FE	no	yes	yes	yes	yes
Survey Noise Controls	no	yes	yes	yes	yes
Parent Firm Controls	no	no	no	no	yes

Notes: * significant at 10%; ** significant at 5%; *** significant at 1%. Estimation by OLS with cluster robust standard errors in parentheses; clustering at the parental firm level. The dependent variable *Decentralization of decision authority* is an index that measures the degree of decentralization in decision making, with values between 1 (decisions are taken by the CEO) and 5 (decisions are taken at the divisional level). Intrafirm trade is measured by a dummy=1 if the parent firm has intrafirm imports from at least one of its affiliates (Panel A) or the *Sum of intrafirm imports / parental sales* defined by the sum of intrafirm imports that a parent firm sources from its affiliates normalized by the parent's domestic sales multiplied by 100% (Panel B). Foreign competition is a subjective survey dummy = 1 if the firm faces *many* or *very many* foreign competitors, its country-industry average or import penetration at the ISIC 2 digit level. *Home Country FE* controls if the parental firm is German or Austrian. *Host Country FE* include dummies for (i) affiliate countries belonging to the 2004 EU enlargement countries, (ii) affiliate countries belonging to the 2007 EU enlargement countries + membership candidates and (iii) affiliate countries belonging to CIS countries. *Industry FE* absorb the parent ISIC 2 digit industry. *Survey Noise Controls* include a set of dummies controlling for (i) if the survey was sent via mail, (ii) if the survey respondent is an executive, (iii) if the survey respondent is a middle (i.e. division) manager. *Parent Firm Controls* include a stock company dummy, a dummy that indicates a technical relation between the divisions within the parent firm and a dummy for affiliates that are controlled directly by the parent firm.

Table 4: Offshoring of Production Tasks and Decentralized Management

Dependent variable: **Decentralization of decision authority**	(1)	(2)	(3)	(4)	(5)
Intrafirm Trade					
Dummy=1 if intrafirm imports >0	0.717**	0.582**	0.577**	0.542*	
	(0.276)	(0.276)	(0.250)	(0.294)	
Sum of intrafirm imports / parental sales					0.0197*
					(0.0106)
Foreign Competition					
Dummy=1 if many foreign competitors	0.646**	0.578**	0.577**		0.535*
	(0.275)	(0.250)	(0.249)		(0.281)
Import penetration				0.663	
				(1.246)	
Firm Size					
Ln(parental sales)	0.110***	0.109***	0.109***	0.123***	0.301***
	(0.0398)	(0.0347)	(0.0347)	(0.0394)	(0.0978)
Observations	588	588	588	613	588
Number of Parent Clusters	126	126	126	138	126
1st Stage					
Effective affiliate tax rate	-0.455***	-0.443***	-0.415***	-0.540***	-16.537**
	(0.0747)	(0.0761)	(0.0726)	(0.0734)	(6.643)
Relative unit labour costs			-0.499*		
			(0.275)		
1st Stage F-Test	37.09	33.87	23.23	54.21	6.55
F-Test crit. value (bias $\leq$ 10 %)	16.38	16.38	19.93	16.38	16.38
Hansen Test (p-val.)			0.948		
Home Country FE	yes	yes	yes	yes	yes
Host Country FE	yes	yes	yes	yes	yes
Survey Noise Controls	yes	yes	yes	yes	yes
Parent Firm Controls	no	yes	yes	no	no

Notes: * significant at 10%; ** significant at 5%; *** significant at 1%. Estimation by IV with cluster robust standard errors in parentheses; clustering at the parental firm level. The dependent variable *Decentralization of decision authority* is an index that measures the degree of decentralization in decision making, with values between 1 (decisions are taken by the CEO) and 5 (decisions are taken at the divisional level). Intrafirm trade is measured by a dummy=1 if the parent firm has intrafirm imports from at least one of its affiliates or the *Sum of intrafirm imports / parental sales* defined by the sum of intrafirm imports that a parent firm sources from its affiliates normalized by the parent's domestic sales multiplied by 100%. Foreign competition is a subjective survey dummy = 1 if the firm faces *many* or *very many* foreign competitors or import penetration at the ISIC 2 digit level. *Home Country FE* controls if the parental firm is German or Austrian. *Host Country FE* include dummies for (i) affiliate countries belonging to the 2004 EU enlargement countries, (ii) affiliate countries belonging to the 2007 EU enlargement countries + membership candidates and (iii) affiliate countries belonging to CIS countries. *Survey Noise Controls* include a set of dummies controlling for (i) if the survey was sent via mail, (ii) if the survey respondent is an executive, (iii) if the survey respondent is a middle (i.e. division) manager. *Parent Firm Controls* include (i) a stock company dummy, (ii) a dummy that indicates a technical relation between the divisions within the parent firm and (iii) a dummy for affiliates that are controlled directly by the parent firm. Instrumental variables are (i) the *Effective affiliate tax rate*, defined as the average of *Ln((taxes - subsidies)/v.a.)* measured at the affiliate country-industry level (ISIC 2 digit) and averaged across the parent firm's affiliates or alternatively (ii) the *Relative unit labour costs*, defined as the Ln of unit labour costs (*compensation of employees /v.a.*) in the affiliate country-industry (ISIC 2 digit) relative to the affiliate industry unit labour costs in Austria or Germany, respectively, averaged across the parent firm's affiliates. 1st stage F-Test statistics are Kleibergen-Paap rank Wald statistics, critical values are Stock-Yogo weak identification test critical values for an IV bias not larger than 10% of the IV coefficient estimate.

affiliate country must affect decentralized management in the headquarter only via intrafirm imports. A concern with the instrument would be that more decentralized firms also offshore more and therefore target countries with low tax regimes. According to our survey, 75 % of the firms stated that tax motives did not play any role for their foreign direct investment decision. However, 81 % stated that tax policy involves substantial risks. We conclude from this, that taxes had little effects on the investment decision ex ante but matter for intrafirm imports ex post. A caveat of the instrument is that it heavily relies on cross-industry variation such that we cannot estimate the IV model including industry fixed effects as well. However, when we compare results from columns (1) and (2) in the OLS Table 3, the OLS coefficient estimates with or without industry fixed effects are pretty close.

In column 1 of Table 4, we use the *effective affiliate tax rate* to instrument for *intrafirm imports*. The first stage coefficient has the expected negative sign and from the first stage Kleibergen-Paap F-test statistic of 37.09, we conclude that the instrument is sufficiently strong.[22] The coefficient for *intrafirm imports* is positive and significant at the 5% level. The estimated coefficient of 0.717 suggests that offshoring firms are on average 18% more decentralized than non-offshoring firms ($0.717/4 = 0.179$). Compared to the ordinary least squares estimates in Table 3, the coefficient for *intrafirm imports* is about twice as large in the instrumental variable estimates. In column 2, we include our set of parent firm controls. The size of our coefficient of interest decreases to 0.582 but remains significant at the 5% level. In order to assess the robustness of our IV estimate, we add the *relative unit labour costs* as a second instrument in column 3. We define these as *Ln(compensation of employees / value added)* in the affiliate country-industry (ISIC 2 digit) relative to the affiliate industry unit labour costs in Austria or Germany and obtain the data from WIOD. Using both instruments allows us to test for an overidentified model. The p-value for the Hansen overidentification test is 0.948 such that we do not have to reject the null hypothesis of an overidentified model. Furthermore, we conclude from the F-test statistic of 23.23 that potential bias from weak instruments is still below 10% of the coefficient size. In column 4, we return to our main instrumental variable but add import penetration instead of using the subjective survey proxy for openness. The coefficient of interest remains positive and significant at the 10% level. Lastly, we use the sum of intrafirm imports relative to parental sales as a proxy for intrafirm trade in column 5. Also here, the coefficient of interest is positive and significant at the 10% level. However, the first stage F-statistic is substantially lower at 6.55.

Offshoring of Managerial Tasks and Decentralized Management

Next, we study the relation between the offshoring of managerial tasks and the level of decentralized management in the parental firms of multinational corporations. Specifically, we formulate the analogue of Prediction 2a:

Prediction 2b: *In a cross section of firms in sectors sufficiently open to trade, multinational firms will have more decentralized management when they offshore more managerial tasks to low wage countries.*

We specify the following model for decentralized management to test for Prediction 2b

$$dec_i = \partial_0 + \partial_1 offm_i + \partial_2 offm_i \times open + \partial_3 open + \partial_4 X_i + \varepsilon_i, \tag{21}$$

where $offm_i$ is a proxy for the level of offshoring of managerial tasks (see Subsection 4.1.3), *open* is

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[22]The Stock-Yogo critical value for a coefficient bias $\leq$ 10% is 16.38 in that case.

a proxy for the openness of the sector to which the firm belongs, X_i is a set of controls, and ε_i is an error term. As in our specification to test for Prediction 2a, we expect $\partial_1 < 0$ and $\partial_2 > 0$.

Table 5 presents the ordinary least squares estimates of Equation (21). Note that the sample size has dropped substantially from that of Tables 3 and 4, as we have fewer observations of managerial offshoring than of production offshoring. All specifications include home and host country dummies, industry fixed effects, parent and our survey noise controls. In columns 1-3, we employ the dummy variable *offshored manager* as a proxy for the offshoring of managerial tasks. The coefficient on the offshored manager dummy is negative and insignificant in column 1. In column 2, we add the interaction term *open × offshored manager dummy* as a measure of $offm_i \times open$, where we use import penetration as our proxy for openness. Now the coefficient on $offm_i$ is negative and significant at the 1% level. Moreover, as predicted by the theory, the interaction term $offm_i \times open$ is positive and significant at the 1% level. In column 3, we replicate column 2 but use our subjective survey measure of foreign competition. As predicted by our theory, the interaction term $offm_i \times open$ is again positive and significant at the 10% level. The coefficient for the dummy variable *offshored manager* turns out negatively but insignificant.

Since larger firms are more likely to have any offshored managers, we use the number of offshored managers normalized by employment in the parent firm as a proxy for the offshoring of managerial tasks in columns 4-5. Also here, the interaction coefficient is positive while the level effect is negative and both coefficient estimates are significant at the 1% level. Endogeneity problems from omitted variables or reversed causality could be a concern for the ordinary least squares estimates of Equation (21). Given our cross-sectional firm-level survey, we lack a credible instrument for managerial offshoring and the novelty of our analysis is that we use data on managerial offshoring for the first time which has, to our best knowledge, not been used in the literature before. Although we cannot attribute causality to managerial offshoring on decentralization, we study the magnitude of our OLS coefficient estimates in order to make the parameter estimates more interpretable. From column 5, we estimate a negative level coefficient $\hat{\partial}_1 = -25.84$ and a positive coefficient $\hat{\partial}_2 = 49.22$ for the interaction term. Our model suggests that managerial offshoring leads to more centralized management in less open industries and to more decentralized management in industries that are sufficiently open to trade. In order to see at which level of openness managerial offshoring leads to more decentralization, we calculate the marginal effect of managerial offshoring at its mean[23] for each decile of the openness distribution in our sample. In our sample, import penetration varies between 0.504 and 0.900 with a median of 0.552. When we calculate the signs of our marginal effect and find that managerial offshoring leads to more centralized management for industries at the 30th percentile and below and to more decentralized management at the 40th percentile and above.[24]

Lastly, in columns 6-7 we normalize the sum of offshored managers by managers employed in the parent's affiliates in order to make sure that our estimates do not capture potential differences in the management intensity across firms (firms that employ many managers might be more likely to offshore part of them). Again the interaction coefficient is positive while the level effect is negative and significance is at the 1% level.

As an additional robustness check, we split the level of import penetration into its four quartiles and interact dummies for each openness quartile with the *offshored manager dummy*. Figure 10 in

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[23]The sample mean of *sum of # offshored managers / parent firm employment* is 0.194.

[24]At the 75th percentile of the openness distribution (import penetration is 0.600), we find a similar effect of 18% for managerial offshoring that we found for production offshoring based on the IV estimate.

the Appendix plots the coefficient estimates for the four interaction terms. The plotted coefficients increase in the import penetration quartile and the null hypothesis that the smallest and the largest coefficient are equal is rejected at the 1% level.

Decentralization across Corporate Decisions

In this subsection we study which decisions become more decentralized due to managerial or production offshoring. In the comparative statics of our theory, we focus on a situation where firms are in a P-equilibrium and then switch to a more decentralized A-equilibrium due to offshoring. But which decisions are the most relevant ones, regarding their potential for delegation? In Table 6 we split our 16, respectively 13 decisions (for Austrian firms) into three distinct groups: high-level O decisions, mid-level P-decisions and low-level A-decisions. Figure 9 in the Appendix plots these decisions and ranks them according to their average degree of decentralization. Based on that ranking of decisions, we define the low-level A-decisions as decisions regarding product prices, moderate wage increases or hiring/firing 2 workers or a secretary. The mid-level P-decisions include decisions regarding budget, transfer pricing, R&D, new products, hiring > 10% of the workforce or the supplier. Lastly, high-level O-decisions include decisions on acquisitions, finance and strategy.

In columns 1-6, we reevaluate Prediction 1b. In columns 1-3 we use the dummy *intrafirm imports* as our regressor of interest. Here we obtain a positive and significant coefficient of interest (10% level) when we use the average decentralization of low- and mid-level A- and P-decisions. However, when we consider the average decentralization of high-level O-decisions in column 3, we do not find any significant effect. In columns 4-6 we repeat this exercise using the sum of intrafirm imports relative to parental sales and only find a positive and significant effect for the mid-level P-decisions (1% level). The coefficient estimates for the other decisions in columns 4 and 6 are negative and insignificant. In columns 7-9, we reevaluate Prediction 2b, using the dummy variable for *managerial offshoring* and its interaction with import penetration. As predicted by our model, we estimate a positive coefficient for the interaction term $offm_i \times open$ and a negative level effect for $offm_i$. When we compare the coefficient size for the interaction term, we again estimate larger coefficients when considering A- and P-decisions. From that we conclude that our theory best describes the decentralization of mid- and low-level decisions.

Offshoring of Managerial Tasks and CEO Wages

Finally, we additionally examine the relation between the offshoring of managerial tasks and the relative wages of managers. According to Proposition 3 and Figures 4 and 5, an increase in the offshoring of managerial tasks reduces the demand for managers, lowering managerial wages (the labour market effect), and leads to firm entry, pushing up managerial wages (the "war for talent" effect). The relative sizes of these effects depends on the openness of the economy. When the economy is sufficiently closed to international trade, the "war for talent" effect as well as the labour market effect are large. From this, we have

Prediction 3: *In a cross section of firms sufficiently open to trade, multinational firms will pay their executives higher wages when they are offshoring managerial tasks to low wage countries.*

Table 5: Offshoring of Managerial Tasks and Decentralized Management

Dependent variable: Decentralization of decision authority	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	dummy if any offshored managers			# normalized by mother employment		# normalized by managers in affiliate	
Managerial Offshoring Measure:							
Managerial Offshoring * Foreign Competition							
Manag. offsh. * Import penetration		5.912***			49.22***		13.75***
		(1.703)			(15.39)		(3.416)
Manag. offsh. * For. comp. (industry average)			0.943*				
			(0.540)				
Managerial Offshoring							
Manag. offsh.	-0.000819	-3.482***	-0.711	-0.374***	-25.84***	-0.00783	-8.145***
	(0.156)	(0.981)	(0.429)	(0.118)	(7.970)	(0.425)	(2.069)
Foreign Competition							
Import penetration	-2.057	-5.791		-4.937	-7.359*	-2.281	-12.05***
	(4.298)	(3.999)		(4.005)	(4.043)	(4.147)	(3.969)
Foreign competition (industry average)			0.917				
			(0.709)				
Firm Size							
Ln(parental sales)	0.378***	0.385***	0.360***	0.328***	0.372***	0.375***	0.391***
	(0.0741)	(0.0661)	(0.0743)	(0.0776)	(0.0705)	(0.0761)	(0.0628)
Observations	469	469	469	449	449	441	441
Number of Parent Clusters	114	114	114	111	111	110	110
Home Country FE	yes	yes	yes	yes	yes	yes	yes
Host Country FE	yes	yes	yes	yes	yes	yes	yes
Industry FE	yes	yes	yes	yes	yes	yes	yes
Survey Noise Controls	yes	yes	yes	yes	yes	yes	yes
Parent Firm Controls	yes	yes	yes	yes	yes	yes	yes

Notes: * significant at 10%; ** significant at 5%; *** significant at 1%. Estimation by OLS with cluster robust standard errors in parentheses; clustering at the parental firm level. The dependent variable *Decentralization of decision authority* is an index that measures the degree of decentralization in decision making, with values between 1 (decisions are taken by the CEO) and 5 (decisions are taken at the divisional level). *Managerial offshoring* is measured by (i) a dummy = 1 if the parent firm offshored any managers to the affiliate firm in columns (1) - (3) or by (ii) the *Sum of # offshored managers / parent firm employment* in columns (4) - (5) which corresponds to the total number of offshored managers relative to employment within the parent or by (iii) the *Sum of # offshored managers / managers in affiliates* in columns (6) - (7) which corresponds to the total number of offshored managers relative to the total number of managers employed in all affiliates of the parental firm. Foreign competition is the country-industry average of the subjective survey dummy = 1 if firms face *many* or *very many* foreign competitors or import penetration at the ISIC 2 digit level. *Home Country FE* controls if the parental firm is German or Austrian. *Host Country FE* include dummies for (i) affiliate countries belonging to the 2004 EU enlargement countries, (ii) affiliate countries belonging to the 2007 EU enlargement countries + membership candidates and (iii) affiliate countries belonging to CIS countries. *Industry FE* absorb the parent ISIC 2 digit industry. *Survey Noise Controls* include a set of dummies controlling for (i) if the survey was sent via mail, (ii) if the survey respondent is an executive, (iii) if the survey respondent is a middle (i.e. division) manager. *Parent Firm Controls* include a stock company dummy, a dummy that indicates a technical relation between the divisions within the parent firm and a dummy for affiliates that are controlled directly by the parent firm.

Table 6: Offshoring and Decentralized Management across Corporate Decisions

Dependent variable: Decentralization of decision authority	(1) low-level A-decisions	(2) mid-level P-decisions	(3) high-level O-decisions	(4) low-level A-decisions	(5) mid-level P-decisions	(6) high-level O-decisions	(7) low-level A-decisions	(8) mid-level P-decisions	(9) high-level O-decisions
Intrafirm Trade									
Dummy=1 if intrafirm imports >0	0.389*	0.373*	-0.0380						
	(0.214)	(0.191)	(0.137)						
Sum of intrafirm imports / parental sales				-0.000864	0.00398***	-0.00117			
				(0.00170)	(0.00151)	(0.00152)			
Managerial Offshoring * Foreign Competition									
Manag. offsh. * Import penetration							3.165	3.391**	2.410**
							(2.365)	(1.645)	(1.018)
Managerial Offshoring									
Manag. offsh.							-1.834	-1.972**	-1.561**
							(1.324)	(0.938)	(0.606)
Foreign Competition									
Import penetration	2.085	-0.531	0.533	2.318	-1.117	0.721	-5.245	-3.414	-0.145
	(2.849)	(2.657)	(2.018)	(2.826)	(2.655)	(2.076)	(5.800)	(4.426)	(2.168)
Firm Size									
Ln(parental sales)	0.177***	0.177***	0.0116	0.178***	0.211***	0.00280	0.450***	0.252***	0.0714*
	(0.0533)	(0.0587)	(0.0401)	(0.0580)	(0.0676)	(0.0422)	(0.0712)	(0.0686)	(0.0402)
Observations	635	635	635	635	635	635	632	632	632
Number of Parent Clusters	142	142	142	142	142	142	162	162	162
Home Country FE	yes	yes	yes	yes	yes	yes	yes	yes	yes
Host Country FE	yes	yes	yes	yes	yes	yes	yes	yes	yes
Industry FE	yes	yes	yes	yes	yes	yes	yes	yes	yes
Survey Noise Controls	yes	yes	yes	yes	yes	yes	yes	yes	yes
Parent Firm Controls	yes	yes	yes	yes	yes	yes	yes	yes	yes

Notes: * significant at 10%; ** significant at 5%; *** significant at 1%. Estimation by OLS with cluster robust standard errors in parentheses; clustering at the parental firm level. The dependent variable *Decentralization of decision authority* is an index that measures the degree of decentralization in decision making, with values between 1 (decisions are taken by the CEO) and 5 (decisions are taken at the divisional level). This index is calculated based on *low-level A-decisions* (product prices, moderate wage increase, hiring/firing 2 workers or secretary) in columns (1), (4) and (7); *mid-level P-decisions* (budget, transfer pricing, R&D, new products, hiring > 10%, supplier) in columns (2), (5) and (8) or *high-level O-decisions* (acquisitions, finance, strategy) in columns (3), (6) and (9). Intrafirm trade is measured by a dummy=1 if the parent firm has intrafirm imports from at least one of its affiliates in columns (1) - (3) or the *Sum of intrafirm imports / parental sales* defined by the sum of intrafirm imports that a parent firm sources from its affiliates normalized by the parent's domestic sales multiplied by 100% in columns (4) - (6). *Managerial offshoring* is measured by a dummy = 1 if the parent firm offshored any managers to the affiliate. Foreign competition is import penetration at the ISIC 2 digit level. *Home Country FE* controls if the parental firm is German or Austrian. *Host Country FE* include dummies for (i) affiliate countries belonging to the 2004 EU enlargement countries, (ii) affiliate countries belonging to the 2007 EU enlargement countries + membership candidates and (iii) affiliate countries belonging to CIS countries. *Industry FE* absorb the parent ISIC 2 digit industry. *Survey Noise Controls* include a set of dummies controlling for (i) if the survey was sent via mail, (ii) if the survey respondent is an executive, (iii) if the survey respondent is a middle (i.e. division) manager. *Parent Firm Controls* include a stock company dummy, a dummy that indicates a technical relation between the divisions within the parent firm and a dummy for affiliates that are controlled directly by the parent firm.

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We specify the following model for CEO wages to test for Prediction 3.

$$wage_i = \partial_0 + \partial_1 offm_i + \partial_2 offm_i \times open + \partial_3 open + \partial_4 X_i + \varepsilon_i, \qquad (22)$$

where $wage_i$ is the natural logarithm of the average executive wage in the board of parental firm i relative to its average firm wage. The variable $open$ is our proxy for the openness of the sector to which the firm belongs, proxied again by import penetration, X_i is a set of controls, and ε_i is an error term. The regressor $offm_i$ is again measured as the number of offshored managers normalized by employment in the parent firm. The level effect captures the reduced demand for managers as a result of managerial offshoring (the labour market effect) and thus, we expect $\partial_1 < 0$. The interaction term $offm_i \times open$ is supposed to take into account the prediction that the effect of a lower demand for managers on relative CEO wages is dampened in more open sectors. Hence, we expect $\partial_2 > 0$.

Table 7 presents the ordinary least squares estimates of Equation (22). Note that our sample size is substantially smaller in the regressions of Equation (22). This is due to the lack of data on executive remuneration in the limited liability corporations in our sample. These firms are not subject to the same disclosure requirements of preparing annual reports with information on executive remunerations. Nevertheless, we consider our estimates to be informative since our data are the first that allow assessing the effect of offshoring managerial tasks on executive wages in stock companies. Throughout all specifications we add home and host country dummies controls. In some specifications we additionally include our firm and survey noise controls.

In column 1, we include the *sum of # offshored managers / parent firm employment* and import penetration separately. The regressor $offm_i$ is not significant, suggesting that the level effect itself does not affect the relative wage for CEOs. In column 2, we add the interaction term $offm_i \times open$ to study if managerial offshoring is associated with higher relative executive wages in more open sectors. Indeed, the interaction term turns out significantly positive while the level effect becomes significantly negative (at the 1% level). In columns 3-4, we repeat the previous regressions but additionally include our set of firm and survey controls. Also here we find a positive interaction effect and a negative level effect although significance drops to the 10% level. Lastly, in column 5, we assess the robustness by using parental employment as an alternative firm size proxy and also estimate a significantly positive interaction effect (1% level) and a negative level effect (5% level) for managerial offshoring.

5 Conclusion

In this paper we incorporate a stylized model of trade in tasks into a small open economy version of the theory of firm organization of Marin and Verdier (2012). We study the predictions of the model with data of 660 offshoring firms in Austria and Germany. We find that offshoring of production and managerial tasks leads to more decentralized management. For managerial tasks this holds, however, only for sufficiently open economies. We find further that managerial offshoring leads to larger CEO wages relative to workers but only in very open industries, which suggests that CEOs operate in a tight labour market giving them large rents.

Table 7: Offshoring of Managerial Tasks and Relative Executive Compensation

Dependent variable: **Ln(avg. exec. compensation / avg. firm wage)**	(1)	(2)	(3)	(4)	(5)
Managerial Offshoring * Foreign Competition					
Managerial offshoring * Import penetration		44.73***		162.3*	113.4***
		(12.69)		(87.18)	(41.40)
Managerial Offshoring					
Managerial offshoring	-0.773	-24.22***	-0.589	-84.47*	-58.07**
	(0.667)	(6.743)	(0.614)	(45.36)	(21.66)
Foreign Competition					
Import penetration	-0.887	-2.852	-2.822	-4.479	-2.566
	(2.413)	(2.114)	(2.279)	(2.741)	(2.376)
Firm Size					
Ln(parental sales)	-0.107	-0.110	-0.0284	-0.0272	
	(0.122)	(0.0965)	(0.125)	(0.105)	
Ln(parental employment)					0.114
					(0.0879)
Observations	149	149	149	149	234
Number of Parent Clusters	29	29	29	29	44
Home Country FE	yes	yes	yes	yes	yes
Host Country FE	yes	yes	yes	yes	yes
Survey Noise Controls	no	no	yes	yes	yes
Parent Firm Controls	no	no	yes	yes	yes

Notes: * significant at 10%; ** significant at 5%; *** significant at 1%. Estimation by OLS with cluster robust standard errors in parentheses; clustering at the parental firm level. The dependent variable *Ln (average executive compensation relative to average firm wage)* is the natural logarithm of the average executive wage relative to the average wage paid in the multinational parent. *Managerial offshoring* is measured by the *Sum of # offshored managers / parent firm employment* which corresponds to the total number of offshored managers relative to employment within the parent. Foreign competition is the import penetration at the ISIC 2 digit level. *Home Country FE* controls if the parental firm is German or Austrian. *Host Country FE* include dummies for (i) affiliate countries belonging to the 2004 EU enlargement countries, (ii) affiliate countries belonging to the 2007 EU enlargement countries + membership candidates and (iii) affiliate countries belonging to CIS countries. *Survey Noise Controls* include a set of dummies controlling for (i) if the survey was sent via mail, (ii) if the survey respondent is an executive, (iii) if the survey respondent is a middle (i.e. division) manager. *Parent Firm Controls* include a stock company dummy, a dummy that indicates a technical relation between the divisions within the parent firm and a dummy for affiliates that are controlled directly by the parent firm.

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Theory Appendix

The Proof of Proposition 1

Case 1. Consider first the case when $B/w < \tilde{B}_P = 2(1 - k/b)/(1 - \alpha\bar{e})$. As $B/w < \tilde{B}_P$, the manager puts in the maximum effort, $\bar{e}$, under both types of the firm organization. Hence, the principal's utility in case of P-organization is

$$
\begin{aligned}
u_P^* &= w\left(E_P^*\right)^2 + e_P^*\alpha B \\
&= w\left(\frac{B(1 - \alpha\bar{e})}{2w}\right)^2 + \bar{e}\alpha B.
\end{aligned}
$$

Under A-organization, the utility is

$$
\begin{aligned}
v_P^* &= w\left(E_A^*\right)^2 + e_A^*\alpha B \\
&= w\left(\frac{B(1 - \bar{e})}{2w}\right)^2 + \bar{e}\alpha B.
\end{aligned}
$$

It is straightforward to see that $u_P^* > v_P^*$ (as $\alpha < 1$). As a result, P-organization is optimal.

Case 2. Consider now the case when $\tilde{B}_P \leq B/w < \bar{B}$. In this case, the manager puts in zero effort under P-organization and the maximum effort under A-organization. As a result,

$$
\begin{aligned}
u_P^* &= w\left(\frac{B}{2w}\right)^2, \\
v_P^* &= w\left(\frac{B(1 - \bar{e})}{2w}\right)^2 + \bar{e}\alpha B.
\end{aligned}
$$

It can be shown that

$$
v_P^* > u_P^* \iff B/w < \bar{B},
$$

implying that A-organization is optimal if $\tilde{B}_P \leq B/w < \bar{B}$.

Case 3. Finally, from the previous reasoning, it follows that when $B/w \geq \bar{B}$, P-organization is optimal: $u_P^* > v_P^*$ and the manager puts in zero effort. That is, we have O-organization as the equilibrium outcome.

Equilibria in the Model

In this section of the Appendix, we discuss the conditions under which a certain type of equilibrium takes place in the model. We start with the P-equilibrium. Recall that in the P-equilibrium, B/w solves the following equation:

$$
B/w = C\left(\frac{w}{Z_X}c_B\right)^{1-\sigma}\left(\frac{a\left(L(1 - I_S) + \left(\frac{(1 - \bar{e}\alpha)^2}{4}\left(\frac{B}{w}\right)^2 + \bar{e}\alpha\frac{B}{w} - q^*I_S/w\right)H\right)}{H\left(\frac{1}{\rho}\frac{w}{Z_X}c_B\right)^{1-\sigma}\left(\frac{(1 - \bar{e}\alpha)^2}{2}\frac{B}{w} + \bar{e}\alpha\right) + IM(1 - I_S)} + \frac{A_m}{w}\right). \tag{23}
$$

The latter can be rewritten in the following way:

$$\left(\frac{B}{w} - C\left(\frac{w}{Z_X}c_B\right)^{1-\sigma}\frac{A_m}{w} \right)\left(H\rho^{\sigma-1}\left(\frac{(1-\bar{e}\alpha)^2}{2}\frac{B}{w} + \bar{e}\alpha \right) + \frac{IM(1-I_S)}{\left(\frac{w}{Z_X}c_B\right)^{1-\sigma}} \right)$$

$$= \quad Ca\left(L(1-I_S) + \left(\frac{(1-\bar{e}\alpha)^2}{4}\left(\frac{B}{w}\right)^2 + \bar{e}\alpha\frac{B}{w} - q^*I_S/w \right)H \right) \iff$$

$$\frac{(1-\bar{e}\alpha)^2}{2}H\left(\frac{B}{w}\right)^2\left(\rho^{\sigma-1} - \frac{Ca}{2} \right)$$

$$+ \frac{B}{w}\left(H\bar{e}\alpha\left(\rho^{\sigma-1} - Ca\right) + \frac{IM(1-I_S)}{\left(\frac{w}{Z_X}c_B\right)^{1-\sigma}} - C\left(\frac{w}{Z_X}c_B\right)^{1-\sigma}\frac{A_m}{w}\frac{H\rho^{\sigma-1}(1-\bar{e}\alpha)^2}{2} \right)$$

$$= \quad Ca\left(L(1-I_S) - \frac{Hq^*I_S}{w} \right) + C\left(\frac{w}{Z_X}c_B\right)^{1-\sigma}\frac{A_m}{w}\left(H\rho^{\sigma-1}\bar{e}\alpha + \frac{IM(1-I_S)}{\left(\frac{w}{Z_X}c_B\right)^{1-\sigma}} \right).$$

Recall that $C = (\sigma-1)^{\sigma-1}\sigma^{-\sigma}$ and $\rho = (\sigma-1)/\sigma$. This implies that $\rho^{\sigma-1} > Ca/2$ (as $a < 1$). Moreover, we assume that

$$I_S \le \frac{wL}{wL + q^*H} \iff L(1-I_S) - \frac{Hq^*I_S}{w} > 0.$$

Let us then introduce the following notation:

$$A_1 \quad = \quad \frac{(1-\bar{e}\alpha)^2}{2}H\left(\rho^{\sigma-1} - \frac{Ca}{2} \right) > 0,$$

$$A_2 \quad = \quad H\bar{e}\alpha\left(\rho^{\sigma-1} - Ca\right) + \frac{IM(1-I_S)}{\left(\frac{w}{Z_X}c_B\right)^{1-\sigma}} - C\left(\frac{w}{Z_X}c_B\right)^{1-\sigma}\frac{A_m}{w}\frac{H\rho^{\sigma-1}(1-\bar{e}\alpha)^2}{2},$$

$$A_3 \quad = \quad Ca\left(L(1-I_S) - \frac{Hq^*I_S}{w} \right) + C\left(\frac{w}{Z_X}c_B\right)^{1-\sigma}\frac{A_m}{w}\left(H\rho^{\sigma-1}\bar{e}\alpha + \frac{IM(1-I_S)}{\left(\frac{w}{Z_X}c_B\right)^{1-\sigma}} \right) > 0.$$

Then, B/w solves the following quadratic equation:

$$A_1\left(\frac{B}{w}\right)^2 + A_2\frac{B}{w} - A_3 = 0.$$

Let us define the positive solution of the above equation as $(B/w)_P$. Note that, since $A_1 > 0$ and $A_3 > 0$, there is a unique positive solution of the above quadratic equation.

In a similar way, one can find that, in the A-equilibrium, B/w solves (see Section 3.3)

$$\tilde{A}_1\left(\frac{B}{w}\right)^2 + \tilde{A}_2\frac{B}{w} - \tilde{A}_3 = 0,$$

where

$$\tilde{A}_1 = \frac{(1-\bar{e})^2}{2} H \left(\rho^{\sigma-1} - \frac{Ca}{2} \right) > 0,$$

$$\tilde{A}_2 = H\bar{e}\alpha \left(\rho^{\sigma-1} - Ca \right) + \frac{IM(1-I_S)}{\left(\frac{w}{Z_X} c_B \right)^{1-\sigma}} - C \left(\frac{w}{Z_X} c_B \right)^{1-\sigma} \frac{A_m}{w} \frac{H\rho^{\sigma-1} (1-\bar{e})^2}{2},$$

$$\tilde{A}_3 = Ca \left(L(1-I_S) - \frac{Hq^*I_S}{w} \right) + C \left(\frac{w}{Z_X} c_B \right)^{1-\sigma} \frac{A_m}{w} \left(H\rho^{\sigma-1}\bar{e}\alpha + \frac{IM(1-I_S)}{\left(\frac{w}{Z_X} c_B \right)^{1-\sigma}} \right) > 0.$$

Let us define the positive solution of this equation as $(B/w)_A$. Again, there exists a unique positive solution of the above equation.

Finally, in the O-equilibrium, B/w solves (in this case, one can just set $\bar{e}$ to zero in the P-equilibrium)

$$\hat{A}_1 \left(\frac{B}{w} \right)^2 + \hat{A}_2 \frac{B}{w} - \hat{A}_3 = 0,$$

where

$$\hat{A}_1 = \frac{H}{2} \left(\rho^{\sigma-1} - \frac{Ca}{2} \right) > 0,$$

$$\hat{A}_2 = \frac{IM(1-I_S)}{\left(\frac{w}{Z_X} c_B \right)^{1-\sigma}} - C \left(\frac{w}{Z_X} c_B \right)^{1-\sigma} \frac{A_m}{w} \frac{H\rho^{\sigma-1}}{2},$$

$$\hat{A}_3 = Ca \left(L(1-I_S) - \frac{Hq^*I_S}{w} \right) + C\frac{A_m}{w} IM(1-I_S) > 0.$$

The unique positive solution of this equation is defined as $(B/w)_O$.

Thus, the P-equilibrium exists and is unique (in the sense that there are no other P-equilibria) if and only if $(B/w)_P < \tilde{B}_P$. The A-equilibrium exists and is unique if and only if $\tilde{B}_P \leq (B/w)_A < \bar{B}$. Finally, the O-equilibrium exists and is unique if and only if $(B/w)_O \geq \bar{B}$.

Note that the model allows for multiple equilibria with different firm organization. Assume that the parameters in the model are such that $\tilde{A}_2$ is close to A_2. In this case, since $\tilde{A}_3 = A_3$, it is straightforward to show that $(B/w)_P < (B/w)_A$. As a result, for some parameters, it can be the case that

$$(B/w)_P < \tilde{B}_P \leq (B/w)_A < \bar{B} \text{ and } (B/w)_O < \bar{B}.$$

This implies that there are two equilibria with A- and P-organization. If, for instance, $\tilde{A}_2 \gg A_2$, then $(B/w)_P > (B/w)_A$ and one cannot exclude the situation when

$$(B/w)_A < \tilde{B}_P \leq (B/w)_P < \bar{B} \text{ and}$$
$$(B/w)_O < \bar{B},$$

which implies no equilibrium in pure strategies.

In general, we have the following inequalities:

$$\hat{A}_1 > A_1 > \tilde{A}_1 > 0,$$
$$\tilde{A}_2 > A_2 > \hat{A}_2,$$
$$\tilde{A}_3 = A_3 > \hat{A}_3 > 0;$$

that do not allow us to order $(B/w)_P$, $(B/w)_A$, and $(B/w)_O$ (recall that $A's$ depend on the parameters in the model in a quite complicated way). As a result, the more detailed analysis of which equilibria exist for a certain set of parameters does not look feasible.

When Offshoring is Profitable

Note that $q > q^*$ if and only if

$$\frac{q(1 - I_S) + q^* I_S}{w} > \frac{q^*}{w}.$$

The left-hand side of the inequality is the real cost of entry into the market if I_S tasks are offshored. That is, in P-equilibrium,

$$\frac{q(1 - I_S) + q^* I_S}{w} = \frac{(1 - \bar{e}\alpha)^2}{4} \left(\frac{B}{w}\right)^2 + \bar{e}\alpha \frac{B}{w}.$$

Thus, $q > q^*$ if and only if

$$\frac{(1 - \bar{e}\alpha)^2}{4} \left(\frac{B}{w}\right)^2 + \bar{e}\alpha \frac{B}{w} > \frac{q^*}{w} \iff$$
$$\frac{B}{w} > 2 \frac{\sqrt{(\bar{e}\alpha)^2 + \frac{q^*}{w}(1 - \bar{e}\alpha)^2} - \bar{e}\alpha}{(1 - \bar{e}\alpha)^2}.$$

As can be inferred from the equilibrium condition for B/w (see (23)), B/w is always strictly greater than $C \left(\frac{w}{Z_X} c_B\right)^{1-\sigma} \frac{A_m}{w}$. Hence,

$$C \left(\frac{w}{Z_X} c_B\right)^{1-\sigma} \frac{A_m}{w} > 2 \frac{\sqrt{(\bar{e}\alpha)^2 + \frac{q^*}{w}(1 - \bar{e}\alpha)^2} - \bar{e}\alpha}{(1 - \bar{e}\alpha)^2} \implies$$
$$\frac{B}{w} > 2 \frac{\sqrt{(\bar{e}\alpha)^2 + \frac{q^*}{w}(1 - \bar{e}\alpha)^2} - \bar{e}\alpha}{(1 - \bar{e}\alpha)^2} \implies$$
$$q > q^*.$$

The Proof of Proposition 3

The proof below establishes our predictions regarding the effect of managerial offshoring on firm organization as stated in Proposition 3. Specifically, we consider how the equilibrium real profits in Equation (23) are affected by the fraction of offshored managerial tasks. First, we analyze the derivative of the equilibrium real profits from (23) with respect to the measure of managerial offshoring I_S. Then, we provide a necessary and sufficient condition for this derivative to be positive (in this case, a rise in the number of offshored managerial tasks under P-organization leads to an increase in the real profits and thereby prompts a transition to a decentralized A-organization).

Let us denote the right-hand side of (23) by $F(B/w, I_S)$. Then, the equilibrium value of B/w solves

$$B/w = F(B/w, I_S),$$

where

$$F(B/w, I_S) \equiv C \left(\frac{w}{Z_X} c_B \right)^{1-\sigma} \left(\frac{a \left(L(1 - I_S) + \left(\frac{(1-\bar{e}\alpha)^2}{4} \left(\frac{B}{w} \right)^2 + \bar{e}\alpha \frac{B}{w} - \frac{q^* I_S}{w} \right) H \right)}{H \left(\frac{1}{\rho} \frac{w}{Z_X} c_B \right)^{1-\sigma} \left(\bar{e}\alpha + \frac{(1-\bar{e}\alpha)^2}{2} \frac{B}{w} \right) + IM(1 - I_S)} + \frac{A_m}{w} \right).$$

It can be shown that

$$F'_{I_S}(B/w, I_S) = C \left(\frac{w}{Z_X} c_B \right)^{1-\sigma} aH \frac{G(B/w)}{\left(H \left(\frac{wc_B}{Z_X \rho} \right)^{1-\sigma} \left[\bar{e}\alpha + \frac{(1-\bar{e}\alpha)^2}{2} \frac{B}{w} \right] + (1 - I_S)IM \right)^2},$$

where

$$
\begin{aligned}
G(B/w) &= -\left(L + \frac{q^*}{w} H \right) \left(\frac{wc_B}{Z_X \rho} \right)^{1-\sigma} \left[\bar{e}\alpha + \frac{(1-\bar{e}\alpha)^2}{2} \frac{B}{w} \right] \\
&\quad + IM \left(\frac{(1-\bar{e}\alpha)^2}{4} \left(\frac{B}{w} \right)^2 + \bar{e}\alpha \frac{B}{w} - \frac{q^*}{w} \right).
\end{aligned}
$$

Note that $G(B/w)$ is a quadratic function of B/w. As $G(B/w)$ is U shaped and $G(0)$ is negative, the equation $G(B/w) = 0$ has two solutions: one positive and one negative. Let us write $(B/w)^*$ for the positive solution of

$$G(B/w) = 0.$$

Specifically, $(B/w)^*$ satisfies

$$IM \left(\frac{(1-\bar{e}\alpha)^2}{4} \left(\frac{B}{w} \right)^2 + \bar{e}\alpha \frac{B}{w} - \frac{q^*}{w} \right) = \left(L + \frac{q^*}{w} H \right) \left(\frac{wc_B}{Z_X \rho} \right)^{1-\sigma} \left[\bar{e}\alpha + \frac{(1-\bar{e}\alpha)^2}{2} \frac{B}{w} \right].$$

Taking into account the properties of $G(B/w)$, it is straightforward to see that $G(B/w) > 0$ (for positive values of B/w) if and only if $B/w > (B/w)^*$. Hence, we can conclude that a rise in I_S raises $F(B/w, I_S)$ if and only if $B/w > (B/w)^*$. In other words, if the equilibrium value of B/w is greater than $(B/w)^*$, then a further marginal rise in I_S increases $F(B/w, I_S)$ and thereby B/w. Otherwise, $F(B/w, I_S)$ and B/w go down with a rise in I_S. A direct implication of this finding is that B/w is increasing in I_S on $[0, wL/(wL + q^*H)]$ if and only if $(B/w)^0 > (B/w)^*$, where $(B/w)^0$ is the solution of

$$B/w = F(B/w, 0).$$

That is, $(B/w)^0$ is the equilibrium value of B/w when $I_S = 0$ (there is no offshoring of managerial labour).

Next, we find the condition when $(B/w)^0 > (B/w)^*$. Since by definition $(B/w)^0$ solves $B/w = F(B/w, 0)$, one can see that $(B/w)^0 > (B/w)^*$ if and only if $F((B/w)^*, 0) > (B/w)^*$ (see Figure 7).
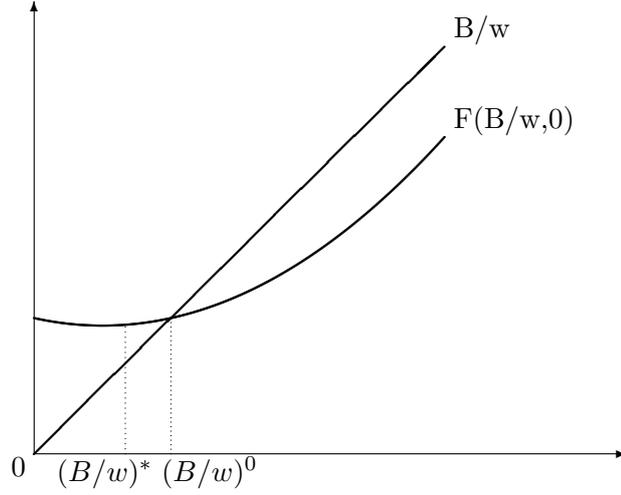
We have that

$$F((B/w)^*, 0) = C\left(\frac{w}{Z_X}c_B\right)^{1-\sigma}\left(\frac{A_m}{w} + \frac{a\left(L + \left(\frac{(1-\bar{e}\alpha)^2}{4}((B/w)^*)^2 + \bar{e}\alpha\,(B/w)^*\right)H\right)}{H\left(\frac{wc_B}{Z_X\rho}\right)^{1-\sigma}\left[\bar{e}\alpha + \frac{(1-\bar{e}\alpha)^2}{2}(B/w)^*\right] + IM}\right).$$

As $G((B/w)^*) = 0$,

$$\left(\frac{wc_B}{Z_X\rho}\right)^{1-\sigma}\left[\bar{e}\alpha + \frac{(1-\bar{e}\alpha)^2}{2}(B/w)^*\right] = \frac{IM\left(\frac{(1-\bar{e}\alpha)^2}{4}((B/w)^*)^2 + \bar{e}\alpha\,(B/w)^* - \frac{q^*}{w}\right)}{\left(L + \frac{q^*}{w}H\right)}.$$

Hence, we derive that

$$F((B/w)^*, 0) = C\left(\frac{w}{Z_X}c_B\right)^{1-\sigma}\left(\frac{A_m}{w} + \frac{a\left(L + \frac{q^*}{w}H\right)}{IM}\right).$$

As a result, B/w is increasing in I_S on $[0, wL/(wL + q^*H)]$ if and only if

$$C\left(\frac{w}{Z_X}c_B\right)^{1-\sigma}\left(\frac{A_m}{w} + \frac{a\left(L + \frac{q^*}{w}H\right)}{IM}\right) > (B/w)^*. \tag{24}$$

The next step is to consider an explicit expression for $(B/w)^*$. We introduce the following notation:

$$\begin{aligned}
D_0 &= IM\frac{(1-\bar{e}\alpha)^2}{4} > 0, \\
D_1 &= IM\bar{e}\alpha - \left(L + \frac{q^*}{w}H\right)\left(\frac{wc_B}{Z_X\rho}\right)^{1-\sigma}\frac{(1-\bar{e}\alpha)^2}{2}, \\
D_2 &= \left(L + \frac{q^*}{w}H\right)\left(\frac{wc_B}{Z_X\rho}\right)^{1-\sigma}\bar{e}\alpha + IM\frac{q^*}{w} > 0.
\end{aligned}$$

Then, $(B/w)^*$ solves

$$D_0\left((B/w)^*\right)^2 + D_1\,(B/w)^* - D_2 = 0,$$

which implies that

$$(B/w)^* = \frac{\sqrt{D_1^2 + 4D_0 D_2} - D_1}{2D_0} > 0.$$

Thus, the inequality (24) is equivalent to

$$C \left(\frac{w}{Z_X} c_B \right)^{1-\sigma} \left(\frac{A_m}{w} + \frac{a \left(L + \frac{q^*}{w} H \right)}{IM} \right) > \frac{\sqrt{D_1^2 + 4D_0 D_2} - D_1}{2D_0} \iff$$

$$C \left(\frac{w}{Z_X} c_B \right)^{1-\sigma} \frac{A_m}{w} > \frac{1}{IM} \left(2 \frac{\sqrt{D_1^2 + 4D_0 D_2} - D_1}{(1 - \bar{e}\alpha)^2} - Ca \left(L + \frac{q^*}{w} H \right) \left(\frac{w}{Z_X} c_B \right)^{1-\sigma} \right). \qquad (25)$$

Let us denote the right-hand side of inequality (25) by $K(z)$, where z is $\frac{1}{IM}$. That is,

$$K(z) = 2 \frac{\sqrt{(\bar{e}\alpha - K_1 z)^2 + \left(K_2 z + \frac{q^*}{w} \right)(1 - \bar{e}\alpha)^2} - (\bar{e}\alpha - K_1 z)}{(1 - \bar{e}\alpha)^2} - K_3 z,$$

where

$$K_1 = \left(L + \frac{q^*}{w} H \right) \left(\frac{w c_B}{Z_X \rho} \right)^{1-\sigma} \frac{(1 - \bar{e}\alpha)^2}{2},$$

$$K_2 = \left(L + \frac{q^*}{w} H \right) \left(\frac{w c_B}{Z_X \rho} \right)^{1-\sigma} \bar{e}\alpha,$$

$$K_3 = Ca \left(L + \frac{q^*}{w} H \right) \left(\frac{w}{Z_X} c_B \right)^{1-\sigma}.$$

Next, we explore the properties of the function $K(z)$. It is straightforward to see that $K(0) > 0$. The derivative of $K(z)$ with respect to z is given by

$$K'(z) = \frac{-2K_1 (\bar{e}\alpha - K_1 z) + K_2 (1 - \bar{e}\alpha)^2}{(1 - \bar{e}\alpha)^2 \sqrt{(\bar{e}\alpha - K_1 z)^2 + \left(K_2 z + \frac{q^*}{w} \right)(1 - \bar{e}\alpha)^2}} + \frac{2K_1}{(1 - \bar{e}\alpha)^2} - K_3.$$

Hence,

$$K'(0) = \frac{-2K_1 \bar{e}\alpha + K_2 (1 - \bar{e}\alpha)^2}{(1 - \bar{e}\alpha)^2 \sqrt{(\bar{e}\alpha)^2 + \frac{q^*}{w} (1 - \bar{e}\alpha)^2}} + \frac{2K_1}{(1 - \bar{e}\alpha)^2} - K_3.$$

Since $-2K_1 \bar{e}\alpha + K_2 (1 - \bar{e}\alpha)^2 = 0$,

$$K'(0) = \frac{2K_1}{(1 - \bar{e}\alpha)^2} - K_3 > 0,$$

as $Ca\rho^{1-\sigma} < 1$ (recall that $Ca\rho^{1-\sigma} = a/\sigma < 1$). Thus, $K(z)$ is increasing in a neighborhood of zero. Moreover, $K'(\infty)$ is also positive, implying that $K(\infty) = \infty$. As for any constant A the equation $K(z) = A$ has at most two solutions and $K(\infty) = \infty$, we can conclude that $K(z)$ is an increasing function of z. Here we employ the following argument: if $K(z)$ were not increasing, then it would have at least two local extrema (since $K'(0) > 0$ and $K'(\infty) > 0$). In that case, there would exist a constant $\bar{A}$ such that the equation $K(z) = \bar{A}$ would have at least three solutions, which contradicts the properties of $K(z)$.

This in turn means that the right-hand side of (25) is always positive and decreasing in IM with its

value at infinity being equal to

$$K(0) = 2\frac{\sqrt{(\bar{e}\alpha)^2 + \frac{q^*}{w}(1 - \bar{e}\alpha)^2} - \bar{e}\alpha}{(1 - \bar{e}\alpha)^2}.$$

As we assume that $C\left(\frac{w}{Z_X}c_B\right)^{1-\sigma}\frac{A_m}{w} > 2\frac{\sqrt{(\bar{e}\alpha)^2+\frac{q^*}{w}(1-\bar{e}\alpha)^2}-\bar{e}\alpha}{(1-\bar{e}\alpha)^2}$ (see (14)), there exists a value of IM (hereinafter denoted by IM_P) such that (25) holds if and only if $IM > IM_P$.

Empirical Appendix

Figure 8: Offshoring of Production and Managerial Tasks across Source Countries

Panel A: Production Offshoring

Panel B: Management Offshoring
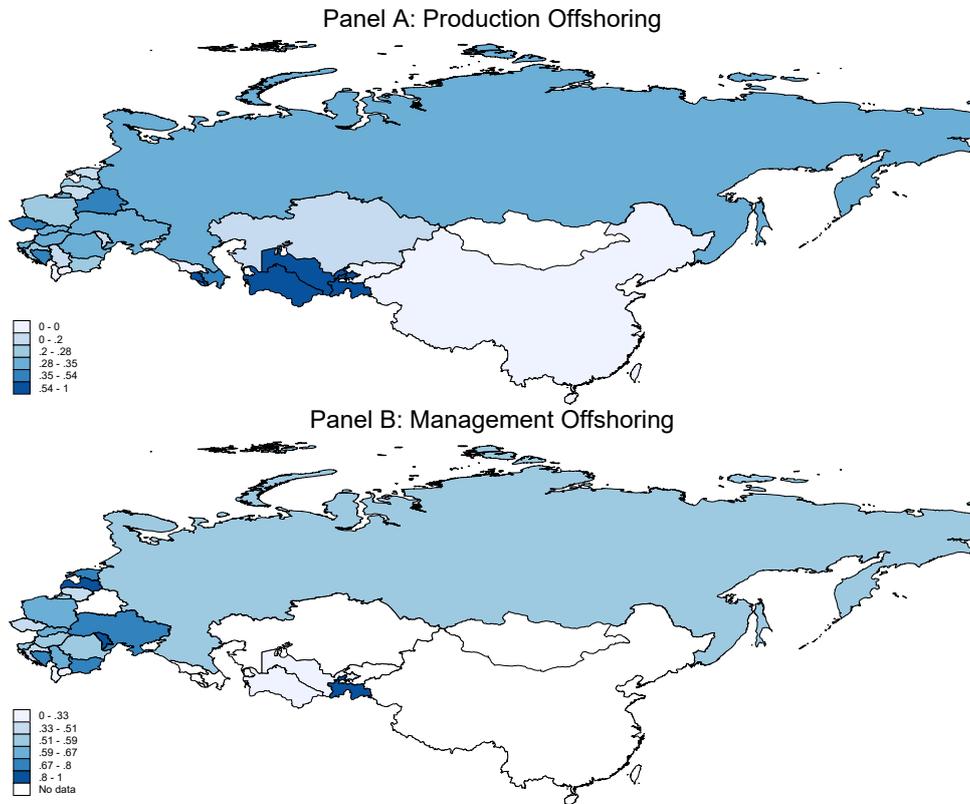
Notes: The coloring of the maps indicates how frequent German and Austrian multinational headquarters offshore production and management to their affiliates in our data. In countries shaded in darker colors, a larger fraction of affiliate firms produce output for their German or Austrian headquarter (Panel A) or hire managers from the local labour market (Panel B).

## Table 8: Distribution of Investment Projects across Host Countries

Host Country	Investment Projects #	in %	Host Country	Investment Projects #	in %
Czech Republic	458	21.57	Belarus	17	0.8
Poland	400	18.84	Kazakhstan	11	0.52
Hungary	363	17.1	Bosnia Herzegovina	10	0.47
Slovakia	170	8.01	Moldova	10	0.47
Russia	144	6.78	Uzbekistan	7	0.33
Romania	128	6.03	Azerbaijan	5	0.24
Croatia	98	4.62	Albania	4	0.19
Slovenia	92	4.33	Georgia	3	0.14
Bulgaria	53	2.5	Macedonia	3	0.14
Ukraine	47	2.21	Turkmenistan	2	0.09
Latvia	28	1.32	Armenia	1	0.05
Lithuania	27	1.27	China	1	0.05
Estonia	20	0.94	Kyrgyzstan	1	0.05
Serbia	19	0.89	Tajikistan	1	0.05

Figure 9: Decentralization of Corporate Decisions in German and Austrian Multinationals
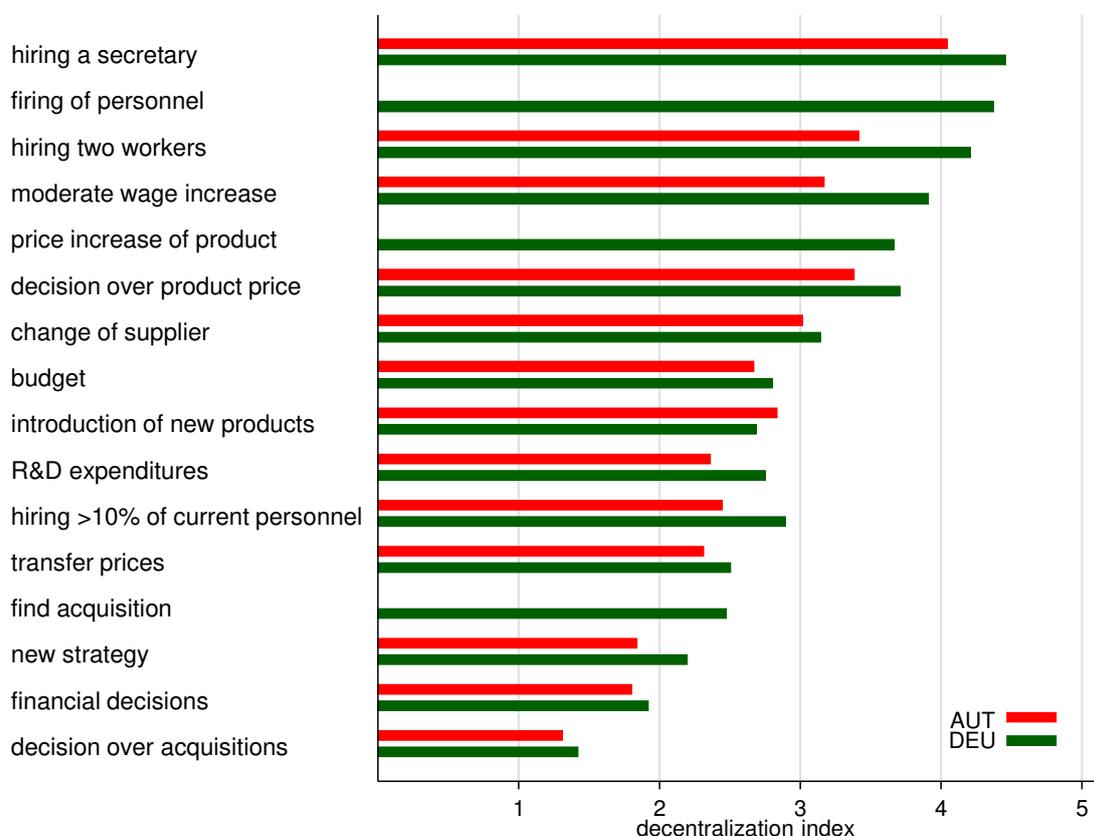
Notes: The figure plots the average *decentralization of decision authority* for each individual out of 16 (for Germany), respectively 13 (for Austria), corporate decisions. Values vary between 1 (decisions are taken by the CEO) and 5 (decisions are taken at the divisional level).

Figure 10: Robustness: Offshoring of Managerial Tasks and Decentralized Management by Import Penetration Quartile
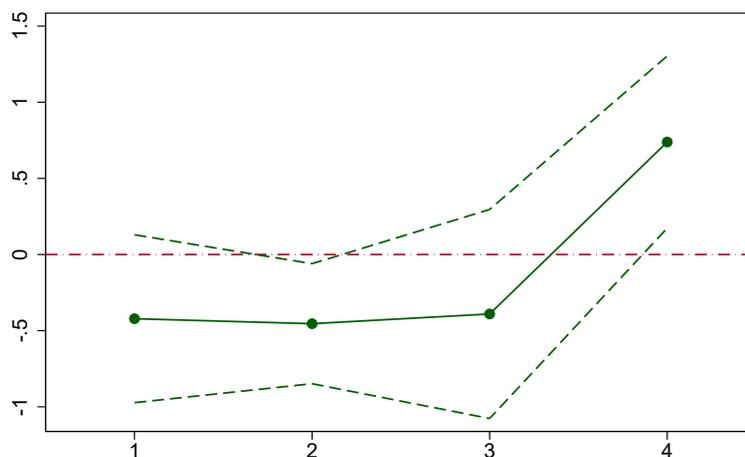
Notes: The figure plots regression coefficients β_i from regressing interaction terms between managerial offshoring and quartile dummies of the import penetration measure. The null hypothesis $\beta_1 = \beta_4$ is rejected at the 1% level. Estimation by OLS with cluster robust standard errors in parentheses; clustering at the parental firm level. The dependent variable *Decentralization of decision authority* is an index that measures the degree of decentralization in decision making, with values between 1 (decisions are taken by the CEO) and 5 (decisions are taken at the divisional level). *Managerial offshoring* is measured by a dummy $= 1$ if the parent firm offshored any managers to the affiliate firm. The estimation additionally includes *Ln(parental sales)*, *Home Country FE*, *Host Country FE*, *Industry FE*, *Survey Noise Controls* and *Parent Firm Controls*. *Home Country FE* controls if the parental firm is German or Austrian. *Host Country FE* include dummies for (i) affiliate countries belonging to the 2004 EU enlargement countries, (ii) affiliate countries belonging to the 2007 EU enlargement countries + membership candidates and (iii) affiliate countries belonging to CIS countries. *Industry FE* absorb the parent ISIC 2 digit industry. *Survey Noise Controls* include a set of dummies controlling for (i) if the survey was sent via mail, (ii) if the survey respondent is an executive, (iii) if the survey respondent is a middle (i.e. division) manager. *Parent Firm Controls* include a stock company dummy, a dummy that indicates a technical relation between the divisions within the parent firm and a dummy for affiliates that are controlled directly by the parent firm.

Table 9: Variable Descriptions

Variable:	Description:
Decentralized Management:	
level of decentralization of authority	index that measures the degree of decentralization in decision making at the parent firm with values between 1 (decisions are taken at the top by the CEO/owner) and 5 (decisions are taken at the divisional level); the index is the mean value of decentralization of 16 (for German parents) or 13 (for Austrian parents) types of corporate decisions. These include decisions on acquisitions, new strategies, transfer pricing, human resources, R&D expenditure, new products, financing, budget, hiring and firing personnel
Offshoring of Production Tasks:	
intrafirm imports in percent of parent firm's sales	sum of all intrafirm imports that a parent firm sources from its affiliates relative to the size of the parent firm (measured by the parent's domestic sales) multiplied by 100%
intrafirm imports	dummy that takes the value 1 if the parent firm has intrafirm imports from at least one of its affiliates and 0 otherwise
IV: effective affiliate tax rate	*Ln((taxes - subsidies)/value added)* measured at the affiliate country-industry level (ISIC 2 digit) and averaged across the parent firm's affiliates; data source is WIOD Rev. 2 for the year 2000
IV: relative unit labour costs	*Ln(compensation of employees /value added)* in the affiliate country-industry (ISIC 2 digit) relative to the affiliate industry unit labour costs in Austria or Germany, respectively, averaged across the parent firm's affiliates; data source is WIOD Rev. 2 for the year 2000
Offshoring of Managerial Tasks:	
offshored manager dummy	dummy that takes the value 1 if the parent firm does not send managers to the affiliate firm and 0 otherwise
Σ # offshored managers / parent employment	sum of all managers that work in affiliate firms and are not sent from the parent firm relative to the number of employees in the parent firm
Σ # offshored managers / Σ affiliate managers	sum of managers that work in all affiliate firms and are not sent from the parent firm relative to the total employed managers in all affiliate firms
Competition and Trade Openness:	
foreign competition (firm)	dummy that takes the value 1 if the parent firm faces many or very many foreign competitors and 0 otherwise
foreign competition (sample)	average of the dummy *foreign competition (firm)* at the country-industry (ISIC 2 digit) level
import penetration	*imports / (output - exports + imports)* at the country-industry (ISIC 2 digit) level; data source is WIOD Rev. 2 for the year 2000
Human Resources:	
Ln(avg. exec. compensation / avg. firm wage)	average executive compensation of executive board members relative to the average employee wage of the parent firm; data sources: average executive compensation is obtained from Kienbaum and additionally hand-collected from annual reports of the firms; whenever only consolidated reports were available from a superordinated entity, executive payments are obtained from there; average employee wages come from the firm survey
Firm Size:	
ln(parental sales)	natural logarithm of the parent firm's domestic sales in EUR
ln(parental employment)	natural logarithm of the parent firm's domestic assets in EUR
ln(affiliate sales)	natural logarithm of the affiliate firm's total sales in EUR