Do Multinationals Transplant their Business Model?§

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Abstract

What determines whether or not multinational firms transplant the mode of organisation to other countries? We embed the theory of knowledge hierarchies in an industry equilibrium model of monopolistic competition to examine how the economic environment may affect the decision of multinational firms about transplanting the business organisation to other countries. We test the theory with original and matched parent and affiliate data on the internal organisation of 660 Austrian and German multinational firms and 2200 of their affiliate firms in Eastern Europe. We find that three factors stand out in promoting the multinational firm's decision to transplant the business model to the affiliate firm in the host country: a competitive host market, the corporate culture of the multinational firm, and when an innovative technology is transferred to the host country. These factors increase the respective probabilities of organisational transfer by 9 percentage points, 18, and 27 percentage points.

Keywords: organisational economics of multinational firms, trade and organisation, the theory of the firm, organisational transfer between countries

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1 Introduction

When multinational firms invest abroad, they surprisingly often do not operate with the same organisational form as their parent firms in the home country. Table 1 documents for the first time that in 68.4 percent of foreign investments, multinational firms do not transplant their parent firms' mode of organisation to the affiliate firm in the host country. The numbers shown in Table 1 are based on survey data we designed and collected on the internal organisation of 660 Austrian and German multinational firms with 2200 of their affiliates in Eastern Europe (for more details on the survey and the data, see Section 5.1) . We collected information on the hierarchical level of 13 corporate decisions in affiliate and parent firms, such as decisions on acquisitions, finance, budget, R&D, new strategy, firing of personnel, etc. (see Table 6 of the Data Appendix B for a full listing of corporate decisions and Figure 6 of Appendix B for the frequency of transplanting individual corporate decisions). The measure of organisational transfer we use is based on the number of corporate decisions which are taken at the same hierarchical level in affiliate firms as in parent firms [1]

Why are business organisations so little transplanted? Why do the same firms use different organisations in different markets? Most of the literature on multinational firms assumes that multinational firms bring technology and organisational skills to the host countries. In a recent paper, Bloom, Van Reenen, and Sadun (2012) suggest that multinational firms are more decentralised than domestic firms because they take with them the more decentralised organisation from their parent firms when they invest in other countries. But the data on the frequency of exporting the organisational form to host countries documented in Table 1 does not suggest that organisational transfer can be taken for granted. The recent literature on international trade shows that multinational firms tend to be larger and more productive than firms that serve only the national market (see Helpman, Melitz, and Yeaple (2004)). The larger firm size of multinational corporations may itself explain why they operate with a more decentralised organisation compared to national firms. In fact, two recent papers on trade and organisation based on different theories of firm hierarchies (see Marin and Verdier (2014); Caliendo and Rossi-Hansberg (2012)) predict that larger firms more exposed to international trade are more decentralised. What then determines whether or not multinational firms transplant their mode of organisation to other countries?

[1] For more details on the measure of organisational transfer see note 1 of Table 1 and Table 8 of the Appendix.

Table 1: DO MULTINATIONALS TRANSPLANT THEIR BUSINESS MODEL?

Parent Firm in:	Business model: Transplanted			Not	Total
	Fully[1]	Close-to-fully[1]	Partially[1]	transplanted[1]	Affiliate Firms
Austria	112	66	66	638	882
	12.7%	7.5%	7.5%	72.3%	100%
Germany	84	56	38	275	453
	8.5%	12.4%	8.4%	60.7%	100%
Total Affiliate Firms	196	122	104	913	1335
	14.7%	9.1%	7.8%	68.4%	100%

Notes: The table reports the absolute number of cases and row percentages.
[1] The degree of transplantation (full, close-to-full, partial and no transplantation) depends on the number of corporate decisions which are taken at the same hierarchical level in the parent and subsidiary firms. For a listing of corporate decisions, see Table 6 in Appendix B. The organisational form is fully transplanted if each corporate decision obtained the same hierarchical rank for the subsidiary firm as for the parent firm. It is close-to-fully transplanted if only one corporate decision differs and partially transplanted if two corporate decisions differ. The organisational form is not transplanted if three or more corporate decisions are different.

In this paper, we focus on the role of the economic environment in the decision to export the organisational form to other countries. If 'corporate culture' matters, we a priori expect firms to operate with the same organisational form in the countries they invest in. Presumably, once the firm has developed an organisational routine which serves it well, it might as well use this routine in other countries. One possible reason why this often does not happen is that the economic environment may force firms to adjust their organisational form to the conditions prevailing in these markets.

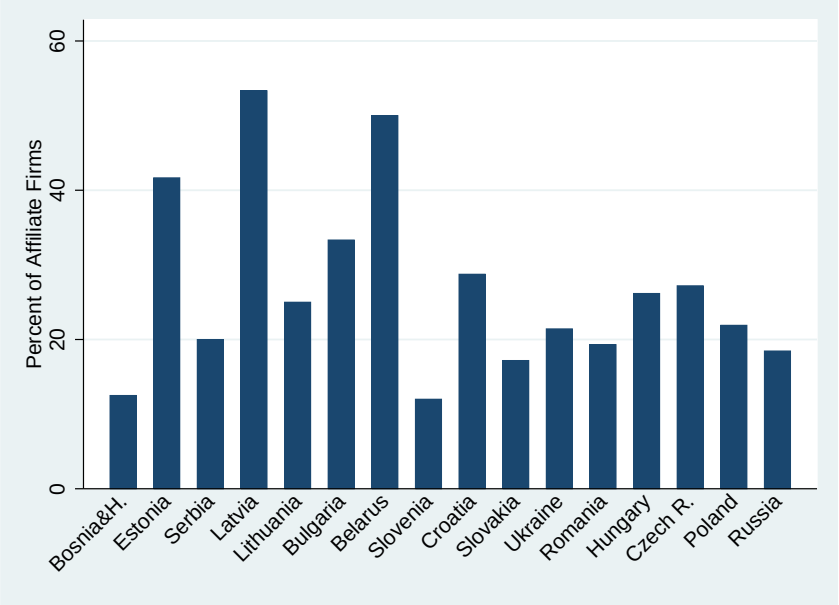
To get a first impression on whether the economic environment matters for the frequency of exporting the business organisation, we look in Table 1 at whether the size of the home market of multinational firms is correlated with the decision to transplant their mode of organisation. We use market size as a proxy for competition.[2] This is indeed the case. German multinationals, located in the larger economy, transplant their organisational form significantly more often than Austrian multinationals, located in the smaller home market.[3] Furthermore, in Figure 1 we show that the market size of the host countries in Eastern Europe is correlated with the frequency with which the parent multinational firm, whether from Austria or Germany, brings the organisational form with them when they invest in these countries. The figure ranks the host countries by their size in terms of GDP (with Bosnia the smallest and Russia the largest) and appears somewhat to suggest that multinational firms transplant their organisational form more often to smaller host markets. Equipped with this information, we proceed

[2]Larger economies have more firms and thus have tougher competition, see Melitz and Ottaviano (2008).

[3]Austria has a population of 8 million people and Germany of 80 million people.

in this paper with a theory in which multinational firms' decisions to transplant their organisational form will be described as a function of the monopolistic competitive environment they face in the home market and in the host market. We then expose this theory to the survey data of 660 multinational firms and their 2200 affiliate firms in Eastern Europe.

Figure 1: HOST COUNTRY SIZE AND THE DECISION TO TRANSPLANT THE ORGANISATIONAL FORM



Notes: The figure shows the percentage of affiliate firms in a given host country with parent firm organisational form fully or close-to-fully transplanted. Host countries are sorted by the size of GDP from left (smallest GDP) to right (largest GDP). Countries with less than 8 affiliate firms are not shown.

We model an economy in which multinational firms decide how to organise production in the parent firm in the home market and the affiliate firm in a host country. We follow a simplified version of Garicano (2000) and Garicano and Rossi-Hansberg (2006) and model the organisation of multinational firms as a knowledge-based hierarchy in which the divisional managers in the parent firms and the affiliate firms deal with routine problems and headquarters (top managers) solve the exceptional problems. Divisional managers need to acquire knowledge to solve problems, which is costly. Therefore, it is efficient for the firm to let the top managers learn how to solve the more complex problems. The problem of the firm is to decide on the level of decentralisation to divisional managers. A more decentralised organisation of production allows the firm to save on top managerial wages and communication costs at the expense of larger training costs for the divisional managers.

We incorporate this model of knowledge hierarchies into a framework with monopolistic competition. Multinational firms compete with local firms in the home and host markets, respectively. They have two options in the choice of organisation. They may use the same level of decentralization in the subsidiary as in the parent firm. In this case they transplant the organisation to the subsidiary firm. Alternatively, multinational firms may choose different levels of decentralization for the parent and subsidiary firm. In this case they do not transplant the organisation. We solve for the industry equilibrium and we show that when multinational firms decide to transplant the organisational mode to the subsidiary firms in the host market they transmit the competitive conditions of one market to that of the other market. By affecting the costs of production, the organisational choice of multinational firms acts as a transmission mechanism through which the competitive conditions in the home and host markets are linked. The link is at work inspite of the fact that competition is segmented in the two markets, since we do not allow for international trade to take place.

We show further that the decision to transplant the organisational form becomes a function of the economic environment multinational firms face in their home and host markets. More specifically, we find that a more competitive home market leads multinational firms to transplant the organisational mode less frequently. Multinational firms weight the relative benefit to be closer to the optimal organisational form fitting the home market relative to the benefit of being closer to the one adapted to the foreign market. At the margin, the firm will lean towards the organisational form where the adjustment generates larger profits. In a more competitive home market, the home market profits weight relatively less than those from the foreign market, and the multinational firm does not transplant the organisational form to the subsidiary firm in the host market.

In a more competitive host market it hurts the profits of the multinational firm less when its subsidiary firm operates with an organisational form which is not optimally adjusted to the host market conditions. When the subsidiary firm operates with the same level of decentralization as the parent firm (when the organisation is transplanted) each unit of output is sold with a lower profit margin, reducing total profits less when competition toughens in this market. This encourages the multinational firm to transplant the organisational form.

We then examine how a continuous increase in competition in the home market (globalization) affects the reorganisation of an individual multinational firm. We show

that an increase in competition in the home market leads to an extensive and intensive margin of reorganisation in the multinational corporation. At first when competition is still weak the multinational firm transplants the organisational form from the parent to the subsidiary firm. The multinational firm adjusts, however, the level of decentralization of the whole multinational corporation towards an organisational pattern that fits optimally the subsidiary's firm market conditions. The multinational corporation becomes more decentralized (the intensive margin of reorganisation). This process can be seen as some kind of 'reverse transplanting' in which the parent firm's organisation is modified to converge towards the optimal organisation of the subsidiary firm. When competition in the home market increases further the multinational firm shifts to the 'no-transplant' strategy (the extensive margin of reorganisation). A major reorganisation in the multinational corporation follows when the parent's and the subsidiary firm's organisations become disconnected.

We also find that gravity factors like distance and communication costs and the cost of training managers matter for the decision to export the business model to the subsidiary firms in the host country. An increase in communication costs has an ambiguous influence on the probability of transplanting the mode of organisation. Furthermore, the multinational firms will transplant the organisational form less when the training costs of managers in the home market increase and they will transplant it more when the training costs of managers in the host market increase. Finally, multinational firms with a stronger corporate culture and with a more innovative technology, respectively are more likely to transplant the mode of organisation to the host country. A stronger corporate culture makes operating with two organisational routines more costly increasing the probability of multinational transplanting. A more innovative technology is more complex and increases the training costs of managers in the affiliate firms which, in turn, encourages multinational transplanting. Thus, organisational transfer and technology transfer appear to be complements.

We confront the predictions of our theory with original firm survey data we collected and designed from 660 Austrian and German multinational parent firms with their 2200 affiliate firms in Eastern Europe. In the empirical analysis we examine the probability of transplanting the organisational form and we show that the market environment variables and gravity factors are economically important for the probability of organisational transfer to host countries. When affiliate firms face an increase in the share of multinational competitors (our measure of the toughness of competition) in their host markets by 10 percentage points, the probability of

transplanting increases by 9 percentage points, while an increase in the share of multinational competitors in the home market by 10 percentage points lowers this probability by 11 percentage points. When the distance between the parent and affiliate firm (our proxy for communication costs) doubles the probability of transplanting the organisational mode declines by 7.4 percentage points. Finally, when the share of people with tertiary and secondary education in the host market increases by 10 percentage points lowering the training costs of managers the decision to export the business model decreases by 6 percentage points.

Moreover, multinational firms with human resource policies in place (our measure of corporate culture) are 18 percentage points more likely, and multinational firms which transfer an innovative technology to the affiliate firms are 27 percentage points more likely, respectively to transfer the organisational mode to the host country.

While there is a large economic literature which has examined the determinants of technology transfer between countries (for a recent survey, see Harrison and Rodriguez-Clare (2010)), research on organisational transfer between countries virtually does not exist. However, there is a large empirical literature in international business which emphasizes the tension between the adjustment to local market conditions and the transfer of the mode of organisation and of human resource management practices in multinational firms, see for example Florida and Kenney (1991). Moreover, the literature on the transplantation of culture between countries which follows the epidemiological approach (see Fernandez (2011)) is related to what we do in this paper. The epidemiological approach tries to separate the effect of culture from the economic and institutional environment by studying variations in outcomes across groups with different cultural backgrounds (immigrants, diplomats) residing in the same country (see Fernandez and Fogli (2009), and Fisman and Miguel (2007)). We instead want to understand the role of the economic environment in corporate outcomes in firms that share the same corporate culture, by coming from the same multinational parent firms but differing in the economic enviroments faced by their affiliated firms in their differing host countries.

Our paper is also related to previous research on organisations in international trade.[4] Helpman, Melitz, and Yeaple (2004) and Antras and Helpman (2004) focus on how firms' home productivity advantage determines the mode of organisation firms choose abroad. Antras, Garicano, and Rossi-Hansberg (2006) study the formation of

[4]For an overview, see Helpman, Marin, and Verdier (2008) and Marin (2015).

teams between countries, Marin and Verdier (2008, 2012, 2014), Caliendo and Rossi-Hansberg (2012) and Conconi, Legros, and Newman (2012) examine how a greater exposure to international trade influences the business model firms choose at home. More recently, an empirical literature on firm decentralisation has emerged with a focus on national firms. This literature examines the trend to decentralisation of US firms (Rajan and Wulf (2006)), how information technology (Bloom, Van Reenen, and Sadun (2012); Acemoglu, Aghion, Lelarge, Van Reenen, and Zilibotti (2007)), international trade and competition (Marin and Verdier (2012, 2014), Guadalupe and Wulf (2010) and Caliendo, Monte, and Rossi-Hansberg (2012)), and trust and religion (Bloom, Van Reenen, and Sadun (2010)) affect the level of decentralisation of firms.

The present paper is organised into the following sections. Section 2 describes the product market with monopolistIc competition, introduces the organisational form of multinational firms as a knowledge hierarchy and derives the optimal level of decentralisation in the firm. Section 3 embeds the model of knowledge hierarchies in a one sector economy with monopolistic competition and examines the determinants of the decision of transplanting the organisational form. Section 4 solves for the industry equilibrium and derives the conditions under which multinational firms will transplant the organisational form to the affiliate firms in the host market. Section 5 describes the data and the empirical results and Section 6 concludes. The proofs of the main results and the description of the data are relegated to the Appendix.

2 A Generic Economy

Demand Side

Consider an economy with L consumers whose preferences are defined over a continuum of differentiated varieties indexed by $i \in \Omega$ and a homogenous good chosen as the numeraire. Preferences are given by

$$U = q_0 + \int_{i\in\Omega} q_i di - \frac{1}{2}\gamma \int_{i\in\Omega} q_i^2 di - \frac{1}{2}\left[\int_{i\in\Omega} q_i di\right]^2,$$

where q_0 and q_i are, respectively, the consumptions of the numeraire good and of variety i of the differentiated good.

Utility maximisation for a typical consumer provides demand for each variety i

$$d_i(p_i, \overline{p}) = \frac{1}{\gamma + N} - \frac{1}{\gamma}\, p_i + \frac{N}{\gamma + N}\frac{1}{\gamma}\, \overline{p}, \tag{1}$$

where $d_i(p_i, \overline{p})$ is the market demand for variety i, γ is the degree of product differentiation between varieties i, p_i is the price of variety i, and $\overline{p} = \frac{1}{N}\int_{i\in\Omega} p_i di$ is the average price index $\overline{p}$ in the differentiated good sector. The aggregate demand for variety i is simply $q_i(p_i, \overline{p}) = Ld_i(p_i, \overline{p})$.

Supply Side

The numeraire good 0 is produced with constant returns to scale (one unit of good 0 requires one unit of labor) under perfect competition. Each variety of the differentiated good is produced under monopolistically competitive conditions. A given variety i is produced with marginal cost c_i. The equilibrium monopolistic profit level of a firm with cost c_i is :

$$\pi(c_i) = \frac{L}{4\gamma}\left[c_D - c_i\right]^2 \tag{2}$$

where c_D is a cutoff cost level

$$c_D = \frac{2\gamma}{2\gamma + N} + \frac{N\eta}{2\gamma + N}\, \overline{c} \tag{3}$$

which is the cost level of a firm indifferent between remaining or leaving the industry. $\overline{c}$ is the average cost in the industry $\overline{c} = \frac{1}{N}\int_{i\in\Omega} c_i di$. Firms with cost $c_i < c_D$ earn positive profits. The cutoff cost level c_D captures the 'toughness' of competition in an industry. In this linear demand system (1), in addition to the taste for variety parameter γ, the markup is determined by the toughness of competition in the market induced either by a lower average costs $\overline{c}$ or a larger number of varieties N [5].

Knowledge Hierarchies

We turn now to the internal organisation of multinational firms and their subsidiaries in foreign markets. We consider the organisation of a multinational firm as a knowledge

[5]For more details, see Ottaviano, Tabuchi, and Thisse (2002).

hierarchy as in Garicano (2000) and Garicano and Rossi-Hansberg (2006). Production is described as a problems solving and information processing activity in which there is a basic trade-off between communication and information access. The role of a hierarchy is to facilitate the acquisition of knowledge by increasing its utilisation rate. We use a simple version of this framework to extend the theory towards a setting with market competition and multinational firms.

Multinational firms choose the hierarchy of their organisation by taking the following considerations into account. There are two types of managers: production managers (that we alternatively also name divisional managers) who draw a unit measure of problems (or tasks or decisions) in [0, 1] per unit of time, and headquarters managers who coordinate the production projects of the divisional managers and also help solve production problems that production managers are unable to solve. Production takes place only if all problems are dealt with by someone in the organisation and are coordinated at the level of the firm. We normalise to 1 the output per production manager and per unit of time once problems are solved. The problems are distributed according to a density function $f(z)$. Without loss of generality, the problems are ordered such that $f'(z) < 0$, i.e., more common problems have a lower index. Agents can only deal with a problem or task if they have the relevant knowledge.

The training cost of divisional managers acquiring the knowledge to deal with all problems with complexity less than z is $a_p z$. This cost may depend on the technology available to different agents, their skill, and local market conditions in the country where the agent is. The cost of training a divisional manager depends therefore on his autonomy z (the level of complexity of problems that he can solve). When that autonomy is reduced, so that the divisional manager has only the knowledge for dealing with the most common problems, i.e., those in $(0, z_p)$, he asks for help for the more complex problems (those with $z > z_p$) from top management who may solve the problem. We assume that top managers (headquarters) have the necessary skills to be able to solve problems for all tasks in [0, 1][6].

The value of an additional layer of problem solvers is to reduce the cost of training workers to higher autonomy levels. The cost of hierarchy is the time wasted, since problem solvers do not produce output, but instead use their time to help divisional managers solve their problems.

[6]In other words, $z_m = 1$.

Suppose then that the organisation must deal with q problems per unit of time. The team needs then $N_p = q$ divisional managers in layer 0 and M top managers (problem solvers) at headquarters. The profits generated by this hierarchy with N_p divisional managers, each receiving a wage w_p, and M top managers specialised in 'problem solving' receiving a wage w_m is

$$\pi = P(q)q - (w_p + a_p z_p) N_p - w_m M. \tag{4}$$

When the N_p divisional managers have autonomy z_p they must learn the z_p most common problems. It is also assumed that the learning technology is such that top managers know all the tasks that the production managers also know, and that the knowledge overlaps. Whenever the production managers confront problems or decisions for which they do not have enough information, so that they need help, a communication cost h (for a helping cost) per question posed must be incurred. The communication cost is only incurred when the problem could not be solved at first and help must be sought. These communication costs depend on the specifics of the organisational form and how agents interact in the organisation. In particular, the geographic distance between the divisional managers and the top managers matters.

A divisional manager can deal with a fraction $F(z_p)$ of the tasks and passes on $(1 - F(z_p)$ to a top manager in the headquarters who spends time $h(1 - F(z_p)$ helping each of the divisional managers assigned to him. Each top manager is endowed with 1 unit of time. Since there are N_p divisional managers, the time constraint of a particular top manager is given by

$$sh(1 - F(z_p)) = 1,$$

where s is the span of control, or ratio of divisional managers per top manager $s = N_p/M$. The top manager spends $sh(1 - F(z_p))$ time solving problems. It follows that the necessary number of top managers to deal with a firm of size N_p of divisional managers is simply given by

$$M = h(1 - F(z_p))N_p$$

This constraint determines a trade-off between what production managers can do and how many top managers are needed. The more knowledge is acquired by divisional managers, the smaller is $sh(1 - F(z_p))$ and the less top managers are needed.

Recalling that a given output level q necessitates $N_p = q$ divisional managers, the

profits of the firm rewrites easily as

$$\pi = P(q)q - c(z_p)q.$$

with $c(z_p)$ the average cost of production given by:

$$c(z_p) = w_p + a_p z_p + h[1 - F(z_p)]w_m.$$

For a given level of output q, the problem of the multinational firm is to decide the degree of worker autonomy (z_p) to minimize average costs of production $c(z_p)$. This results in

$$-c_z(z_p) = 0. \tag{5}$$

The solution of this equation provides an optimal degree of decentralisation of a multinational firm z_p^* [7]

or

$$z_p^* = f^{-1}\left[\frac{a_p}{hw_m}\right].$$

which depends on the training costs of production managers a_p, the top managers' wages w_m and the communication costs between top managers and divisional managers h. A more decentralised hierarchy (larger value of z_p) allows a firm to save on top managerial wages and communication costs at the expense of larger training costs of divisional managers.

3 A Model of Transplanting the Organisation

We now embedd the model of knowledge hierarchies into a framework with monopolistic competition with multinational firms. Multinational firms compete on a product market as described in the previous section. To simplify, we abstract from the subscript i. They have an inverse demand function $P(q)$ where output q is produced with productive labor only. Consider m multinational firms operating in two segmented markets: a home market H with n_H local domestic firms and the m multinational

[7] Note that the optimal degree of decentralization does not depend on the output size of the firm. This is because we assume that there is no hiring constraints at each level of the firm hierarchy and a constant return to scale production function for output.

parent firms, and a foreign market F with n_F local foreign firms competing with the multinational subsidiary firms. Each multinational firm has one subsidiary firm in F. We assume that local firms (domestic and foreign) do not have knowledge hierarchies (all production problems are solved at the bottom level) and they produce their output with marginal costs c_H and c_F, respectively. Multinational firms and their subsidiaries have a one-level hierarchical organisation between headquarters' managers and divisional (or production) managers.

Following the previous section, the marginal costs of the parent and the subsidiary firms depend on the degree of decentralization z between headquarters managers and divisional managers. Headquarters managers are assumed to reside in the home country H only. For a given level of decentralization z in the multinational parent firm, the marginal costs of production of parent firms are $c_H^m(z) = w_p^H + a_p^H z + h[1 - F(z)]w_m$. w_p^H and a_p^H are the divisional managers' wages and training costs in the parent firm in country H. w_m is the wage of headquarters managers. For a given level of decentralization between the headquarters managers and the divisional managers in the subsidiary firm, the marginal costs of production of the subsidiary firms are $c_F^m(z) = w_p^F + a_p^F z + h[1 - F(z)]w_m(1 + \delta)$. w_p^F and a_p^F are the subsidiary (divisional) managers' wages and training costs in country F. The cost of communication between headquarters and subsidiary managers are increased from h to $h\,(1 + \delta)$, because subsidiary managers are residing in F different from the multinational headquarters (located in H).

The optimal level of decentralization in the parent firm in H may differ from that in the subsidiary firm in F. The optimal level of decentralization of the parent firm in H is given by

$$z_p^H = f^{-1}\left[\frac{a_p^H}{hw_m}\right] = \arg\min c_H^m(z)$$

The optimal level of decentralization of the subsidiary firm in F is

$$z_p^F = f^{-1}\left[\frac{a_p^F}{h\,(1+\delta)\,w_m}\right] = \arg\min c_F^m(z)$$

The multinational firms have two options. They may use the same organisation (the same level of decentralization z) in the subsidiary firm in F as in the parent firm in H. We call this a 'transplant' strategy. Alternatively, the multinational firm may choose

different levels of decentralization for the parent and subsidiary firm. We call this a 'no–transplant' strategy. Under the 'no-transplant' strategy the multinational firm adopts the level of decentralization z_p^H in the parent firm and z_p^F in the subsidiary firm. The parent firm operates then with the marginal costs $c_H^m(z_p^H) = c_H^m$ and the subsidiary firm produces with the marginal costs $c_F^m(z_p^F) = c_F^m$. However, the 'no-transplant' strategy involves an efficiency loss at the parent firm due to frictions in coordinating activities between firms with different organizational routines. This efficieny loss is assumed to increase the parent firms' costs by some factor $1 + \theta$. Under the 'transplant' strategy the multinational firm saves these coordination costs, but it prevents the firm to adjust its organization optimally to the market conditions prevailing in each local market.

Stage Game We consider the following game structure that allows us to analyze the industry equilibrium in the domestic market (H) and the host market (F) given a *fixed* number of established multinational firms m operating in the global economy. Each multinational is assumed to have one parent division in market H and one subsidiary in market F.

- Stage 1: Local domestic firms n_H and local foreign firms n_F.firms decide to enter in their respective markets H and F. They pay a fixed cost of entry of F_H and F_F, respectively.

- Stage 2: The multinational parent firms m decide whether or not to transplant the organisation to their subsidiary firms. Under the 'transplant' strategy z is constrained to be the same across markets and chosen optimally to maximize total profits of the multinational firm. Under the 'no transplant' strategy, the multinational firm implements z_p^H and z_p^F in markets H and F, respectively. The marginal costs of parent firms are increased by $1+\theta$, because of the inefficiency of operating with different organizational routines.

We assume, however, that multinational firms are heterogenous with respect to these inefficiency costs. Some firms may be more flexible than others in dealing with diffferent organizational routines. We assume that the parameter θ is distributed on an interval $\left[0, \overline{\theta}\right]$ with a density distribution $g(\theta)$.

- Stage 3 : The multinational firms choose the optimal level of decentralization z_p^H and z_p^F in markets H and F under the 'no-transplant' strategy and the optimal joint value of z under the 'transplant' strategy.

- Stage 4: The multinationals firms compete in prices in both markets with local

domestic firms n_H and local foreign firms n_F.

The model can be solved backwards. Stage 4 is obtained from the standard monopolistic competition model as outlined in section 2. .In stage 3 the optimal level of decentralization is determined depending on the multinational strategy of 'transplant' or 'no transplant'. Stage 2 provides the equilibrium decisions of "transplant" versus "no transplant" of the multinationals given the market structures in markets H and F. Finally stage 1 provides the free entry conditions for local domestic and local foreign firms in their respective markets.

The Optimal Organisation

We turn now to stage 3 in which the multinational firms determine the optimal level of decentralization under the 'no-transplant' strategy and choose the optimal joint level of decentralization under the 'transplant' strategy.

The optimal organisation under the 'no-transplant' strategy When the multinational firms do not transplant the organisation to the subsidiary firm, they will choose $z_p^H = \arg\min c_H^m(z)$ for the parent firm in country H and $z_p^F = \arg\min c_F^m(z)$ for the subsidiary firm in country F.

The optimal organization under the 'transplant' strategy For a given level of decentralization z, total profits of the multinational firms are

$$\pi\left(c_D^H, c_D^F, z\right) = \frac{L^H}{4\gamma}\left[c_D^H - c_H^m(z)\right]^2 + \frac{L^F}{4\gamma}\left[c_D^F - c_F^m(z)\right]^2$$

For given market toughness c_D^H and c_D^F in the two markets, the total profits of the multinational firms under the 'transplant' strategy are given by:

$$\pi_T\left(c_D^H, c_D^F\right) = \max_{z\in[0,1]} \pi\left(c_D^H, c_D^F, z\right)$$

The first order condition for the joint organizational form z is

$$\frac{\partial \pi\left(c_D^H, c_D^F, z\right)}{\partial z} = -\frac{L^H}{2\gamma}\left[c_D^H - c_H^m(z)\right]\frac{\partial c_H^m}{\partial z} - \frac{L^F}{2\gamma}\left[c_D^F - c_F^m(z)\right]\frac{\partial c_F^m}{\partial z} = 0 \qquad (6)$$

We assume that $\pi\left(c_D^H, c_D^F, z\right)$ is a concave function of $z \in [0,1]$[8] and thus the second order condition $\partial^2\pi\left(c_D^H, c_D^F, z\right)/\partial z^2 < 0$ holds at the optimum value z^*.We assume further that the cost of communication between the headquarters firm and the subsidiary firm δ is sufficiently large so that $z_p^H < z_p^F$. Subsidiary firms have more management autonomy z_p^F than parent firms z_p^H when each optimally adjusts the organization to local market conditions.[9] We show in the appendix that the optimal joint level of decentralization z^* solution of (6) is such that $z_p^H < z^* < z_p^F$. Intuitively, the joint optimal organization under the 'transplant' strategy z^* lies between the optimal level of decentralization in the parent firm and the subsidiary firm, respectively.

Differenciating (6) we get $z^*\left(\underset{-}{c_D^H}, \underset{+}{c_D^F}\right)$. Under the 'transplant' strategy, the multinational firms become more decentralized with tougher competition in H (smaller c_D^H) and they becomes more centralized with tougher competition in F (smaller c_D^F). Intuitively, the joint optimal organization z^* under the 'transplant' strategy weights the relative benefit to be closer to the optimal organizational form fitting the home market z_p^H relative to the benefit of being closer to the one adapted to the foreign market z_p^F. At the margin, the firm will lean more towards the organizational form where the adjustment generates larger profits. When competition becomes tougher in market H, the profit margin of the home market weights relatively less than the one of the foreign market F. This induces z^* to be closer to z_p^F, the level of decentralization of market F which is more decentralized to begin with. Hence, the multinational firms choose to be more decentralized when competition becomes tougher in H. Conversely, when competition becomes tougher in the foreign market F, it is more important for the multinational firm to adjust its organizational structure towards the one that best corresponds to the home market H with the larger profit margin. Given that the organization of the parent firm is more centralized to begin with, the multinational firms choose therefore to be more centralized when competition increases in F.

The preceding discussion can then be summarized in the following Proposition.

Proposition 1. *Under the 'transplant'-strategy multinational firms are more decentralized when competition in the home market increases and they are more centralized when competition in the host market increases.*

Proposition 1 implies that the marginal costs of production of parent and subsidiary firms become a function of the toughness of competition at home and abroad:

[8] This will be ensured when $c_H^m(z)$ and $c_F^m(z)$ are sufficiently convex in $z \in [0,1]$.

[9] We show in the empirical part of this paper that this assumption is supported by the data.

$$
\begin{aligned}
c_H^m(z^*) &= f^H(\underset{-}{c_D^H}, \underset{+}{c_D^F}) \\
c_F^m(z^*) &= f^F(\underset{+}{c_D^H}, \underset{-}{c_D^F})
\end{aligned}
$$

A smaller c_D^H (tougher competition in the home market) induces z^* to be closer to the optimal level of decentralization of the foreign market z_p^F. This is bad news for the parent firm's costs which are now further away from the minimum cost level associated with z_p^H. Hence, $c_H^m(z^*)$ goes up when c_D^H goes down. At the same time a smaller c_D^H is good news for the subsidiary firm's costs which are now closer to the minimum cost level associated with z_p^F. Hence, $c_F^m(z^*)$ goes down when c_D^H goes down. The other signs of variation can be understood by the same logic.

Furthermore, we make the following assumption:

Assumption T: $c_H^m(z^*) < c_H$, $c_F^m(z^*) < c_F$ and $\left(1+\overline{\theta}\right) c_H^m(\mathrm{z}_p^H) < c_H$)

Assumption T states that multinational firms have a technological advantage compared to local firms in markets H and F, and produce with lower costs independently whether or not they transplant the organisation.

The Decision to Transplant the Organisation

We can solve now stage 2 to determine the conditions under which multinational firms will transplant the organisation. Denote $x \in [0,1]$ as the fraction of multinationals which choose to transplant the mode of organization. Consider then a generic multinational firm characterized by an efficiency loss under the 'no-transplant' strategy

θ. This multinational firms' profits write as :

$$\begin{aligned}\pi_T\left(c_D^H, c_D^F\right) &= \max_{z\in[0,1]} \frac{L^H}{4\gamma}\left[c_D^H - c_H^m(z)\right]^2 + \frac{L^F}{4\gamma}\left[c_D^F - c_F^m(z)\right]^2 \\ &\quad \text{for the 'transplant' strategy}\end{aligned}$$

$$\begin{aligned}\pi_{NT}\left(c_D^H, c_D^F, \theta\right) &= \frac{L^H}{4\gamma}\left[c_D^H - (1+\theta)\, c_H^m(z_p^H)\right]^2 + \frac{L^F}{4\gamma}\left[c_D^F - c_F^m(z_p^F)\right]^2 \\ &\quad \text{for the 'no-transplant' strategy}\end{aligned}$$

This multinational firm decides to transplant the organisation if anf only if

$$\pi_T\left(c_D^H, c_D^F\right) \geq \pi_{NT}\left(c_D^H, c_D^F, \theta\right)$$

This is equivalent to θ larger than some threshold θ^* given by $\pi_T\left(c_D^H, c_D^F\right) = \pi_{NT}\left(c_D^H, c_D^F, \theta^*\right)$ which rewrites as the following threshold condition:

$$\frac{L^H}{4\gamma}\left[c_D^H - c_H^m(z^*)\right]^2 + \frac{L^F}{4\gamma}\left[c_D^F - c_F^m(z^*)\right]^2 = \frac{L^H}{4\gamma}\left[c_D^H - (1+\theta^*)\, c_H^m(z_p^H)\right]^2 + \frac{L^F}{4\gamma}\left[c_D^F - c_F^m(z_p^F)\right]^2$$

or

$$\begin{aligned}&L^H\left[(1+\theta^*)\, c_H^m(z_p^H) - c_H^m(z^*)\right]\left[c_D^H - \tfrac{c_H^m(z^*) + (1+\theta^*) c_H^m(z_p^H)}{2}\right] \\ &= L^F\left[c_F^m(z^*) - c_F^m(z_p^F)\right]\left[c_D^F - \tfrac{c_F^m(z^*) + c_F^m(z_p^F)}{2}\right]\end{aligned} \tag{7}$$

In the Appendix, we show that condition (7) necessarily implies:

$$c_H^m(z^*) < (1+\theta^*)\, c_H^m(z_p^H). \tag{8}$$

Intuitively, for the threshold firm to be indifferent between the 'transplant' and the 'no-transplant' strategy, the production costs of the parent firm under the 'no transplant' strategy $(1+\theta^*)\, c_H^m(z_p^H)$ have to be larger than the production costs under the transplant' strategy $c_H^m(z^*)$. The subsidiary firm has lower cost of production under the 'no-transplant' strategy than under the 'transplant'strategy. Therefore, in order for the multinational firm to be indifferent between the two strategies, it must be the

case that the parent firm has larger costs of production under the 'no-transplant' (ie. $(1+\theta^*)\, c_H^m(z_p^H) > c_H^m(z^*)$).

The threshold cost characterizing the decision to transplant is $\theta^* = \theta\left(c_D^H, c_D^F, L^H, L^F\right)$ and depends on the toughness of competition in the two markets H and F, and on the size of L^H, L^F of such markets. The fraction of multinational firms with a 'transplant' strategy is

$$x = \int_{\theta^*}^{\bar{\theta}} f(\theta) d\theta = 1 - F(\theta^*) \tag{9}$$

We then have the following proposition:

Proposition 2. *i) Multinational firms transplant the organisation less often when competition becomes tougher in the home market H:*

$$\frac{\partial \theta^*}{\partial c_D^H} < 0 \quad \frac{\partial x^*}{\partial c_D^H} > 0$$

ii) Multinational firms transplant the organisation more often when competition becomes tougher in the host market F.

$$\frac{\partial \theta^*}{\partial c_D^F} > 0 \quad \frac{\partial x^*}{\partial c_D^F} < 0$$

iii) Multinational firms transplant the organisation more often when the home market H is larger:

$$\frac{\partial \theta^*}{\partial L^H} < 0 \quad \frac{\partial x^*}{\partial L^H} > 0$$

iv) Multinational firms transplant the organisation less often when the host market F is larger

$$\frac{\partial \theta^*}{\partial L^F} > 0 \quad \frac{\partial x^*}{\partial L^F} < 0$$

Proof. The threshold θ^* is given by the condition$\pi_T\left(c_D^H, c_D^F\right) = \pi_{NT}\left(c_D^H, c_D^F, \theta^*\right)$.

Simple differentiation with respect to c_D^H, c_D^F. L^H and L^F provides:

$$\begin{aligned}
\frac{\partial \pi_T}{\partial c_D^H} - \frac{\partial \pi_{NT}}{\partial c_D^H} &= \frac{L^H}{2\gamma}\left[(1+\theta^*)\, c_H^m(z_p^H) - c_H^m(z^*)\right] > 0 \\
\frac{\partial \pi_T}{\partial c_D^F} - \frac{\partial \pi_{NT}}{\partial c_D^F} &= \frac{L^F}{2\gamma}\left[c_F^m(z_p^F) - c_F^m(z^*)\right] < 0
\end{aligned}$$

and

$$\begin{aligned}
\frac{\partial \pi_T}{\partial L^H} - \frac{\partial \pi_{NT}}{\partial L^H} &= \frac{1}{2\gamma}\left[(1+\theta^*)\, c_H^m(z_p^H) - c_H^m(z^*)\right]\left[c_D^H - \frac{c_H^m(z^*) + (1+\theta^*)\, c_H^m(z_p^H)}{2}\right] > 0 \\
\frac{\partial \pi_T}{\partial L^F} - \frac{\partial \pi_{NT}}{\partial L^F} &= \frac{1}{2\gamma}\left[c_F^m(z_p^F) - c_F^m(z^*)\right]\left[c_D^F - \frac{c_F^m(z^*) + c_F^m(z_p^F)}{2}\right] < 0
\end{aligned}$$

The proposition follows then immediately from the fact that $\pi_{NT}\left(c_D^H, c_D^F, \theta\right)$ is decreasing in θ and (9). □

Figure 2 illustrates the results and shows the curve $h(\theta) = \pi_T\left(c_D^H, c_D^F\right) - \pi_{NT}\left(c_D^H, c_D^F, \theta\right)$ as a function of θ. When $\theta = 0$, there is no cost of having two different organizations in the multinational parent and the subsidiary firm. Hence, the 'no transplant' strategy generates larger aggregate profits and $h(0) < 0$. When θ is sufficiently large, the efficiency costs of having two organizational routines become too large. For sufficiently large θ, the 'transplant' strategy is preferred and $h(\theta)$ becomes positive. There is a unique threshold θ^* satisfying condition (9) above which the multinational firm transplants the organisation.

The effect of an increase in the toughness of competition in the home market (lower c_D^H) is shown in Figure 3. Lower c_D^H shifts the $h(\theta)$-curve downward and the threshold θ^* increases with a lower fraction of multinational firms undertaking organisational transplanting. Similarly, lower c_D^F shifts the $h(\theta)$-curve upwards with a larger fraction of multinational firms implementing organisational transplanting.

Figure 2: THE DECISION TO TRANSPLANT THE ORGANISATION

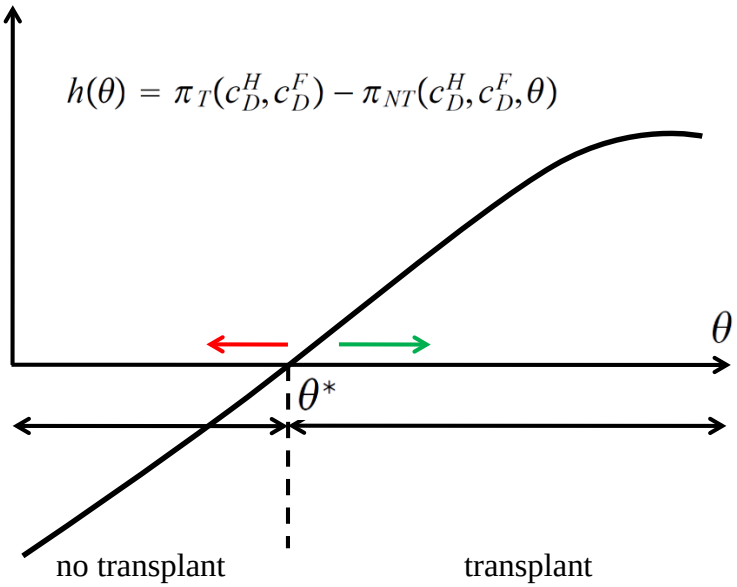
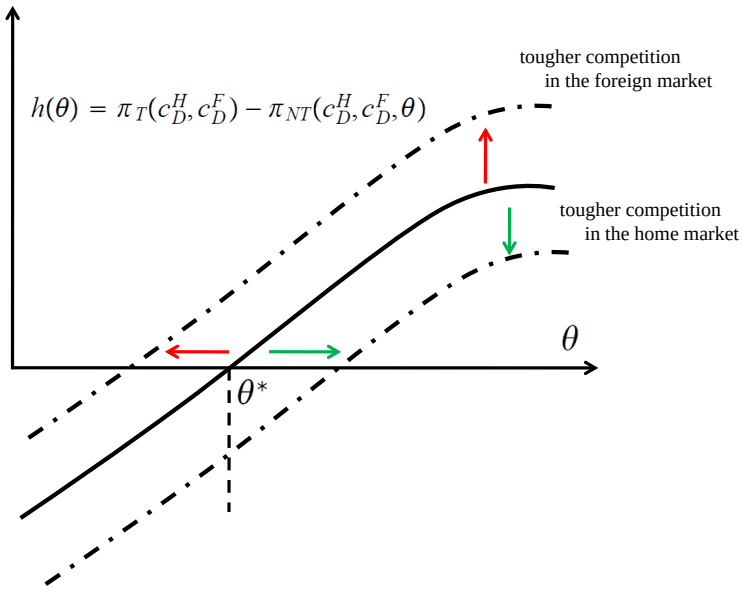


Figure 3: MARKET COMPETITION AND MULTINATIONAL TRANSPLANTING



4 The Industry Equilibrium

We now solve for stage 1 and describe the industry equilibrium with free entry of n^H domestic local firms and n^F foreign local firms when the number of multinational firms m is fixed. We first characterize the equilibrium conditions linking the thoughness competition c_D^H and c_D^F in markets H and F, as implied by equilibrium 'transplanting' of multinational firms and the local market structures. Then, we solve for the free entry conditions of domestic local and foreign firms.

4.1 The Transmission of Competition between Markets

Denote by $N^H = m + n^H$, the total number of firms competing in market H, the toughness of competition in the home market can be written as

$$\begin{aligned} c_D^H &= c_D^H(\theta^e, n_H, m) = \frac{2\gamma}{2\gamma + N^H} + \frac{N^H}{2\gamma + N^H}\,\overline{c}^H \\ &= \frac{2\gamma + n_H c_H + m\left[\int_0^{\theta^*} f(\theta)(1+\theta)c_H^m(z_p^H)d\theta + \int_{\theta^*}^{\overline{\theta}} f(\theta)c_H^m(z^*)d\theta\right]}{2\gamma + n_H + m} \end{aligned}$$

Hence, $c_D^H = c_D^H(\underset{+}{\theta^*}, \underset{+}{c_H^m}(z^*), n_H, m)$ is an increasing function of $\theta^*$and the cost $c_H^m(z^*)$. The larger the threshold θ^*, the larger is the fraction of multinational firms with 'no-transplant'. Therefore, the toughness of competition in this market becomes weaker (ie. c_D^H is larger) as parent firms with a 'no-transplant' strategy have larger marginal costs of production as they incur an efficieny loss of θ (recall condition (8)). Similarly, parent firms with larger costs of production under the 'transplant' strategy $c_H^m(z^*)$ lead to weaker competition in market H and a larger value of c_D^H.

From Propositions 1 and 2 linking the cost function $c_H^m(z^*) = f^H(c_D^H, c_D^F)$ and the threshold $\theta^* = \theta^*(c_D^H, c_D^F)$ to the toughness of competition, we obtain a 'fixed point' condition that characterizes the equilibrium toughness of competition c_D^H in market H :

$$c_D^H = \Phi^H(\theta^*(\underset{-}{c_D^H}, \underset{+}{c_D^F}), f^H(\underset{-}{c_D^H}, \underset{+}{c_D^F}), n_H, m)$$

The condition shows a positive relationship between the toughness of competition in the home market $c_D^H = \Theta^H(\underset{+}{c_D^F}, n_H, m)$, and the toughness of competition in the foreign market c_D^F. An increase in the thougness of competition in F (lower c_D^F) influences the market conditions in H via two channels. First, according to Proposition 2, lower c_D^F

leads to more multinational transplanting, which lowers the costs of parent firms (see condition (8)) increasing the competitive conditions in H. Second, from Proposition 1, tougher competition in F induces, for the inframarginal multinational firms with a 'transplant' strategy, a move to a more centralized organisation which is closer to the optimal organization fitting the home market. This way, the paren firms are now operating closer to their minimum costs which, in turn, increases the competitive conditions in H. For both reasons, more competition in F gets transmitted to more competition in H.

Similarly, denote by $N^F = m + n^F$, the total number of firms competing in market F, the toughness of competition in the foreign market can be written as:

$$\begin{aligned} c_D^F(\theta^e, n_F, m) &= \frac{2\gamma}{2\gamma + N^F} + \frac{N^F}{2\gamma + N^F}\,\overline{c}^F \\ &= \frac{2\gamma + n_F c_F + m\left[\left(\int_0^{\theta^*} f(\theta)d\theta\right) c_F^m\left[z_p^F\right] + \left(\int_{\theta^*}^{\overline{\theta}} f(\theta)d\theta\right) c_F^m z^*\right]}{2\gamma + n_F + m} \end{aligned}$$

with $c_D^F = c_D^F(\underset{-}{\theta^*}, \underset{+}{c_F^m(z^*)}, n_F, m)$ as a decreasing function of $\theta^*$and an increasing function of the cost $c_F^m(z^*)$ with the 'fixed point' condition of c_D^F in the foreign market F:

$$c_D^F = \Phi^F(\theta^*(\underset{-}{c_D^H}, \underset{+}{c_D^F}), f^F(\underset{+}{c_D^H}, \underset{-}{c_D^F}), n_F, m)$$

leading to another positive relationship between the toughness of competition in the foreign market $c_D^F = \Theta^F(\underset{+}{c_D^H}, n_F, m)$ and the toughness of competition on the home market c_D^H. Tougher competition in H now spills over to more competition in F. The channels at work are similar to before. First, according to Proposition 2, lower c_D^H leads to less multinational transplanting, which lowers the costs of subsidiary firms in F (they are now operating with their minimum costs in the foreign market). Second, from Proposition 1, tougher competition in H induces, for the inframarginal multinational firms with a 'transplant' strategy, a move to a more decentralized organisation which is closer to the optimal organization fitting the foreign market. This way, the subsidiary firms are now operating closer to their minimum costs which, in turn, increases the competitive conditions in F. Note, that via their organizational choice of z^* multinational firms transmit the competitive conditions of one market to that of the other market. This way, the multinational firms' choice of organisation acts as a transmission mechanism through which the competitive conditions in the foreign and domestic markets are linked. The connection between the two markets is at work inspite

of the fact that competition is segmented, since we do not allow for international trade to take place.

4.2 Free Entry

We now solve for the free entry conditions of domestic local and domestic foreign firms. The industry equilibrium can be characterized by the following set of conditions:

$$\begin{aligned}
c_D^H &= \Theta^H(c_D^F, n_H, m) \quad \text{domestic market competition} \\
&\quad + \\
c_D^F &= \Theta^F(c_D^H, n_F, m) \quad \text{foreign market compettion} \\
&\quad + \\
\theta^* &= \theta\left(c_D^H, c_D^F,\right) \quad \text{equilibrium transplanting behavior} \\
z^* &= z^*\left(c_D^H, c_D^F\right) \quad \text{equilbrium level of decentralization under the 'transplant' strategy} \\
\pi^H(c_H) &= \frac{L^H}{4\gamma}\left[c_D^H - c_H\right]^2 - F_H = 0 \quad \text{free entry local domestic firms} \\
\pi^F(c_F) &= \frac{L^F}{4\gamma}\left[c_D^F - c_F\right]^2 - F_F = 0 \quad \text{free entry local foreign firms}
\end{aligned}$$

The equilibrium is obtained recursively. First, the free entry condition for local firms provides the equilibrium thoughness of competition c_D^H and c_D^F in the two markets:

$$\begin{aligned}
\frac{L^H}{4\gamma}\left[c_D^H - c_H\right]^2 &= F_H \quad \text{or } c_D^H = c_H + \sqrt{\frac{4\gamma F_H}{L^H}} \\
\frac{L^F}{4\gamma}\left[c_D^F - c_F\right]^2 &= F_F \quad \text{or } c_D^F = c_F + \sqrt{\frac{4\gamma F_F}{L^F}}
\end{aligned}$$

The equilibrium level of decentralization under the 'transplant' strategy $z^* = z^*\left(c_D^H, c_D^F\right)$ is immediately deduced. Then, the equilibrium threshold θ^* is obtained from (9) which can be rewritten as:

$$\begin{aligned}
&L^H\left[(1+\theta^*)\, c_H^m(z_p^H) - c_H^m(z^*)\right]\left[c_D^H - \frac{c_H^m(z^*) + (1+\theta^*)c_H^m(z_p^H)}{2}\right] \\
&= L^F\left[c_F^m(z^*) - c_F^m(z_p^F)\right]\left[c_D^F - \frac{c_F^m(z^*) + c_F^m(z_p^F)}{2}\right]
\end{aligned} \tag{10}$$

From $c_D^H = \Theta^H(c_D^F, n_H, m)$ and $c_D^F = \Theta^F(c_D^H, n_F, m)$ we get the equilibrium number of domestic firms n_H and foreign firms n_F which are consistent with the competitive

conditions in both markets.

4.3 Market Size and Competition

We now examine how changes in the market environment affects the decision to transplant the organisation to the subsidiary firm in the host country. The comparative statics are summarized in the following proposition:

Proposition 3. *In the free entry industry equilibrium with domestic and foreign firms, the following comparative statics hold*

i) Multinational firms transplant the organisation more often when the home market becomes larger (with an increase in L^H).

ii) Multinational firms transplant the organisation less often when the host market becomes larger (with an increase in L^F).

iii) Multinational firms transplant the organisation more often when competition in the home market becomes weaker (with larger fixed cost of entry F_H)

iv) Multinational firms transplant the organisation less often when competition in the host market becomes weaker (with larger fixed cost of entry F_F)

Proof. In the Appendix. □

Intuitively, an increase in the size of the home market L^H has two effects. First, from part iii) of Proposition 2, an increase in L^H leads to more organisational transplanting. Second, an increase in L^H leads to entry of local domestic firms and an increase in competition. From part i) of Proposition 2, an increase in competition (lower c_D^H) leads to less organisational transplanting. It turns out, that the first effect dominates the second effect and thus an increase in L^H leads to more organisational transplanting. Similarly, an increase in L^F leads to less organisational transplanting from part iv) of Proposition 2, but it leads via entry of local foreign firms (lower c_D^F) to more competition and thus from part ii) of Proposition 2 to more organisational transplanting. The first effect dominates the second, and as a result, an increase in L^F leads to less organisational transplanting.

The intuition of parts iii) and iv) of the proposition is also straightforward. An increase in the fixed costs of entry of domestic firms F_H weakens competition and, thus, from part i) of Prosposition 1 encourages organisational transplanting. Similarly, an increase in the fixed costs of entry of foreign firms F_F weakens competition and leads via part ii) of Proposition 1 to less organisational transplanting.

4.4 Reverse Transplanting

We can use Proposition 3 to illustrate how a continuous change in one parameter affects the pattern of multinational transplanting and the reorganisation within the global multinational corporation. To fix ideas, we consider an increase in globalization, a continuous increase in the toughness of competition in H (a continuous decline in c_D^H). From Proposition 2 it holds that $\theta^* = \theta^*(c_D^H)$.In an industry equilibrium with free entry the threshold θ^* is a declining function of c_D^H. Figure 4 plots this threshold-curve for the marginal multinational firm which is indifferent between the 'transplant' and the 'no-transplant' strategy. The set of multinational firms with an efficiency costs θ to the right of the downward-sloping curve $\theta^*(c_D^H)$ and a low tougness of competition (large c_D^H) are adopting the 'transplant' strategy with the same level of decentralization z in the parent and subsidiary firm. The set of multinational firms with efficiency costs to the left of $\theta^*(c_D^H)$ and intense competition (small c_D^H) choose the 'no-transplant' strategy and disconnect the organisational routines in the parent and subsidiary firm.

To examine the reorganisation within the global multinational corporation in response to changes in c_D^H we take the perspective of one specific multinational firm with an efficiency cost θ_A. In Figure 6 we show that for a tougness of competition of c_D^H above the threshold c_{AD}^H the multinational firm adopts the 'transplant' strategy, and for c_D^H below the threshold c_{AD}^H the firm shifts to the 'no-transplant' strategy. Above c_{AD}^H, the multinational firm implements under the 'transplant' strategy the common level of decentralization $z^*\left(c_D^H\right)$ that satisfies the FOC (6). This level lies in the interval $z_p^H \leq z^*\left(c_D^H\right) \leq z_p^F$. As competition in H increases (and c_D^H declines), the subsidiary firm's profits take a larger weight and $z^*\left(c_D^H\right)$ increases and becomes closer to z_p^F to better fit the host market conditions. Below c_{AD}^H, the multinational firm shifts to the 'no-transplant' strategy with the parent firms' level of decentralization of z_p^H and the subsidiary firms' z_p^F

Figure 4: MULTINATIONAL TRANSPLANTATION AND HOME MARKET COMPETITION

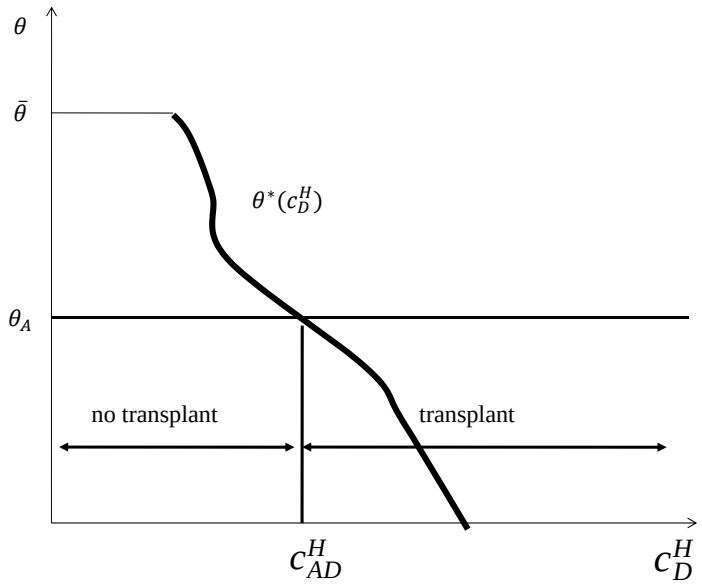
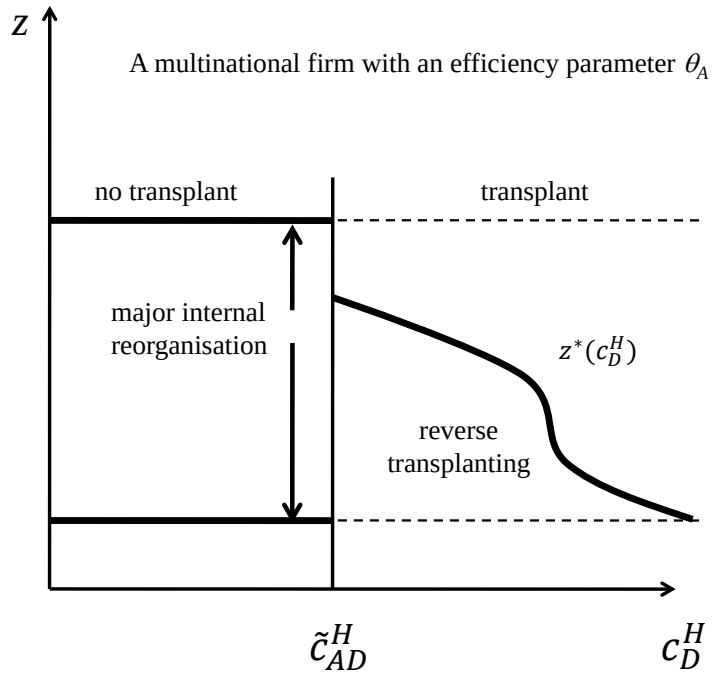


Figure 5: MULTINATIONAL TRANSPLANTATION AND HOME MARKET COMPETITION



Note that a shift of c_D^H induces an *extensive* and an *intensive* margin of reorganization. On the extensive margin, a decline in c_D^H increases the threshold θ^* determining which multinational firm shifts to the 'no-transplant' strategy. On the intensive margin, a decline in c_D^H affects the level of decentralization of the inframarginal multinational firm which adopts a 'transplant' strategy. For this multinational firm, a smaller c_D^H shifts the optimal $z^*\left(c_D^H\right)$ of the whole multinational corporation towards an organizational pattern that is optimally adjusted to the subsidiary firm's market conditions. This process can be seen as some kind of 'reverse transplanting' in which the parent firm's organization is modified to converge towards the optimal organisation of the subsidiary firm. This convergence process goes on until the multinational firm shifts to the 'no-transplant' strategy when c_D^H crosses the threshold c_{AD}^H. A major reorganisation in the multinational corporation follows when the parent's and the subsidiary's organisations become disconnected.

4.5 An Increase in Training Costs of Managers

The organisation of multinational firms will also respond to changes in the training costs of managers. The comparative statics for changes in the training costs of managers in country H and F are given in the following proposition.

Proposition 4. *In an industry equilibrium with free entry of domestic and foreign firms, multinational firms will transplant the organisation less when the training costs in the home market a_p^H increase and they will transplant it more when the training costs in the host market a_p^H increase. This holds if $(1+\theta^*)\, z_p^H < z^*$.*

Proof. In the appendix. □

Intuitively, larger training costs a_p^H in H affect profits of the multinational firm through two channels. First, an increase in a_p^H leads to larger marginal production costs of the parent firm $c_H^m(z^*)$ and $(1+\theta)\, c_H^m(z_p^H)$ under both organisations. Marginal costs increase less when the parent firm is more centralized because the divisional manager has to be trained less. Parent firms which do not transplant the organisation are more centralized (ie. $z^* > z_p^H$). Therefore, marginal costs are unambiguously lower when the firm does not transplant the organisation when $z^* > (1+\theta)\, z_p^H$. This discourages to transplant the organisation when a_p^H increases.

Second, an increase in a_p^H translates into lower profits in the parent firm. Profits decline less the smaller the output of the parent firm. The output of the parent firm will be smaller when it does not transplant the organisation, because the parent firm has an efficiency loss of having two organisational routines. As a consequence, profits are less reduced when the firm does not transplant the organisation. This discourages to transplant the organisation when a_p^H increases.

Larger training costs a_p^F in F affects profits of the multinational firm through two channels. First, an increase in a_p^F leads to larger marginal costs of the subsidiary firm $c_F^m(z^*)$ and $c_F^m(z_p^F)$ under both organisations. Marginal costs increase less when the subsidiary firm is more centralized because subsidiary managers have to be trained less. Subsidiary firms with transplanted organisations are more centralized (ie. $z^* < z_p^F$). Hence, marginal costs are lower (and profits are less reduced) when the multinational firm transplants the organization. This encourages to transplant the organisation when a_p^F rises.

Second, an increase in a_p^F translates into lower profits in the subsidiary firm. Profits decline less the lower the output of the subsidiary firm. The output of the subsidiary firm will be smaller when the organisation is transplanted to the subsidiary firm. Therefore, the multinational firm will prefer to shift to the 'transplant' strategy when a_p^F increases.

4.6 An Increase in Communication Costs

Finally, we consider how changes in the cost of communication δ affect the strategy to transplant the organisation to the subsidiary firm in the host country. We summarize the findings in the following proposition.

Proposition 5. *An increase in communication costs between the headquarters and the subsidiary firm is a priori ambiguous on the decision to transplant the organisation. When z_p^F is close to 1 and/or $c_F^m(z^*)$ is close to $c_F^m(z_p^F)$, a larger value of δ leads to less multinational transplanting in the free entry industry equilibrium.*

Proof. In the appendix. □

Intuitively, an increase in communication costs affects profits of the multinational firm via two channels. First, larger communication costs increase the cost of production of the subsidiary firms $c_F^m(z^*)$ and $c_F^m(z_p^F)$ under both organisations. Production costs increase more the more centralized the subsidiary firm as it needs to ask for more help from the headquarters. Subsidiary firms with transplanted organisations are more centralized (ie. $z^* < z_p^F$). Hence, marginal costs are larger (and profits are more reduced) when the multinational firms transplants the organisation. This discourages to transplant the organisation when δ rises. Second, an increase in δ translates into lower profits in the subsidiary firm. Profits decline less the lower the output of the subsidiary firm. The output of the subsidiary firm will be smaller when the organisation is transplanted to the subsidiary firm (as the firm does not adjust optimally to the host market conditions.). Therefore, the multinational firm will prefer to shift to the 'transplant' strategy when δ increases. Overall, the effect of δ on profits is a priori ambigious. When the subsidiary firm is very decentralized under the strategy of 'no-transplant' (ie. z_p^F close to 1) and/or the cost increase in the subsidiary firm under the 'transplant' strategy is not too large (ie $c_F^m(z^*)$ close to $c_F^m(z_p^F)$) the first effect on profits dominates the second and the multinational firm prefers not to transplant the organisation when δ increases.

5 Empirical Evidence

In this section, we confront the predictions of our theory with original data about 660 multinational firms in Austria and Germany with 2200 affiliate firms in Eastern Europe and the former Soviet Union. We first describe the original data we collected from a survey among 660 multinational firms with 2200 affiliate firms in Eastern Europe. We then derive the predictions from the theory we want to test. Here, we proceed in three steps. First, we examine how the decision to transplant the organisational form is influenced by the multinational's corporate culture, communication costs, and technology. Second, we analyse how a multinational firm's decision to transplant the organisational form is affected by market competition and the training costs of managers in the host and home countries, respectively. Third, we investigate the joint decision of whether to transplant or not and the level of decentralisation of those multinationals firms which decide to transplant the organizational form.

5.1 The Data

We conducted a survey of 660 multinational firms in Austria and Germany with 2200 of their affiliate firms in Eastern Europe including Russia and the Ukraine and other former Soviet Republics in the period 1990–2001. Due to the length of the questionnaire, we personally visited the firms in Austria and Germany, or conducted the interviews by phone. The data are a full population survey of multinational firms in Austria and Germany investing in Eastern Europe and the former Soviet Union. Since foreign investment activity in Eastern Europe started only with the fall of communism in 1990 (under central planning, foreign ownership was prohibited), we were able to obtain 80 percent of German foreign investment and 100 percent of Austrian foreign investment in Eastern Europe during this period inspite of collecting detailed data on the internal organisation of these multinational firms and their human resource policies. The firms included in the sample are global corporations with at least two subsidiaries outside of Austria, Germany, and Eastern Europe, respectively. In 1998–1999, about 90 percent of total outgoing foreign direct investment in Austria was reoriented to Eastern Europe, while in Germany, Eastern Europe accounted for only about 4 to 5 percent of total outgoing foreign investment. This explains why the sample consists of relatively more Austrian firms inspite of Austria being much smaller than Germany in terms of population.

Measuring Organisation, Communication, and Technology

The dataset is unique not only because of its scope but also because of the detailed information on the internal organisation of multinational firms in general and their corporate culture in particular.[10] The data include matched parent and affiliate information on the internal organisation and the multinationals' human resource policies. To our knowledge, it is the only existing dataset suitable for testing our theory.

Measuring Transplantation We measure the transplantation of the parent firm's organisational form to the affiliate firm by asking the CEO at the headquarters of

[10]For a detailed overview of all the variables and their descriptive statistics, see Tables 7 and 8 of the Data Appendix B.

the corporation, regarding the organisational form of the parent firm: "Who decides in your company about the following corporate decisions listed in Table 6 in Appendix B? Please rank between 1, taken at headquarters, and 5, taken at the divisional level." We also asked, regarding the organisational form of the affiliate firm, 'Who decides in your company about the following decisions listed in Table 6 of the Appendix? Please rank between 1, taken at the headquarters of the parent firm, and 5, taken by the manager of the affiliate firm in the host country.' The 13 corporate decisions are, decisions on acquisitions, finances, new strategy, wage increase, R&D expenditure, budget, transfer and product prices, introducing a new product, changing a supplier, hiring two and 20 new workers, respectively as well as hiring a new secretary. Responses ranged between five hierarchical ranks with 1 as a centralised decision, taken entirely at headquarters, and 5 as a decentralised decision, taken at the divisional/affiliate level (for a full listing of the corporate decisions and their hierarchical rank in the affiliate and parent firms, see Table 6 of the Appendix B).

Based on the information of the hierarchical rank of corporate decisions in the parent and affiliate firms, we constructed our measure of transplantation of the organisational form from parent firms to foreign affiliate firms. We employ three measures which vary by the tightness of when the organisation is considered to be transplanted. The dummy variable full transplantation indicates whether or not the organisational form of the parent firm is fully transplanted to the subsidiary. It takes the value of one if each of the 13 corporate decisions have the same hierarchical rank in both parent and subsidiary firms. The dummy variable close-to-full transplantation, takes a value of one if the hierarchical rank is the same for each corporate decision or if one of the decisions differs in hierarchical rank between parent and subsidiary firms. Finally, the dummy variable partial transplantation takes a value of one if the hierarhical rank is the same for each corporate decision with up to two exceptions.

Table 6 of the Appendix B shows the percentages of affiliate firms in which a particular corporate decision is taken at the same hierarchical level as in the parent firm. It is interesting to note that the most centralised and the most decentralised corporate decisions appear to be transplanted most often to affiliate firms. The very centralised decision over acquisitions and the very decentralised decision on hiring a secretary are transplanted to more than 70 percent of the affiliate firms, while the decisions on finances and R&D are least often transplanted to the affiliate firm. Only in about half of the affiliate firms are these two decisions taken at the same hierarchical level in the affiliate as in the parent firm.

The Level of Decentralisation We use the two survey questions on the hierarchical level of corporate decisions in affiliate and parent firms to construct an overall measure of the level of decentralisation of the decision making process in both the parent and the affiliate firm. We calculate simple means from the available scores of the 13 decisions in the parent and affiliate firms and call it the *decentralisation of parent firm* and the *decentralisation of affiliate firm*, respectively. Table 6 of the Appendix B shows that the most centralised decision is the decision on acquisitions with a mean ranking of 1.34 and 1.41 for parent and subsidiary firms, respectively, followed by the decision on a new strategy (with a respective mean ranking of 1.90 and 1.88). Not surprisingly, the most decentralised decisions tend to be the decision on hiring a secretary (mean ranking of 4.15 and 4.65) and the decision on hiring two new workers, whereas the decision on R&D and the decision to introduce a new product tend to be taken cooperatively between headquarters and divisional/subsidiary managers in the host country (with a respective mean ranking of 2.58 and 2.80). It is interesting to note that affiliate firms tend to be more decentralised than parent firms in Germany and Austria.

We calculate a simple average of *decentralization of parent firm* and *decentralization of affiliate firm* and denote it *decentralization of multinational* for those multinational firms which decide to transplant the organisational form. We distinguish three versions of the variable, depending on whether the 'transplant' strategy refers to full transplantation, close-to-full transplantation, or partial transplantation.

Other Measures of Corporate Culture

Human Resource Policies Our survey includes further information on the corporate culture of the multinational firm. The variable *incentive salary in parent firm* is a dummy variable that takes a value of 1 if a parent firm has a human resource policy in place to incentivise its employees for performance through performance based wage increases. Such performance based pay increases are relatively rare, being in place in only 14% of parent firms (see Tables 7 and 8 of Appendix B). We use this variable to proxy for the cost of a change in the organisational form. The idea is that firms with explicit human resource policies are likely to have a stronger corporate culture which is supposed to be more costly to change.

Communication Costs As a proxy for communication costs, we use the variable *distance* between parent and subsidiary firms which is defined by the geographic

distance between the capitals of the countries where the parent firm and the subsidiary firm are located. *Distance* is supposed to capture not only the costs of face-to-face communication but also cultural differences between the parent firms and the host regions. The further away the foreign affiliate firm from the headquarters firm, the more costly is communication between them. The average distance between parent and affiliate firms is over 900 kilometres (see Tables 7 and 8 of Appendix B).

Technology In our survey we also asked the parent firms to provide us with information on the nature of the technology transferred to subsidiary firms. The dummy *technology is innovative* takes a value of one if the technology is new, a dummy *technology is established* takes a value of one if the technology is relatively established and a dummy *technology is outdated* refers to a fully established or even outdated technology. In most cases, the transferred technology is either established (60%) or outdated (32%).

Finally, the size of the multinational corporation is measured by the number of employees as the *size of parent firm* and the *size of affiliate firm*. As expected, parent firms are usually much larger than affiliate firms: the average number of employees in parent firms reaches 7000, while it is only around 350 in affiliate firms.

Measuring Market Competition We use several data sources to proxy for product market competition in a home and a host market. First, we use OECD data on the activity of multinational firms (OECD, 2012) and calculate the share of multinationals as the ratio of the number of multinational firms with inward FDI activity to the total number of firms in a given market (the latter is obtained from OECD (2009)). The measure is calculated for the home and host markets, respectively, at the two-digit ISIC industry level.

Second, we obtain from our firm survey two subjective firm-level measures of competition as perceived by parent and subsidiary firms. They are dummy variables indicating for each parent and subsidiary firm whether the firm faces *many domestic competitors* and *many world competitors* rather than few competitors, respectively. 73 percent of parent firms indicate that they face many world competitors as compared to 31 percent of subdidiary firms. Therefore, many world competitors rather than many domestic competitors is our preferred subjective measure of competition for the parent firms.

Finally, we calculate the sectoral *Lerner* index for parent and subsidiary firms at the one-digit ISIC industry level. It is derived as the share of personal costs in total sales and thus represents marginal costs of production. We use data of all parent firms and subsidiary firms available in our dataset to derive the Lerner index for the home and hosts markets respectively (see Tables 7 and 8 of the Data Appendix B for a more formal definition).

Training Costs of Managers We employ two measures to proxy for the training costs of managers in the home and the host markets, respectively. The first proxy, denoted as skill endowment, is the share of the population with secondary and higher education in a country and is constructed from OECD Education at a Glance Indicators (OECD, 2002). The larger the share, the higher the skill endowment in a country and thus the lower the training costs of managers. The second measure, wage skill premium, is calculated as the ratio of labor compensation per hour of the medium- and the high-skilled labor force to average labor compensation per hour. It is available at two-digit ISIC industry level and obtained from the EU KLEMS database (EUKLEMS, 2008). The larger the premium the more costly it is to train managers.

5.2 Predictions and Empirical Results

Corporate Culture, Distance, and Technology

We start by examining how the multinational firms' corporate culture, distance, and technology affect the decision to transplant the organisational form to other countries. From Propositions 4 and 5 we derive the following predictions.

Prediction 1: Multinational firms with a corporate culture (which makes operating with two organisational routines more costly) are more likely to transplant the business model to the subsidiary firm in the host country.

Prediction 2: An increase in the distance between the multinational headquarters and the affiliate firm makes it less likely that the organisational form is transplanted. The prediction holds when the subsidiary firm is very decentralized (under the strategy

of 'no-transplant') and/or the level of decentralization between the parent and affiliate firm is sufficiently close.

Prediction 3: A more innovative technology increases the training costs of managers in the host country which makes it more likely that the organisational form is transplanted to the affiliate firm.

To expose the Predictions 1 to 3 to the data, we consider the following econometric model of the probability of transplanting the organisational form to the affiliate firm in the host country.

$$Prob(trans_{ijk}) = \partial_1 + \partial_2 inc_{ijk} + \partial_3 dist_{ijk} + \partial_4 tech_{ijk} + \partial_5 w'_{ijk} + \nu_{ijk} \qquad (11)$$

Here, $trans_{ijk}$ is a dummy variable taking the value 1 for a multinational firm which has close-to-fully transplanted the organisational form to its affiliate firm, i.e. when all corporate decisions or all corporate decisions except one have the same hierarchical rank in the affiliate firm as in the parent firm, and zero otherwise. i denotes the firm, j denotes the home country, and k denotes the host country. inc_{ijk} is a dummy variable indicating the cost of having two organisational routines. It is captured by whether the parent multinational firm has an explicit human resource policy in place. $dist_{ijk}$ measures the communication costs between the parent and affiliate firm and is given by the geographic distance between the parent and affiliate firm. $tech_{ijk}$ indicates that the technology transferred to the affiliate firm is innovative rather than established or outdated. w'_{ijk} is a vector of controls and ν_{ijk} is an error term. In light of Predictions 1, 2, and 3, we test for the hypotheses $\partial_2 > 0$ and $\partial_3 < 0$, $\partial_4 > 0$.

Our findings are given in Table 2 which presents probit maximum likelihood estimates of equation 11. All p-values are based on robust standard errors, which allow for heteroskedasticity at the firm level. In all regressions, we also include two additional firm-level controls to avoid omitted variable bias. These are the log of the number of employees in parent and affiliate firms as a measure of firm size. To test the sensitivity of our results to the way the survey was conducted, we also include two survey controls in columns (4)-(6). The first dummy indicates whether the respondent to the survey was a top executive, while the second dummy takes a value of one if the respondend was a middle (i.e. divisional) manager. To further check the robustness, we also include a set of host and home country dummies (columns (5) and (6)) as well

as industry dummies (column (6)).

The coefficient on *incentive salary in parent firm* is, as predicted by the theory, positive and highly significant at conventional levels, suggesting that firms with larger costs of having two different organisational routines in the affiliate and parent firm tend to transplant their business model significantly more often. *incentive salary in parent firm* is capturing whether or not multinational firms incentivise their workers by having performance based wages in place. We assume that multinational firms with performance based wages have an explicit human resource policy and a stronger corporate culture. To get a sense of the economic importance of each of the regressors, we report the marginal effects in the last column of Table 2. Multinational firms which use incentive wages to reward for performance are 18 percentage points more likely to transplant the organisational form.

Columns 2 to 6 test for Prediction 2. The estimated coefficient on *distance* is negative and significant, suggesting that when the affiliate firm's distance to the parent firm doubles, the probability of transplanting decreases by 7.4 percentage points. Finally, in columns 3 to 6 we test Prediction 3. The dummy variables *technology is innovative* or *established* rather than outdated are both positive and significant. The probability of transplanting increases most (by 26.8 percentage points) when the technology transferred to the subsidiary firm is innovative and by 5 percentage points when the technology is established rather than outdated.

Table 2: DETERMINANTS OF TRANSPLANTATION: CORPORATE CULTURE, COMMUNICATION AND TECHNOLOGY

Dependent variable: Close-to-full transplantation	(1)	(2)	(3)	(4)	(5)	(6)	Marginal effects
Human resource policy							
Incentive salary in parent firm	0.73***	0.78***	0.64***	0.47***	0.44***	0.60***	18.3
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	
Communication costs							
Log (distance)		-0.14***	-0.10*	-0.15***	-0.26***	-0.30***	-7.4
		(0.00)	(0.05)	(0.00)	(0.01)	(0.00)	
Technology							
Technology is established			0.19*	0.21**	0.25**	0.20*	5.0
			(0.07)	(0.04)	(0.02)	(0.08)	
Technology is innovative			0.77***	0.95***	0.99***	0.83***	26.8
			(0.00)	(0.00)	(0.00)	(0.00)	
Observations	1,155	1,155	1,031	1,031	1,011	1,006	
Pseudo R^2	0.038	0.045	0.051	0.097	0.117	0.169	
Firm size controls (2)	Y	Y	Y	Y	Y	Y	
Survey controls (2)	N	N	N	Y	Y	Y	
Home country dummy (1)	N	N	N	N	Y	Y	
Host country dummies (15)	N	N	N	N	Y	Y	
Industry dummies (8)	N	N	N	N	N	Y	

Notes: * significant at 10%, ** significant at 5%, ***significant at 1%. Probit estimates with robust standard errors. P-values are reported in parentheses. Marginal effects are based on column (6) and are calculated at mean for continuous variables and for discrete changes from zero to one for dummy variables (both in percentage points). The dependent variable *close-to-full transplantation* is a dummy that takes a value of one if each corporate decision obtained the same hierarchical rank for the parent firm as for the subsidiary firm or if only one corporate decision differs. *Incentive salary in parent firm* is a dummy that takes a value of one if the parent firm incentivises performance through salary increases. *Distance* is the distance between parent and subsidiary firm in km. *Technology is established* and *technology is innovative* are dummy variables that indicate the nature of the technology transferred to a subsidiary firm, while *technology is outdated* is the omitted category. Firm size controls refer to the log of the number of employees in the parent and subsidiary firms. Survey controls include two dummy variables, which indicate whether the survey respondend is an executive or a middle (i.e. division) manager respectively. Home and host country dummies are dummies for the location of the parent and subsidiary firm respectively. Finally, industry dummies are one-digit industry dummies for the subsidiary firm based on ISIC Rev. 3. See also Table 7 in Appendix B for more detailed definitions of the variables.

Market Competition

Next, we study the relationship between the probability of transplanting the organisational form and the market competition which is derived from Proposition 3.

Prediction 4: (a) A multinational firm is more likely to transplant its business model to its affiliate firm facing tougher competition in its host market, (b) while it is less likely to transplant from a more competitive home market.

To confront Prediction 4 with the data, we proceed with the following econometric specification.

$$Prob(trans_{ijk}) = \theta_1 + \theta_2 \nabla'_{ijk} + \theta_3 \log comp_k + \theta_4 \log comp_j + \theta_5 w'_{ijk} + \nu_{ijk} \qquad (12)$$

Here, ∇'_{ijk} is a vector of the organisational variables we have included to test Predictions 1–3, while $comp_k$ and $comp_j$ are a proxy for market competition in the host and home countries, respectively. In light of Prediction 4, we expect $\theta_3 > 0$ and $\theta_4 < 0$.

The results are reported in Table 3. We employ several measures of market competition. First, we use the share of multinational firms in the total number of firms in a sector in column (1). According to the theory, a larger share of multinational competitors present in the host or home markets, respectively, increases the toughness of competition as the share of low cost firms in the market is larger. As predicted, the coefficient of *share of multinationals, home market* is negative and significant suggesting that multinational firms faced with a larger number of multinational competitors in the home market transplant significantly less frequently. When the share of multinational exposure in the home market increases by 10 percentage points the probability to transplant declines by 11 percentage points. The coefficient of the *share of multinationals, host market* is positive and significant suggesting that multinational firms faced with a larger number of multinational competitors in the host market transplant the organisational mode significantly more frequently. When the share of multinational exposure in the host market increases by 10 percentage points the probability to transplant increases by 9 percentage points.

Second, we test the robustness of the results using alternative measures of competition. In column (2), we show the results with firm specific measures of competition. As predicted by the theory, multinational firms transplant their business model significantly more often when they are faced with many competitors in their host markets and they transplant their organisational form with lower probability when they are facing many competitors in their home market. Competition in host and home markets is an economically important driver of organisational transfer to the host economies of Eastern Europe. When competition in the host country is tough (*many*

competitors) rather than weak (few competitors), the probability of transplanting increases by 20 percentage points, while *many competitors* in the home market lowers this probability by around 15 percentage points. In addition, in column (3) we replace the firm-level measures of competition by the Lerner index. A 10 percentage point increase of the *Lerner index* in the home market increases the probability to transplant the organisational form by 7 percentage points, while the same increase of the Lerner index in the host market decreases the probability to transplant by 10 percentage points.

In columns 4-5, we examine the robustness of the results to the inclusion of further controls including home and host country dummies as well as industry dummies. Compared to Table 2, the number of host country dummies is limited as the variable *share of multinationals* is available only for eight host countries in our sample (Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Poland, Slovakia and Slovenia). The industry dummies are included at 1-digit level only, so that the effects of the sectoral variable *share of multinationals* (computed at 2 digit level) can still be estimated.

Training Costs of Managers

Next, we proceed to analyse how the training costs of managers in the home and host countries affect the decision to transplant the mode of organisation as is derived in Proposition 4.

Prediction 5: (a) A multinational firm is less likely to transplant the organisational mode when the training costs of managers in the home market increase, and (b) it is more likely to transplant when the training costs of managers in the host market increase.

To test for Prediction 5 we add to equation 12 two proxies for the training costs of managers in the home and host markets, respectively. In column (1) of Table 4 we include the endowment with human capital in the home and host countries, respectively. When a country's endowment with human capital increases, the more educated are potential divisional managers, the easier it is for them to learn more complex tasks and therefore the lower the costs that firms are expected to pay to train them. Therefore, we proxy for the training costs of managers by the share of the working population with tertiary and secondary education in a country. As expected by the theory, when the

Table 3: DETERMINANTS OF TRANSPLANTATION: MARKET COMPETITION

Dependent variable: Close-to-full transplantation	(1)	(2)	(3)	(4)	(5)	Marginal effects
Market competition						
Share of multinationals, host market	0.03*			0.04**	0.04**	0.9
	(0.06)			(0.02)	(0.03)	(column 5)
Share of multinationals, home market	-0.04**			-0.05***	-0.04**	-1.1
	(0.03)			(0.01)	(0.01)	(column 5)
Many domestic competitors, subsidiary firm		0.81***				20.2
		(0.00)				(column 2)
Many world competitors, parent firm		-0.53***				-14.3
		(0.00)				(column 2)
Host market Lerner			0.03*			0.7
			(0.09)			(column 3)
Home market Lerner			-0.04***			-1.0
			(0.00)			(column 3)
Observations	631	986	1031	628	628	
Pseudo R^2	0.0945	0.172	0.106	0.122	0.183	
Firm size controls (2)	Y	Y	Y	Y	Y	
HR policy, distance, technology (4)	Y	Y	Y	Y	Y	
Survey controls (2)	Y	Y	Y	Y	Y	
Home country dummy (1)	N	N	N	Y	Y	
Host country dummies (7)	N	N	N	Y	Y	
Industry dummies (7)	N	N	N	N	Y	

Notes: * significant at 10%, ** significant at 5%, ***significant at 1%. Probit estimates with robust standard errors. P-values are reported in parentheses. Marginal effects calculated at mean for continuous variables and for distcrete changes from zero to one for dummy variables (in percentage points, the columns with corresponding specification are reported in parentheses). The dependent variable *close-to-full transplantation* is a dummy that takes a value of one if each corporate decision obtained the same hierarchical rank for the parent firm as for the subsidiary firm or if only one corporate decision differs. *Share of multinationals* is the share of multinational firms in total firms operating in the home/host market. *Many domestic competitors* and *many world competitors* (rather than few competitors) are subjective measures of market competition as perceived by the subsidiary and parent firm respectively. *Home* and *host market Lerner* are indices of market competition calculated as the share of personal costs in total sales at sectoral level. Firm size controls refer to the log of the number of employees in the parent and subsidiary firms. HR policy, distance and technology refer to the four explanatory variables - *incentive salary*, *Log(distance)*, *technology is established* and *technology is innovative* - used in Table 2. Survey controls include two dummy variables, which indicate whether the survey respondend is an executive or a middle (i.e. division) manager respectively. Home and host country dummies are dummies for the location of the parent and subsidiary firm respectively. Industry dummies are one-digit industry dummies for the subsidiary firm based on ISIC Rev. 3. See also Table 7 in Appendix B for more detailed definitions of the variables.

skill endowment in the host country increases by 10 percentage points the probability to transplant decreases by 6 percentage points. The corresponding effect for the home market is, however, not significant.

We proceed to use the wages of medium- and high-skilled workers relative to workers with primary education as an alternative measure for the training costs of managers and denote it *wage skill premium* (column 2). The findings are similar. An increase in the *wage skill premium* in the host market by 10 percentage points increases the probability to transplant by 17 percentage points, while the *wage skill premium* in the home market is not significant. Further, we include survey controls in columns 3 and 4 and industry dummies in column 4. The results remain, however, similar. In all specifications of Table 4, we also report the coefficients of the two competition variables - *share of multinationals* in home and host markets, which remain robust to

the different specifications as well.

Table 4: DETERMINANTS OF TRANSPLANTATION: TRAINING COSTS OF MANAGERS

Dependent variable: Close-to-full transplantation	(1)	(2)	(3)	(4)	Marginal effects
Market competition					
Share of multinationals, host market	0.05***	0.03**	0.05***	0.04**	1.1
	(0.00)	(0.02)	(0.00)	(0.01)	(column 4)
Share of multinationals, home market	-0.05**	-0.04**	-0.06***	-0.06***	-1.4
	(0.02)	(0.03)	(0.00)	(0.01)	(column 4)
Training costs of managers					
Skill endowment of host country	-0.03***		-0.03***	-0.02**	-0.6
	(0.01)		(0.01)	(0.01)	(column 4)
Skill endowment of home country	-0.02		-0.06	-0.05	
	(0.60)		(0.11)	(0.18)	
Wage skill premium, host market		0.06***			1.7
		(0.00)			(column 2)
Wage skill premium, home market		0.02			
		(0.29)			
Observations	547	594	547	547	
Pseudo R^2	0.088	0.086	0.120	0.185	
Firm size controls (2)	Y	Y	Y	Y	
HR policy, distance , technology (4)	Y	Y	Y	Y	
Survey controls (2)	N	N	Y	Y	
Industry dummies (7)	N	N	N	Y	

Notes: * significant at 10%, ** significant at 5%, ***significant at 1%. Probit estimates with robust standard errors. P-values are reported in parentheses. Marginal effects calculated at mean (in percentage points, the columns with corresponding specification are reported in parentheses, only significant effects are reported). The dependent variable *close-to-full transplantation* is a dummy that takes a value of one if each corporate decision obtained the same hierarchical rank for the parent firm as for the subsidiary firm or if only one corporate decision differs. *Share of multinationals* is the share of multinational firms in total firms operating in the home/host market. *Skill endowment* is the share of population with secondary and higher education in home/host country. *Wage skill premium* is the ratio of labor compensation of medium- and high-skilled labor force per hour to average labor compensation per hour calculated at two-digit industry level. Firm size controls refer to the log of the number of employees in the parent and subsidiary firms. HR policy, distance and technology refer to the four explanatory variables - *incentive salary*, *Log(distance)*, *technology is established* and *technology is innovative* - used in Table 2. Survey controls include two dummy variables, which indicate whether the survey respondend is an executive or a middle (i.e. division) manager respectively. Industry dummies are one-digit industry dummies for the subsidiary firm based on ISIC Rev. 3. See also Table 7 in Appendix B for more detailed definitions of the variables.

As a final robustness check of the determinants of transplantation, we present in Table 9 of Appendix B the regression results for all three measures of transplanting the mode of organisation: full transplantation, close-to-full transplantation and partial transplantation. As explanatory variables, we include all the main determinants of transplantation discussed so far. The results are mostly robust, though some effects tend to become insignificant with the weak measure of partial transplantation.

The Joint Decision: The Level of Decentralization

The decision to tranplant the organisation and the choice of the level of decentralization of the whole multinational corporation under the 'transplant' strategy are jointly determined. In Figure 6 of the theory section we illustrate how changes in the home market conditions affect these choices. At weak competition firms transplant and choose a level of z which is closer to the host market conditions z_p^F. They decentralize. When competition toughens and crosses the threshold, the firm shifts to the‚no-transplant' strategy. Parent and subsidiary organisations become disconnected. We proceed to test this joint decision by determining the level of decentralization of the whole multinational corporation in response to the competitive conditions in the home and host market when the firm decides to transplant the organisation. From Proposition 1 we obtain the following prediction.

Prediction 6: (a) Under the 'transplant' strategy a multinational corporation is more decentralized when competition in the home market increases and (b) it is more centralized when competition in the host market increases.

To test for the prediction we employ the Heckman maximum likelihood model in Table 5 to jointly estimate (i) the decision to transplant the organisational mode (the selection equation) and (ii) the decision over the level of decentralization of the whole multinational corporation (the outcome equation), if the organizational mode is transplanted.[11] To identify the selection equation, we exclude (log) *distance* from the outcome equation. The rationale for selecting this variable for exclusion is that the theory predicts a strong effect of distance on the decision to transplant but no such effect on the decision over the level of decentralisation. The joint estimation allows us to take into account the possible correlation between the error terms in the two equations.

The estimated coefficients for the selection of the transplant strategy (Panel A) are similar to the results we obtained before. For the level of decentralization (Panel B) we find that an increase in the share of multinational exposure in the host market of 10 percentage points reduces the level of decentralization in the multinational corporation by a rank of 0.2 to 0.3 on the scale between 1 and 5 which corresponds to a reduction

[11] Note that under the 'transplant' strategy, the level of decentralization of the parent and subsidiary are either identical or close to identical, depending on the tightness of our measure of transplantation.

in the the level of decentralization of 5 to 7.5 percent.[12] An increase in the share of multinational exposure in the home market of 10 percentage points increases the level of decentralization of the multinational corporation by a rank of 0.3 to 0.7 which corresponds to an increase in the level of decentralization of 7.5 to 17.5 percent. When the home market becomes less profitable due to an increase in competition, the multinational corporation adjusts its level of decentralization to the one that fits better to the host market conditions. This way, we identify in the data a process of 'reverse transplanting' in which the parent firms' organisation is modified to be closer to the optimal organisation of the subsidiary firm.

[12]A reduction by 0.2 corresponds to $0.2/4 = 5$ percent in the possible range of the level of decentralisation between 1 and 5.

Table 5: JOINT DETERMINANTS OF TRANSPLANTATION AND DECENTRALISATION

Panel A. Selection equation with dependent variable: Transplantation						
	Full	Close-to-full	Partial	Full	Close-to-full	Partial
	(1)	(2)	(3)	(4)	(5)	(6)
Incentive salary in parent firm	0.54***	0.76***	0.35**	0.41**	0.66***	0.22
	(0.00)	(0.00)	(0.02)	(0.02)	(0.00)	(0.16)
Technology is innovative	0.59***	0.44**	0.30	0.78***	0.63***	0.49***
	(0.00)	(0.03)	(0.11)	(0.00)	(0.00)	(0.01)
Share of multinationals, host market	0.04***	0.03**	0.01	0.04***	0.03**	0.01
	(0.00)	(0.01)	(0.31)	(0.01)	(0.02)	(0.35)
Share of multinationals, home market	-0.04**	-0.02	-0.01	-0.05***	-0.03*	-0.02
	(0.05)	(0.25)	(0.70)	(0.01)	(0.09)	(0.30)
Log(distance)	-0.32***	-0.28***	-0.11*	-0.36***	-0.32***	-0.16**
	(0.00)	(0.00)	(0.10)	(0.00)	(0.00)	(0.02)
Panel B. Outcome equation with dependent variable: Decentralisation of multinational						
	(1)	(2)	(3)	(4)	(5)	(6)
Incentive salary in parent firm	-0.63***	-0.26*	-0.30**	-0.69***	-0.32**	-0.29**
	(0.00)	(0.09)	(0.03)	(0.00)	(0.02)	(0.02)
Technology is innovative	-0.28	-0.30*	-0.37**	-0.33	-0.46***	-0.46***
	(0.18)	(0.08)	(0.01)	(0.13)	(0.00)	(0.00)
Share of multinationals, host market	-0.03***	-0.02**	-0.02***	-0.03***	-0.02**	-0.02***
	(0.00)	(0.04)	(0.01)	(0.00)	(0.02)	(0.01)
Share of multinationals, home market	0.07***	0.05***	0.03***	0.07***	0.04***	0.03***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Observations (selected)	699 (94)	699 (145)	699 (198)	699 (94)	699 (145)	699 (198)
ρ	0.27	0.54**	0.07	0.23	0.48**	0.14
Wald test of indep. eqns. ($\rho = 0$)	(0.48)	(0.02)	(0.87)	(0.49)	(0.03)	(0.68)
Size controls	Y	Y	Y	Y	Y	Y
Survey controls	N	N	N	Y	Y	Y

Notes: * significant at 10%, ** significant at 5%, ***significant at 1%. Heckman maximum likelihood estimates with robust standard errors. P-values are reported in parentheses. The dependent variables in the selection equation are *full transplantation* (columns 1 and 4), *close-to-full transplantation* (columns 2 and 5) and *partial transplantation* (column 3 and 6). They indicate whether the organizational form was fully (close-to-fully or partially) transplanted from the parent firm to its subsidiary firm. The dependent variable in the outcome equation is *decentralisation of multinational*, which is the mean of decentralisation of parent and subsidiary firm under the 'transplant' strategy. *Incentive salary in parent firm* is a dummy that takes a value of one if the parent firm incentivises performance through salary increases. *technology is innovative* is a dummy variables that indicates the nature of the technology transferred to a subsidiary firm, while *technology is established and outdated* are the omitted category. *Share of multinationals* is the share of multinational firms in total firms operating in a market. *Distance* is the distance between parent and subsidiary firm in km; it is excluded from the outcome equation. P-values are reported for Wald test for independent equations (i.e. the test that the correlation between the error terms in the selection and outcome equation denoted as ρ is 0). Size controls refer to the log of the number of employees in the parent and subsidiary firms. Survey controls include two dummy variables, which indicate whether the survey respondend is an executive or a middle (i.e. division) manager respectively. See also Table 7 in Appendix B for more detailed definitions of the variables.

6 Conclusion

In this paper we investigate the conditions under which multinational firms transplant the business organisation to the affiliate firms in host countries. In concluding, we want to return to the puzzle we raised in the introduction, that there is a surprisingly high proportion of multinational firms that do not transplant their mode of organisation to host countries. In our analysis we found that three factors stand out as drivers of organisational transfer to host countries. First, multinational firms with a strong corporate culture are 18 percentage points more likely to transplant their organisational form to host countries. A strong corporate culture makes it costly for multinational firms to have two organisational routines and to choose a business model for affiliate firms which is optimally adjusted to the host market conditions. Among Austrian and German multinational firms in our data, however, only a minority (14 percent) are facing these organisational costs by having human resource policies in place incentivising their workers (which is our proxy of corporate culture).

Second, multinational firms which transfer an innovative technology to affiliate firms in the host country are 27 percentage points more likely to export the business organisational form abroad. Our estimates suggest that technology transfer and organisational transfer go hand in hand. A new technology increases the training costs of production managers in the affiliate firms, making saving on these costs in a more centralised organisation in the affiliate firms more desirable. However, among the multinational firms in our sample, only very few (8 percent) describe the technology they transfer to host countries as innovative, while the majority of firms (60 percent) perceive the technology as established. Thus, the rare occurence of multinational firms with a strong corporate culture and with innovative technologies have both contributed to the low frequency of transplanting the mode of organisation to the affiliate firms in eastern Europe.

Lastly, we find that market competition is an economically important driver of organisational transfer. Multinational firms investing in host countries with tough competition are more likely to export the organisational form to these countries, while multinational investors coming from a home market with tough competition are less likely to transplant the organisation. Thus, the tougher competitive environment in rich countries due to globalization (during this period openess doubled in Austria and Germany) has also conributed to the low frequency of multinational firms' transplanting the business model.

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A Appendix: Theory

- **The optimal joint organizational form under the 'transplant' strategy**

Denote $\pi\left(c_D^H, c_D^F, z\right) = \frac{L^H}{4\gamma}\left[c_D^H - c_H^m(z)\right]^2 + \frac{L^F}{4\gamma}\left[c_D^F - c_F^m(z)\right]^2$. Then we know that the first order condition for this joint organizational form z is simply given from:

$$\frac{\partial \pi\left(c_D^H, c_D^F, z\right)}{\partial z} = -\frac{L^H}{2\gamma}\left[c_D^H - c_H^m(z)\right]\frac{\partial c_H^m}{\partial z} - \frac{L^F}{2\gamma}\left[c_D^F - c_F^m(z)\right]\frac{\partial c_F^m}{\partial z} = 0 \qquad (13)$$

We assume that for the relevant range of z the profit function $\pi\left(c_D^H, c_D^F, z\right)$ is strictly concave (ie. $\partial^2\pi\left(c_D^H, c_D^F, z\right)/\partial z^2 < 0$) in order to have a well defined maximization problem.

Moreover, we assume that the cost of communication δ between the headquarters and the subsidiary is sufficiently large that $z_p^H < z_p^F$. Under full adjustment to local conditions, the firm wants to implement more management autonomy in the subsidiary firm than in the parent firm. Given that z_p^H(resp. z_p^F) are the optimal organizational forms for the H market (resp. the F market), we have

$$\frac{\partial c_H^m}{\partial z}\left(z_p^H\right) = \frac{\partial c_F^m}{\partial z}\left(z_p^F\right) = 0$$

and $z_p^H < z_p^F$ implies

$$\frac{\partial c_H^m}{\partial z}\left(z_p^F\right) > 0 \text{ and } \frac{\partial c_F^m}{\partial z}\left(z_p^H\right) < 0$$

we then get

$$\begin{aligned}\frac{\partial \pi\left(c_D^H, c_D^F, z_p^H\right)}{\partial z} &= -\frac{L^F}{2\gamma}\left[c_D^F - c_F^m(z_p^H)\right]\frac{\partial c_F^m}{\partial z}\left(z_p^H\right) > 0\\ \frac{\partial \pi\left(c_D^H, c_D^F, z_p^F\right)}{\partial z} &= -\frac{L^H}{2\gamma}\left[c_D^H - c_H^m(z_p^F)\right]\frac{\partial c_H^m}{\partial z}\left(z_p^F\right) < 0\end{aligned}$$

The concavity of $\pi\left(c_D^H, c_D^F, z\right)$ then implies that the optimal joint organizational form z^* solution of (13) is such that $z_p^H < z^* < z_p^F$.

Differentiation of (13), we get

$$\begin{aligned}\frac{\partial^2 \pi\left(c_D^H, c_D^F, z^*\right)}{\partial c_D^H \partial z} &= -\frac{L^H}{2\gamma}\frac{\partial c_H^m}{\partial z}(z^*) < 0\\ \frac{\partial^2 \pi\left(c_D^H, c_D^F, z^*\right)}{\partial c_D^F \partial z} &= -\frac{L^F}{2\gamma}\frac{\partial c_F^m}{\partial z}(z^*) > 0\end{aligned}$$

This is so because we assume that $z_p^H < z_p^F$ and therefore $z_p^H < z^* < z_p^F$ and thus $\frac{\partial c_H^m}{\partial z}(z^*) > \frac{\partial c_H^m}{\partial z}\left(z_p^H\right) = 0$ and $\frac{\partial c_H^m}{\partial z}(z^*) < \frac{\partial c_F^m}{\partial z}\left(z_p^F\right) = 0$.

From this we obtain that $z^*\underset{- \quad +}{\left(c_D^H, c_D^F\right)}$. The multinational corporation under the 'transplant' strategy is more decentralized the tougher is competition in the home market and it is more centralized the tougher is competition in the host market. From this follows that the marginal costs of production of the parent firm and the subsidiary firm are a function of the toughness of competition in H and in$F$ with the following signs:

$$\begin{aligned}c_H^m\left(z^*\right) &= f^H(\underset{-}{c_D^H}, \underset{+}{c_D^F})\\ c_F^m\left(z^*\right) &= f^F(\underset{+}{c_D^H}, \underset{-}{c_D^F})\end{aligned}$$

QED.

- **Proof that** $c_H^m(z^*) < (1+\theta^*)\, c_H^m(z_p^H)$:

Recall that the threshold condition writes as:

$$L^H\left[(1+\theta^*)\,c_H^m(z_p^H)-c_H^m(z^*)\right]\left[c_D^H-\frac{c_H^m(z^*)+(1+\theta^*)\,c_H^m(z_p^H)}{2}\right]$$
$$=L^F\left[c_F^m(z^*)-c_F^m(z_p^F)\right]\left[c_D^F-\frac{c_F^m(z^*)+c_F^m(z_p^F)}{2}\right] \quad (14)$$

Note that $c_F^m(z^*)-c_F^m(z_p^F)>0$. As well $c_D^F-c_F^m(z^*)>0$ and $c_D^H>\max\left\{c_H^m(z^*);(1+\theta^*)c_H^m(z_p^H)\right\}$ in order to ensure that the multinational firms produce positive outputs in markets F and H. Thus $c_D^F-\frac{c_F^m(z^*)+c_F^m(z_p^F)}{2}>c_D^F-c_F^m(z^*)>0$. Therefore, it follows from equation (14) that

$$c_H^m(z^*)<(1+\theta^*)\,c_H^m(z_p^H)$$

- **Proof of Proposition 2:**

i) Comparative statics for market size L^H : differentiation of RHS of (10) with respect to L^H gives:

$$\begin{aligned}
&\frac{1}{4\gamma}\left[c_H+\sqrt{\frac{4\gamma F_H}{L^H}}-c_H^m(z^*)\right]^2-\frac{1}{4\gamma}\sqrt{\frac{4\gamma F_H}{L^H}}\left[c_H+\sqrt{\frac{4\gamma F_H}{L^H}}-c_H^m(z^*)\right]\\
&-\frac{1}{4\gamma}\left[c_H+\sqrt{\frac{4\gamma F_H}{L^H}}-(1+\theta^*)\,c_H^m(z_p^H)\right]^2+\frac{1}{4\gamma}\sqrt{\frac{4\gamma F_H}{L^H}}\left[c_H+\sqrt{\frac{4\gamma F_H}{L^H}}-(1+\theta^*)\,c_H^m(z_p^H)\right]\\
=\;&\frac{1}{4\gamma}\left[c_H+\sqrt{\frac{4\gamma F_H}{L^H}}-c_H^m(z^*)\right]^2-\frac{1}{4\gamma}\left[c_H+\sqrt{\frac{4\gamma F_H}{L^H}}-(1+\theta^*)\,c_H^m(z_p^H)\right]^2\\
&+\frac{1}{4\gamma}\sqrt{\frac{4\gamma F_H}{L^H}}\left[c_H^m(z^*)-(1+\theta^*)\,c_H^m(z_p^H)\right]
\end{aligned}$$

The RHS rewrites as

$$\begin{aligned}
&\left((1+\theta^*)\,c_H^m(z_p^H)-c_H^m(z^*)\right)\cdot\begin{bmatrix}\frac{1}{2\gamma}(c_H+\sqrt{\frac{4\gamma F_H}{L^H}})-\frac{1}{4\gamma}c_H^m(z^*)\\-\frac{1}{4\gamma}\,(1+\theta^*)\,c_H^m(z_p^H)-\frac{1}{4\gamma}\sqrt{\frac{4\gamma F_H}{L^H}}\end{bmatrix}\\
=\;&\frac{1}{4\gamma}\left((1+\theta^*)\,c_H^m(z_p^H)-c_H^m(z^*)\right)\begin{bmatrix}[c_H-c_H^m(z^*)]\\+\left[c_H-(1+\theta^*)\,c_H^m(z_p^H)\right]+\sqrt{\frac{4\gamma F_H}{L^H}}\end{bmatrix}\\
>\;&0
\end{aligned}$$

Thus the equilibrium threshold θ^* goes down and there is more multinational transplanting with a larger domestic market L^H

ii) Comparative statics for market size L^F : Similarly differentiation of RHS of (10) with respect to L^F gives:

$$\begin{aligned}
& \frac{1}{4\gamma}\left[c_F+\sqrt{\frac{4\gamma F_F}{L^F}}-c_F^m(z^*)\right]^2-\frac{1}{4\gamma}\sqrt{\frac{4\gamma F_F}{L^F}}\left[c_F+\sqrt{\frac{4\gamma F_F}{L^F}}-c_F^m(z^*)\right] \\
& -\frac{1}{4\gamma}\left[c_F+\sqrt{\frac{4\gamma F_F}{L^F}}-c_F^m(z_p^F)\right]^2+\frac{1}{4\gamma}\sqrt{\frac{4\gamma F_F}{L^F}}\left[c_F+\sqrt{\frac{4\gamma F_H}{L^H}}-c_F^m(z_p^F)\right] \\
= & \frac{1}{4\gamma}\left[c_F+\sqrt{\frac{4\gamma F_F}{L^F}}-c_F^m(z^*)\right]^2-\frac{1}{4\gamma}\left[c_F+\sqrt{\frac{4\gamma F_F}{L^F}}-c_F^m(z_p^F)\right]^2 \\
& +\frac{1}{4\gamma}\sqrt{\frac{4\gamma F_F}{L^F}}\left[c_F^m(z^*)-c_F^m(z_p^F)\right]
\end{aligned}$$

the RHS rewrites as:

$$\begin{aligned}
& \left(c_F^m(z_p^F)-c_F^m(z^*)\right)\cdot\begin{bmatrix}\frac{1}{2\gamma}(c_F+\sqrt{\frac{4\gamma F_F}{L^F}})-\frac{1}{4\gamma}c_F^m(z^*)\\ -\frac{1}{4\gamma}c_F^m(z_p^F)-\frac{1}{4\gamma}\sqrt{\frac{4\gamma F_F}{L^F}}\end{bmatrix} \\
= & \frac{1}{4\gamma}\left(c_F^m(z_p^F)-c_F^m(z^*)\right)\cdot\left[[c_F-c_F^m(z^*)]+\left[c_F-c_F^m(z_p^F)\right]+\sqrt{\frac{4\gamma F_F}{L^F}}\right] \\
< & 0
\end{aligned}$$

Thus the equilibrium threshold θ^* goes up and there is less multinational transplanting with larger foreign market L^F

iii) Comparative statics for F_H (fixed costs of local firms or index of local competition)

Differentiation of RHS of (10) with respect to F_H gives :

$$\begin{aligned}
& \frac{L^H}{4\gamma}\left[c_H+\sqrt{\frac{4\gamma F_H}{L^H}}-c_H^m(z^*)\right]\sqrt{\frac{4\gamma}{L^H F_H}} \\
& -\frac{L^H}{4\gamma}\left[c_H+\sqrt{\frac{4\gamma F_H}{L^H}}-(1+\theta^*)\,c_H^m(z_p^H)\right]\sqrt{\frac{4\gamma}{L^H F_H}} \\
= & \frac{L^H}{4\gamma}\sqrt{\frac{4\gamma}{L^H F_H}}\left[(1+\theta^*)\,c_H^m(z_p^H)-c_H^m(z^*)\right]>0
\end{aligned}$$

thus θ^* goes down and there is more transplant with less home market competition (higher F_H)

iv) Comparative statics for F_F (fixed costs of local firms or index of local competition)

Similarly differentiation of RHS of (10) with respect to F_F gives

$$\begin{aligned} & \frac{L^F}{4\gamma}\left[c_F+\sqrt{\frac{4\gamma F_F}{L^F}}-c_F^m(z^*)\right]\sqrt{\frac{4\gamma}{L^F F_F}} \\ & -\frac{L^F}{4\gamma}\left[c_F+\sqrt{\frac{4\gamma F_F}{L^F}}-c_F^m(z_p^F)\right]\sqrt{\frac{4\gamma}{L^F F_F}} \\ = \quad & \frac{L^F}{4\gamma}\sqrt{\frac{4\gamma}{L^F F_F}}\left[c_F^m(z_p^F)-c_F^m(z^*)\right]<0 \end{aligned}$$

thus θ^* goes up and there is less multinational transplanting with weaker competition in the host market (larger F_F)

QED.

•

• **Proof of Proposition 3 :**

i) Comparative statics with respect to a_p^H: differentiation of RHS of (10) with respect to a_p^H gives

$$\begin{aligned} & -\frac{L^H}{2\gamma}\left[c_H+\sqrt{\frac{4\gamma F_H}{L^H}}-c_H^m(z^*)\right]\frac{\partial c_H^m(z^*)}{\partial a_p^H} \\ & +\frac{L^H}{2\gamma}\left[c_H+\sqrt{\frac{4\gamma F_H}{L^H}}-(1+\theta^*)\,c_H^m(z_p^H)\right](1+\theta^*)\,\frac{\partial c_H^m(z_p^H)}{\partial a_p^H} \end{aligned}$$

or

$$\begin{aligned} & -\left[c_H+\sqrt{\frac{4\gamma F_H}{L^H}}-c_H^m(z^*)\right]z^*+\left[c_H+\sqrt{\frac{4\gamma F_H}{L^H}}-(1+\theta^*)\,c_H^m(z_p^H)\right](1+\theta^*)\,z_p^H \\ = \quad & \left[c_H+\sqrt{\frac{4\gamma F_H}{L^H}}\right]\left((1+\theta^*)\,z_p^H-z^*\right)+c_H^m(z^*)z^*-(1+\theta^*)\,c_H^m(z_p^H)\,(1+\theta^*)\,z_p^H \end{aligned}$$

This can be rewritten as

$$
\begin{aligned}
& \left[c_H + \sqrt{\frac{4\gamma F_H}{L^H}}\right]\left((1+\theta^*)\, z_p^H - z^*\right) + c_H^m(z^*)\left(z^* - (1+\theta^*)\, z_p^H\right) \\
& + \left(c_H^m(z^*) - (1+\theta^*)\, c_H^m(z_p^H)\right)(1+\theta^*)\, z_p^H \\
= \quad & \left[c_H + \sqrt{\frac{4\gamma F_H}{L^H}} - c_H^m(z^*)\right] \underbrace{\left((1+\theta^*)\, z_p^H - z^*\right)}_{+ \text{ or } -} \\
& + \underbrace{\left(c_H^m(z^*) - (1+\theta^*)\, c_H^m(z_p^H)\right)}_{-}(1+\theta^*)\, z_p^H \\
\gtreqless \quad & 0
\end{aligned}
$$

When $(1+\theta^*)\, z_p^H - z^* < 0$, the sign of the preceding expression is negative. θ^* goes up and there is less multinational transplanting with larger training cost a_p^H in H.

ii) Comparative statics with respect to a_p^F: similarly differentiation of RHS of (10) with respect to a_p^F gives

$$
\begin{aligned}
& -\frac{L^F}{2\gamma}\left[c_F + \sqrt{\frac{4\gamma F_F}{L^F}} - c_F^m(z^*)\right]\frac{\partial c_F^m(z^*)}{\partial a_p^F} \\
& +\frac{L^F}{2\gamma}\left[c_F + \sqrt{\frac{4\gamma F_F}{L^F}} - c_F^m(z_p^F)\right]\frac{\partial c_F^m(z_p^F)}{\partial a_p^F}
\end{aligned}
$$

or

$$
\begin{aligned}
& -\left[c_F + \sqrt{\frac{4\gamma F_F}{L^F}} - c_F^m(z^*)\right] z^* + \left[c_F + \sqrt{\frac{4\gamma F_F}{L^F}} - -c_F^m(z_p^F)\right] z_p^F \\
= \quad & \left[c_F + \sqrt{\frac{4\gamma F_F}{L^F}}\right]\left(z_p^F - z^*\right) + c_F^m(z^*)z^* - c_F^m(z_p^F)z_p^F
\end{aligned}
$$

which gives

$$\begin{aligned}
& \left[c_F + \sqrt{\frac{4\gamma F_F}{L^F}}\right]\left(z_p^F - z^*\right) + c_F^m(z^*)\left(z^* - z_p^F\right) + \left(c_F^m(z^*) - c_F^m(z_p^F)\right) z_p^F \\
= & \left[c_F + \sqrt{\frac{4\gamma F_F}{L^F}} - c_H^m(z^*)\right]\left(z_p^F - z^*\right) + \underbrace{\left(c_F^m(z^*) - c_F^m(z_p^F)\right)}_{+} z_p^F \\
> & \ 0
\end{aligned}$$

In that case θ^*goes down, there is more multinational transplanting associated with larger training cost in F. **QED.**

- **Proposition 4: comparative statics on communication costs**

- Comparative statics with respect to δ: differentiation of RHS of (10) with respect to δ gives

$$\begin{aligned}
& -\frac{L^F}{2\gamma}\left[c_F + \sqrt{\frac{4\gamma F_F}{L^F}} - c_F^m(z^*)\right]\frac{\partial c_F^m(z^*)}{\partial \delta} \\
& +\frac{L^F}{2\gamma}\left[c_F + \sqrt{\frac{4\gamma F_F}{L^F}} - c_F^m(z_p^F)\right]\frac{\partial c_F^m(z_p^F)}{\partial \delta}
\end{aligned}$$

which is proportional to

$$\begin{aligned}
& -\left[c_F + \sqrt{\frac{4\gamma F_F}{L^F}} - c_F^m(z^*)\right][1 - F(z^*)] + \left[c_F + \sqrt{\frac{4\gamma F_F}{L^F}} - c_F^m(z_p^F)\right][1 - F(z_p^F)] \\
= & \left[c_F + \sqrt{\frac{4\gamma F_F}{L^F}}\right]\left(F(z^*) - F(z_p^F)\right) + c_F^m(z^*)[1 - F(z^*)] - c_F^m(z_p^F)[1 - F(z_p^F)]
\end{aligned}$$

or

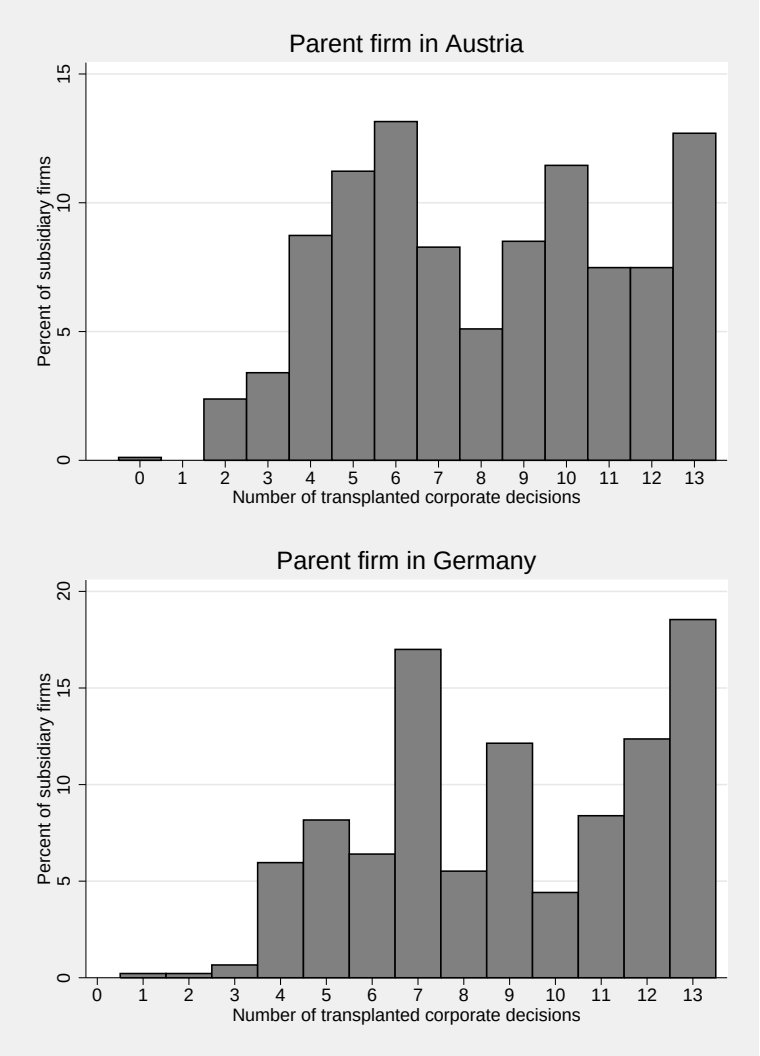
$$\left[c_F + \sqrt{\frac{4\gamma F_F}{L^F}} - c_F^m(z^*)\right]\underbrace{\left(F(z^*) - F(z_p^F)\right)}_{-} + \underbrace{\left(c_F^m(z^*) - c_F^m(z_p^F)\right)}_{+}[1 - F(z_p^F)] \gtrless 0$$

The sign is ambiguous. However when z_p^F is close to 1 (full decentralization) and/or $c_F^m(z^*) - c_F^m(z_p^F)$ is small (not much loss of productive efficiency of a subsidiary firm

which is subject to the 'transplant' strategy), then the second term is small and we get a negative sign for the expression above. In this case, an increase in communication costs tends to reduce multinational transplanting in the industry.

B Appendix: Data and Results

Figure 6: THE FREQUENCY OF TRANSPLANTING THE ORGANISATIONAL FORM



Notes: The organisational form is fully transplanted if each corporate decision obtained the same hierarchical rank for the subsidiary firm as for the parent firm (i.e., 13 transplanted corporate decisions). It is close-to-fully transplanted if the hierarchical rank of only one corporate decision differs (i.e. 12 transplanted corporate decisions) and partially transplanted if two corporate decisions differ in hierarchical rank (i.e., 11 transplanted corporate decisions). The organisational form is not transplanted if three or more corporate decisions are different (i.e., 0–10 transplanted corporate decisions).

Table 6: Corporate Decisions in Subsidiary and Parent Firms

Corporate decision[1]	Affiliates with the same hierarchical rank as parent firms[2]	Mean level of decentralisation[3]	
		Affiliate firms	Parent firms
on acquisitions	78%	1.41	1.34
to hire a new secretary	70%	4.65	4.15
to hire two new workers	64%	4.26	3.67
to change a supplier	61%	3.23	3.09
on transfer prices	61%	2.43	2.45
on budget	60%	2.72	2.70
to hire 20 new workers	59%	2.82	2.51
to introduce a new product	55%	2.80	2.76
on wage increase	55%	4.10	3.45
on product price	54%	3.75	3.48
on a new strategy	54%	1.88	1.90
financial decisions	52%	2.54	1.90
on R&D expenditure	51%	2.58	2.79

[1] The corporate decisions listed were collected for both German and Austrian parent firms as well as all subsidiary firms and are sorted from the most similar decisions in affiliate firms compared with parent firms to the least similar decisions.
[2] Percentage of affiliate firms in which a particular decision is taken at the same hierarchical level as in parent firms.
[3] Mean over the rank of one to five with one (centralised) meaning only the headquarters of the parent firm takes the decision, and five (decentralised), the decision is delegated to the divisional manager (parent firm) or to the affiliate manager (affiliate firm).

Table 7: Description of Variables and Data Sources

Variable	Description
Corporate Culture	
Full transplantation	dummy that takes a value of one if the organisational form is fully transplanted from the parent firm to its subsidiary and zero otherwise; full transplantation means that all corporate decisions obtained the same hierarchical rank for the parent firm as for the subsidiary firm
Close-to-full transplantation	dummy that takes a value of one if the organisational form is close-to-fully transplanted from the parent firm to its subsidiary and zero otherwise; close-to-full transplantation means that either each corporate decision obtained the same hierarchical rank for the parent firm as for the subsidiary firm or only one corporate decision differs

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Variable	Description
Partial transplantation	dummy that takes a value of one if the organisational form is partially transplanted from the parent firm to its subsidiary and zero otherwise; partial transplantation means that either each corporate decision obtained the same hierarchical rank for the parent firm as for the subsidiary firm or the rank differs for up to two corporate decisions
Decentralisation of parent firm	mean of ranking between one (centralised) and five (decentralised) of several corporate decisions depending on whether the headquarters (centralised) or the divisional manager of the parent firm (decentralised) makes the decision; see Table 6 for a listing of corporate decisions
Decentralisation of subsidiary firm	mean of ranking between one (centralised) and five (decentralised) of several corporate decisions depending on whether the headquarters of the parent firm (centralised) or the subsidiary manager (decentralised) makes the decision; see Table 6 for a listing of corporate decisions
Decentralisation of multinational	mean of decentralisation of parent and subsidiary firm under the 'transplant' strategy (three versions of this variable are derived, depending on whether the 'transplant' strategy refers to (i) full transplantation, (ii) close-to-full transplantation or (iii) partial transplantation)
Human resource policy	
Incentive salary in parent firm	dummy that takes a value of one if the parent firm incentivises performance through salary increases and zero otherwise
Communication costs	
Distance	distance between the parent and the subsidiary firm in km
Technology	
Technology is outdated	dummy that takes a value of one if the technology of the investment project is fully established or outdated and zero otherwise
Technology is established	dummy that takes a value of one if the technology of the investment project is relatively established and zero otherwise
Technology is innovative	dummy that takes a value of one if the technology of the investment project is new and zero otherwise
Market Competition	
Share of multinationals, host market	ratio of the number of enterprises or establishments with inward FDI activity to the total number of enterprises and establishments at the two-digit ISIC Rev.3 level in host market (in percent), reference year: 2000
Share of multinationals, home market	ratio of the number of enterprises or establishments with inward FDI activity to the total number of enterprises and establishments at the two-digit ISIC Rev.3 level in home market (in percent), reference year: 2000
Many domestic competitors, subsidiary	dummy that takes a value of one if the subsidiary firm faces many competitors at the domestic market and zero otherwise
Many domestic competitors, parent	dummy that takes a value of one if the parent firm faces many competitors at the domestic market and zero otherwise
Many world competitors, subsidiary	dummy that takes a value of one if the subsidiary firm faces many competitors worldwide and zero otherwise
Many world competitors, parent	dummy that takes a value of one if the parent firm faces many competitors worldwide and zero otherwise

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Variable	Description
Host market Lerner	ratio of personal costs to total sales of subsidiary firms at the one-digit ISIC Rev.3 level (in percent)
Home market Lerner	ratio of personal costs to total sales of parent firms at the one-digit ISIC Rev.3 level (in percent)
⟶ *Source of FDI data: Activity of Multinationals (OECD, 2012)*	
⟶ *Source of data on total number of firms: Structural Analysis database (OECD, 2009)*	
Training Costs of Managers	
Skill endowment of host country	share of population with secondary or higher education in a host country (in percent), reference year: 2000
Skill endowment of home country	share of population with secondary or higher education in a home country (in percent), reference year: 2000
Wage skill premium, host market	ratio of labor compensation of high- and medium-skilled labor force per hour to average labor compensation per hour in a host country at two-digit ISIC Rev.3 industry level, reference year: 2000
Wage skill premium, home market	ratio of labor compensation of high- and medium-skilled labor force per hour to average labor compensation per hour in a home country at two-digit ISIC Rev.3 industry level, reference year: 2000
⟶ *Source of skill endowment: Education at a Glance 2002 (OECD, 2002)*	
⟶ *Source of labor compensation: EU KLEMS database (EUKLEMS, 2008)*	
Firm size controls	
Size of parent firm	number of employees of parent firm
Size of subsidiary firm	number of employees of subsidiary firm
Survey controls	
Respondent is an executive	dummy that takes a value of one if the respondent to the survey was an executive and 0 otherwise
Respondent is a middle manager	dummy that takes a value of one if the respondent to the survey was a middle manager (i.e. divisional manager) and 0 otherwise
Other controls	
Home country dummy	dummy that takes a value of one if the parent firm is located in Germany and 0 otherwise
Host country dummies	country dummies for the location of subsidiary firm
Industry dummies	one-digit industry dummies for the subsidiary firm based on ISIC Rev.3

Notes: If not reported otherwise, the data come from a survey of 660 German and Austrian firms with 2200 investment projects in Eastern Europe, conducted by the Chair of International Economics at the University of Munich.

Table 8: Descriptive Statistics

Variable	Obs.	Mean	Min	Max	Std. Dev.	Obs. with dummy = 1
Corporate Culture						
Full transplantation	1335	0.15	0	1	0.35	196
Close-to-full transplantation	1335	0.24	0	1	0.43	318
Partial transplantation	1335	0.32	0	1	0.47	422
Decentralisation of parent firm	1472	2.81	1	5	0.84	.
Decentralisation of subsidiary firm	1388	2.95	1	5	0.69	.
Decentralisation of multinational						
↪ under full transplantation	196	2.94	1	4.44	0.75	.
↪ under close-to-full transplantation	318	3.03	1	4.73	0.69	.
↪ under partial transplantation	422	2.99	1	4.73	0.67	.
Incentive salary in parent firm	1549	0.14	0	1	0.34	210
Communication Costs						
Distance	2122	903.04	17	6000	799.24	.
Technology						
Technology is outdated	1826	0.32	0	1	0.47	585
Technology is established	1826	0.60	0	1	0.49	1099
Technology is innovative	1826	0.08	0	1	0.27	142
Market Competition						
Share of multinationals, host market	1281	1.79	0	27.6	4.47	.
Share of multinationals, home market	1862	1.31	0	18.45	3.13	.
Many domestic competitors, subsidiary	1978	0.46	0	1	0.50	900
Many domestic competitors, parent	2058	0.46	0	1	0.50	940
Many world competitors, subsidiary	1938	0.29	0	1	0.45	563
Many world competitors, parent	2010	0.73	0	1	0.45	1463
Host market Lerner	2123	17.35	8.87	54.55	5.89	.
Home market Lerner	2123	24.01	13.22	32.48	6.15	.
Training Costs of Managers						
Skill endowment of host country	1391	80.26	70	86	6.42	.
Skill endowment of home country	2123	79.35	76	82	2.98	.
Wage skill premium, host market	1472	1.99	1.34	3.11	0.43	.
Wage skill premium, home market	2117	1.68	1.21	2.24	0.26	.
Firm size controls						
Size of parent firm	1993	6970.20	1	233000	25233.78	.
Size of subsidiary firm	1921	346.61	1	49000	1660.02	.
Survey controls						
Respondent is an executive	2123	0.19	0	1	0.40	411
Respondent is a middle manager	2123	0.08	0	1	0.27	162

Table 9: Determinants of Full, Close-to-full and Partial Transplantation

Dependent variable:	(1)	(2)	(3)	(4)	(5)	(6)
Transplantation	Full	Close-to-full	Partial	Full	Close-to-full	Partial
Human resource policy						
Incentive salary in parent firm	0.57**	0.87***	0.31	0.53**	0.83***	0.27
	(0.01)	(0.00)	(0.10)	(0.02)	(0.00)	(0.17)
Communication costs						
Log (distance)	-0.44***	-0.34***	-0.37***	-0.42***	-0.30***	-0.34***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)
Technology						
Technology is established	0.32**	0.19	0.23*	0.40***	0.21	0.27**
	(0.04)	(0.19)	(0.08)	(0.01)	(0.15)	(0.05)
Technology is innovative	0.76***	0.51**	0.48**	1.00***	0.73***	0.67***
	(0.00)	(0.04)	(0.04)	(0.00)	(0.01)	(0.00)
Market competition						
Share of multinationals, host market	0.05***	0.05***	0.01	0.05***	0.05***	0.01
	(0.00)	(0.00)	(0.40)	(0.00)	(0.00)	(0.35)
Share of multinationals, home market	-0.07***	-0.05**	-0.03	-0.09***	-0.06***	-0.04**
	(0.00)	(0.01)	(0.12)	(0.00)	(0.00)	(0.04)
Training costs of managers						
Skill endowment of host country	-0.04***	-0.03***	-0.01	-0.04***	-0.03***	-0.01
	(0.00)	(0.01)	(0.10)	(0.00)	(0.01)	(0.14)
Skill endowment of home country	0.05	0.01	0.14***	-0.00	-0.05	0.08
	(0.43)	(0.86)	(0.01)	(0.95)	(0.44)	(0.15)
Observations	547	547	547	547	547	547
Pseudo R^2	0.110	0.089	0.052	0.147	0.120	0.084
Size controls (2)	Y	Y	Y	Y	Y	Y
Survey controls (2)	N	N	N	Y	Y	Y

Notes: * significant at 10%, ** significant at 5%, ***significant at 1%. Probit estimates with robust standard errors. P-values are reported in parentheses. The dependent variable *full transplantation* is a dummy that takes a value of one if the organisational form is fully transplanted, i.e. if each corporate decision obtained the same hierarchical rank for the parent firm as for the subsidiary firm. The dependent variable *close-to-full transplantation* is a dummy that takes a value of one if each corporate decision obtained the same hierarchical rank for the parent firm as for the subsidiary firm or if one corporate decision differs. The dependent variable *partial transplantation* is a dummy that takes a value of one if each corporate decision obtained the same hierarchical rank for the parent firm as for the subsidiary firm or if up to two corporate decision differ. *Incentive salary in parent firm* is a dummy that takes a value of one if the parent firm incentivises performance through salary increases. *Distance* is the distance between parent and subsidiary firm in km. *Technology is established* and *technology is innovative* are dummy variables that indicate the nature of the technology transferred to a subsidiary firm, while *technology is outdated* is the omitted category. *Share of multinationals* is the share of multinational firms in total firms operating in a market and *skill endowment* is the share of population with secondary education or higher in a country (both shares are expressed in percent). Size controls refer to the log of the number of employees in the parent and subsidiary firms. Survey controls include two dummy variables, which indicate whether the survey respondend is an executive or a middle (i.e. division) manager respectively. See also Table 7 in Appendix B for more detailed definitions of the variables.