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The Theory of the Firm goes Global

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GESY

Discussion Paper No. 370

The Theory of the Firm goes Global

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January 2012

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The Theory of the Firm goes Global*

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January 2012

Discussion of Pol Antras, "Grossman and Hart (1986) goes Global" at the Anniversary Conference of Grossman and Hart at 25, Brussels, June 2011.

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Abstract

What insights can be gained from bringing the theory of the firm to the global economy? I discuss several new features of the world economy that can be explained by incorporating the theory of the firm into the theory of international trade. Among the new features I discuss are the move to flatter corporate hierarchies and the decentralization of authority in firms, the "war for talent", the rise of CEO pay in rich countries, organizational convergence across countries, and firm heterogeneity.

In his paper Pol gives an excellent review and new ideas of how Grossman and Hart (1986) (GH) have influenced recent developments in international trade. The "new new trade theory" opens the black box of the firm and brings firms with organizations into international trade and foreign direct investment (for an overview, see Helpman, Marin, Verdier 2008). Similar to the development of the theory of the firm (see Bolton and Scharfstein 1998), the theory of international trade and organizations (ITO) has been developing in two directions. One approach focusses on the *boundaries of the multinational corporation* (see Grossman and Helpman 2002, Antras 2003, Antras and Helpman 2004, 2008, Nunn and Trefler 2008); the second approach focusses on the *internal organization* of national and multinational firms (Marin and Verdier 2003, 2008a,b,c, 2009, 2011, Puga and Trefler 2010, Antras, Garicano, Rossi-Hansberg 2006, 2008, Bloom, Sadun, van Reenen 2010, Guadalupe and Wulf 2010, Caliendo and Rossi-Hansberg 2011, Marin and Rousova 2011, Marin, Rousova, Verdier 2012). In his paper, Pol mainly describes the literature on the boundaries of the multinational corporation of which he and Elhanan Helpman, are the leading exponents. This is natural, because the theory of the international organization of production is a direct offspring of Grossman and Hart (1986) taken to the global economy. However, GH had an indirect influence on the theories of internal organizations such as Aghion and Tirole (1997) which have been incorporated into trade models. Therefore, I will use my discussion to talk about the second approach.

Why should we take the theory of the firm global? In the last two decades the nature of international trade has been changing. Modern economic commerce involves movements across international boundaries – but often within the boundaries of the firm. It is often characterized by a "war for talent" rather than a "war for market shares". Firms engaged in international trade have met these challenges of the new features of world trade by organizing production in an international value chain, by decentralizing their system of command in flatter corporate hierarchies, by making human capital to the new stakeholder of the firm, and by compensating their CEOs with skyrocket earnings. Thus, we ask: have international trade and competition been the driving forces behind these observed changes in the corporation? [i]

In Marin and Verdier (2008a, 2008b, 2011) we introduce internal hierarchies into models of international trade with imperfect competition to answer how international trade may lead to flatter corporate hierarchies, to decentralization of decision making in the firm, to a "war for talent", to a rise in CEO pay in rich countries, to organizational convergence across countries, and to heterogeneity across firms in the same industry. I will briefly discuss how international trade can give rise to each of these phenomena in turn. [ii]

International Trade and Flatter Corporate Hierarchies

Theory

In Marin and Verdier (2008a, 2008b) we introduce a variant of the Aghion and Tirole (1997) (AT) theory of the firm into a Dixit and Stiglitz (1977) model of monopolistic competition and into a Melitz and Ottaviano (2008) model of international trade in order to examine how international trade may affect corporate organization in similar countries (North-North Trade).

In the AT theory of the firm the owner (the principal) hires a manager (the agent) to bring new projects to the firm. Once the contract is signed both, the principal and the agent, may exert effort to find profitable projects for the firm. To make things interesting, we assume that there is a conflict of interest between the owner and the manager: the manager will suggest a high cost project – a project that maximizes his private benefits (perks, career concerns) rather than a project which maximizes the profits of the firm. Moreover, it is assumed that the manager's effort to find profitable projects is not contractible. The parties cannot write a contract over the manager's effort (here is where GH comes in) and thus once the manager is employed, the amount of effort he provides - which is costly to the manager - will depend on how likely it is that the owner will overrule the manager's project suggestion. This, in turn, will depend on two things: first, how much effort in finding projects the owner herself undertakes and second, whether the owner allocates formal authority to herself or delegates it to the manager. If the owner holds formal authority and undertakes some information collection herself, it is more likely that she will overrule the manager's project suggestion and in this case the manager will be discouraged to look for projects for the firm. Thus, there is a trade-off between control and initiative in the firm. Having a boss – hierarchies – is bad, because it destroys the initiative of workers. However, if the owner decides not to look for projects, say due to overload, and the manager searches and proposes a project, it is profitable for the owner/principal to follow his suggestion. In this case, the manager has "real" rather than "formal" authority. Alternatively, the owner may decide to keep the manager's initiative alive and to decentralize the decision to the manager. In this case the manager has "formal" authority.

In Marin and Verdier (2008b) we bring the AT-firm into a one sector economy with monopolistic competition with differentiated goods a la Melitz and Ottaviano (2008) (MO). In each firm a principal hires a manager to monitor projects and workers to produce. As in AT the allocation of authority in these firms is governed by the trade-off between control and initiative. Consumers have linear demand across a continuum of varieties and price mark-ups become endogenous and a function of the toughness of competition in the market.

How is trade openness affecting the trade-off between control and initiative in the firm? With more trade, the market becomes larger and profits increase. When profits increase, the owner/principal monitors more, since there is more at stake. When the trade shock is sufficiently large, the stakes rise and owners in firms are monitoring so much that they destroy the initiative of their managers in the firm. To prevent this from happening, principals decide to delegate formal authority to their managers. At the same time, however, more trade means more foreign competition. Tougher competition, in turn, makes incentives between the owner and the manager less aligned. The conflict of interest between owner and manager rises and, hence, the owner monitors more. At some level of competition, the owner decides to delegate authority to the manager to encourage his initiative. Thus, with more trade, decentralization to the manager occurs, because under her formal authority the owner cannot otherwise keep the manager's initiative alive.

Incorporating AT into international trade brings two important insights. First, the trade-off between control and initiative of the AT model disappears in very weak and very tough trade environments. As a result, the relationship between international trade and the level of decentralization is non-monotonic. Firms in a small market protected from foreign competition have small profits in which owners/principals monitor little and do not destroy the initiative of managers. In protected markets there are no costs of control in the firm, because firms can keep the initiative of their managers alive even when principals have formal authority. Hence, the firm organization is centralized in trade protected markets. Firms in large open markets face tough competition, but profits are unambiguously larger (the market size effect dominates the competition effect when trade is liberalized). As the stakes are very large, principals in firms monitor and search so intensively that they destroy the initiative of their managers even when they decentralize and delegate formal authority to them. Hence, there are again no costs of control, since the principal cannot keep the enthusiasm of the manager alive even when she empowers him. The organization will again be centralized in markets very open to trade. Only at intermediate levels of trade openness is there a trade-off between control and initiative as described in the theory of the firm of AT. Principals decentralize power to their managers to keeps their initiative alive.

Second, the conflict of interest between owners/principals and managers/agents (congruence in the parlance of AT) becomes endogenous and a function of the trade environment that firms face. In markets more open to trade the conflict of interest between the owner and the manager increases. It matters more who runs the firm in a more competitive environment. When the manager has formal authority, he chooses the larger cost project (which maximizes his private benefit) which translates in more profit losses to the firm in a tougher trade environment. Profits decline more in firms run by the

manager, because high cost firms loose more sales and fight this loss by lowering their price mark-ups compared to low cost firms run by principals.

Empirics

In Marin and Verdier (2008b) we derive predictions from the theory and expose them to the data. We predict that in a cross-section of firms, firms will have more decentralized corporate hierarchies when they face tougher competition and they are more exposed to international trade. We predict further that organizational change towards less hierarchical firms is more likely to happen in firms more exposed to international trade. We test these predictions for a cross-section of 2200 firms with novel data which we have designed and collected among German and Austrian corporations. The data are a full population survey of firms in Austria and Germany investing in Eastern Europe including Russia and Ukraine. Our dataset provides detailed information on the internal organization of firms in the two countries. We measure delegation of authority by asking the CEO at the headquarters of the corporation: "Who decides in your company over the following decisions listed in Figure 1, please rank between 1 taken at headquarters and 5 taken at the divisional level?" The figure reveals that firms in the smaller economy, Austria, are more centralized compared to firms in the larger economy, Germany. This finding is in accordance with the theory, since the theory predicts that in larger more competitive markets firms are more likely to decentralize authority. The figure also reveals that there is a stark variation in the allocation of authority across different types of corporate decisions. The decision over acquisitions, finance, and over a new strategy tend to be centrally organized in firms, the decision over hiring and firing of personnel appears to be decentralized to the divisional level, while R&D and the decision to introduce a new product, or to change a supplier are typically joint decisions between headquarters and the divisional level in firms. The pattern of power allocation in firms is strikingly similar in both countries.

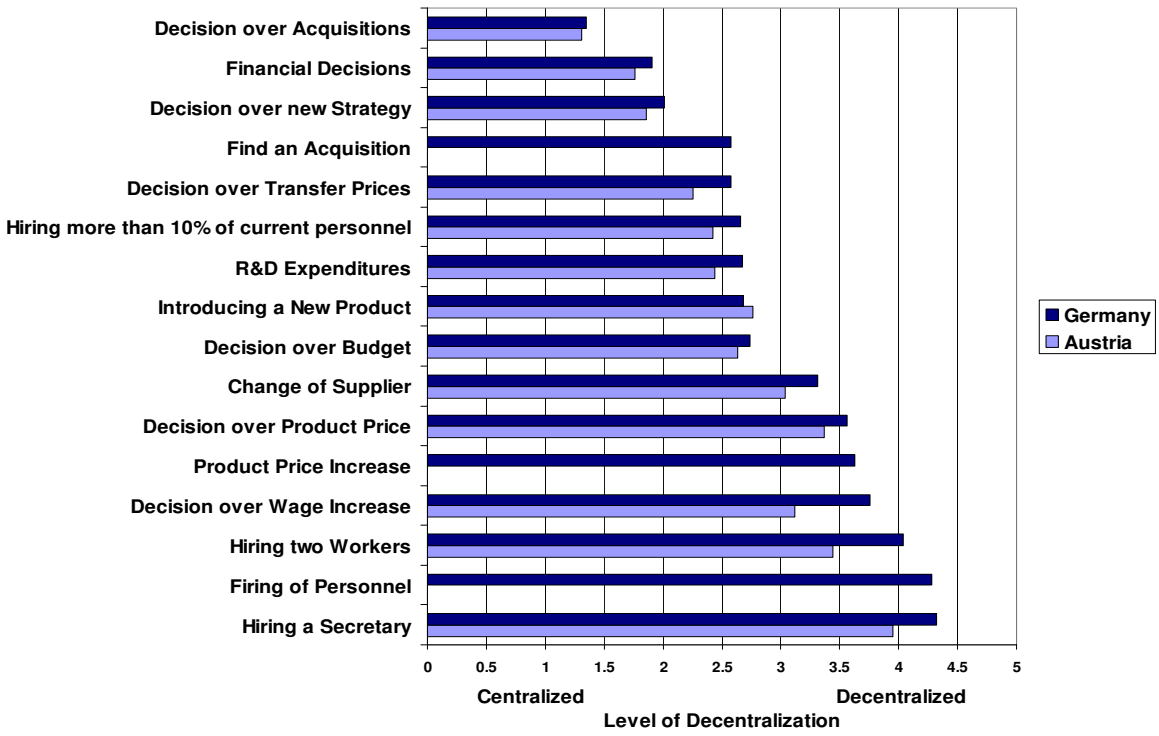

Figure 1: Corporate Decisions ranked by the level of Decentralization

We then rank each firm by its level of decentralization by averaging over the hierarchical score of the 16 corporate decisions listed in Figure 1. Figure 2 shows the correlation between the number of foreign competitors as perceived by firms and the level of decentralization in firms in Austria and Germany. In both countries firms with a larger number of foreign competitors tend to be more decentralized. Note also, that - as predicted by the theory - in the larger more competitive economy, Germany, firms recentralize authority when competition becomes very tough. To show that decentralization of decision making power is driven in particular to encourage managers to bring new ideas to the firm, we examined the allocation of authority for two corporate decisions - the decision over R&D and the decision to introduce a new product - separately for which empowerment may matter most. We indeed find in the empirical analysis that firms respond much quicker to an increase in international trade by changing the allocation of power over the R&D decisions compared to the other corporate decisions.

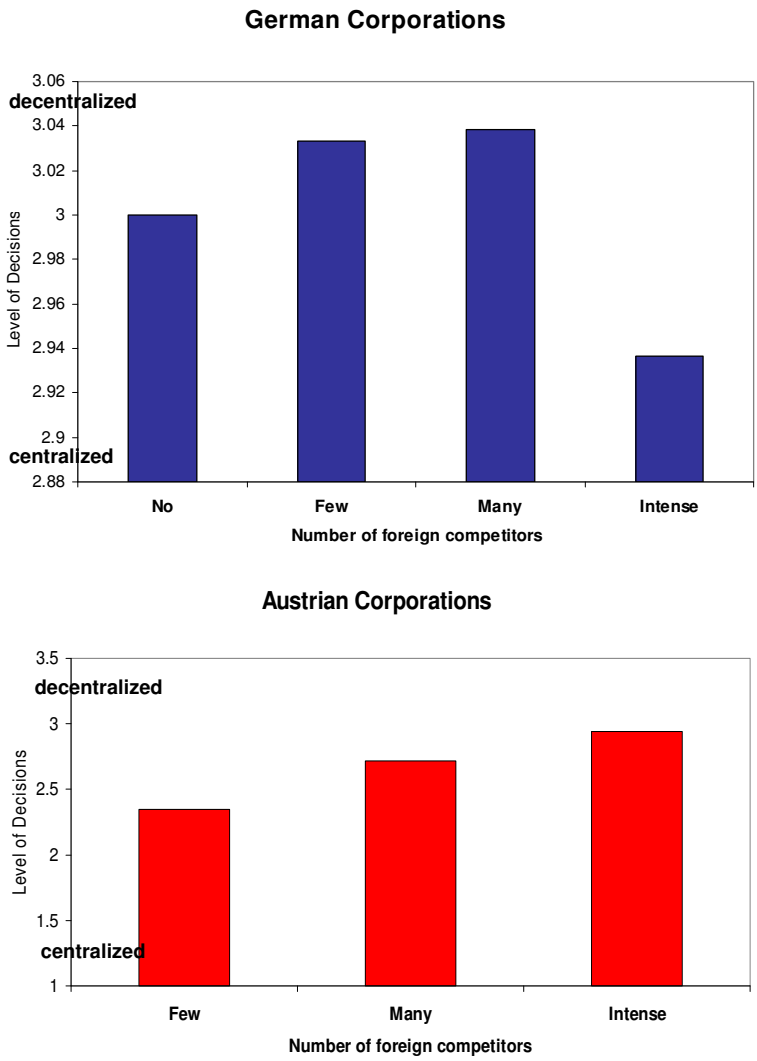

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Figure 2: Level of Decentralization and Foreign Competition

Bloom, Sadun and Van Reenen (2010) use a similar measure of decentralization between headquarters and middle managers which they collected for several countries such as the US, UK, Europe and Asia. Interestingly, they find that the US, UK and Northern European countries are the most decentralized and the Asian countries the most centralized. They also find a positive correlation between the level of decentralization and product market competition. Guadalupe and Wulf (2010) (GW) use the Canadian-US Free Trade Agreement (FTA) in 1989 as a natural experiment to address issues of causality. They see the FTA as an exogenous increase in competition for US firms in industries where tariffs were removed. GW analyze panel data for the US and their measure of organization is the breadth and depth of hierarchy defined as the number of positions reporting to the CEO and the number of positions between the CEO and the division managers. They find that

increased foreign competition leads to downsizing and the removal of hierarchical layers in the corporation.

International Trade and the "war for talent"

In the previous section we examined the effect of North-North trade on the way firms organize. I turn now to how North-South trade may influence corporate organization in different countries. In Marin and Verdier (2003, 2011) we introduce a variant of the Aghion and Tirole (1997) theory of the firm into a Helpman and Krugman (1985) (HK) model of international trade in which countries differ in factor endowments. We consider a world economy consisting of two countries, the human capital rich North, and the labour rich South. In each country there are two sectors: the X-sector produces differentiated goods under monopolistic competition and the Y-sector produces homogenous goods under perfect competition. In each firm in the X-sector a principal hires a skilled manager to run the firm. We assume that the X-sector is more skill intensive than the Y-sector. Consumers' preferences over the two goods Y and X are given by CES utility.

We gain several insights from putting the partial equilibrium theory of the firm of AT in general equilibrium of trade of HK. First, the mode of organization that firms choose becomes a function of relative factor prices, and therefore, in equilibrium, of relative factor endowments of countries. In countries where skilled labor is relatively scarce, the wages of unskilled workers will tend to be low, while the startup costs of a firm (which consist of the wages of skilled managers) will tend to be high, thus making entry more costly. These forces tend to make the ratio of profits to unskilled wages high in skill-scarce countries and low in skill abundant countries. It follows that countries with very high or very low ratios of skilled managers to unskilled workers will tend to have firms in which principals keep formal authority, while in countries with intermediate ratios of skills the mode of organization in which authority is delegated to skilled managers might prevail.

Second, we find that in the general equilibrium of the closed economy, there exists a range of relative factor endowments for which there are multiple equilibria, with all principals in the monopolistically competitive X-sector either decentralizing or not decentralizing authority.

Third, we show in the Rybczynski theorem of firm organization that there also exists a range of factor endowments for which we get a unique mixed equilibrium, with some principals decentralizing formal authority and some principals keeping it to themselves. In this range, factor prices are independent of factor endowments: factor market clearing comes about through a relocation of resources from one organizational mode to the other (in equilibrium, different organizational modes

differ in their factor intensity). In this range of factor endowments the mode of organization becomes a new source of comparative advantage.

How does international trade affect corporate organization in the skill rich North? Suppose that the North is sufficiently skill rich. Then in autarky the start-up costs (the cost of a manager) in the North will be low relative to wages of low skilled workers. As the stakes are low, principals in firms monitor little and do not destroy the initiative of managers. Thus, in autarky principals will keep formal authority and choose a centralized organization. When the skill rich North opens up to trade, it specializes more in the skill intensive monitoring activity resulting in a fall in the relative wage for low skilled workers and an increase in profits. When profits increase, firms want to enter the market. As firms can enter and run a firm only by hiring a skilled manager, market entry is constrained by the pool of available managers in the country. Firms compete for the limited amount of skilled managers available in the economy pushing up the relative wage for skilled managers. Thus, with more trade, manager talent has more opportunities outside the firm and managers becomes more mobile resulting in a "war for talent" triggered by trade liberalization. With the rise in start-up costs of firms, the stakes rise and principals start to monitor more destroying the initiative of managers. When the trade shock is sufficiently large, principals decentralize formal authority to the skilled manager and the talent firm emerges in equilibrium.

International Trade and the Rise of Executive Pay

The compensation of executive board members in industrialized countries has become a highly controversial topic as CEO pay increased six fold from 1980-2005 in the US and 3.5 fold from 1977-2008 in Germany.

Why is international trade a candidate to explain the rise of executive pay? Recent long-run time series evidence for the US in the period 1936-2005 (Frydman and Saks 2010) and for Germany (Fabbri and Marin 2011) suggest that the available explanations for the surge in executive compensation receive only modest support from the data if at all. A proper understanding of the rise in executive pay requires integrating the theory of the firm into international trade theory. Most of the explanations on executive pay (except Gabaix and Landier (2008)) have in common that they focus on failures in the internal control mechanism of firms, but they neglect the market environment in which firms operate, in particular the market for executives. In Marin and Verdier (2011) we examine both the incentives inside firms as well as how these incentives interact with the trade environment firms' face allowing us to analyse how international trade affects executive pay.

One major prediction of our theory is that globalization is leading to a rise in executive pay above and beyond the typical trade induced increases in the skill premium in skill rich countries. The mechanism by which international trade may lead to a rise in CEO pay in the skill rich North is that international trade puts pressure on the demand for managers for two novel reasons: the "war for talent", and an economy wide shift to a more skill intensive organization. As described before, in the "war for talent" new firms enter the market and compete with incumbent firms for the available manager talent in the North in order to start a firm which pushes up the relative wage of skilled managers. The skill bias organizational change involves an economy wide move from a low-skill intensive organization, in which the owner runs the firm, to a skill intensive organization in which the skilled manager runs the firm.

Empirical papers so far have focussed on two mechanisms by which international trade may lead to a rise in CEO pay. Cunat and Guadalupe (2005, 2009) show that firms in the UK and the US shift to more incentive based pay when confronted with more import competition. In Marin (2009) I find that firms pay their managers more when they are engaged in the search for talent. I use firms' participation in talent fairs as a measure for the "war for talent". Fabbri and Marin (2011) find that an increase in average CEO pay in Germany - as a proxy for a local competition for managers - has been the driving force behind the rise in CEO pay in Germany, while US average CEO pay - as a proxy for a global competition for talent - has a significant but economically unimportant influence.

Figure 3 documents the positive correlation between the firms' intensity of talent search and CEO pay in Austria and Germany. The intensity of talent search is measured by the fraction of talent fairs firms participated in relative to the total number of talent fairs taking place in Germany and Austria. The larger the fraction, the more intensively the firm engages in the search for talent.

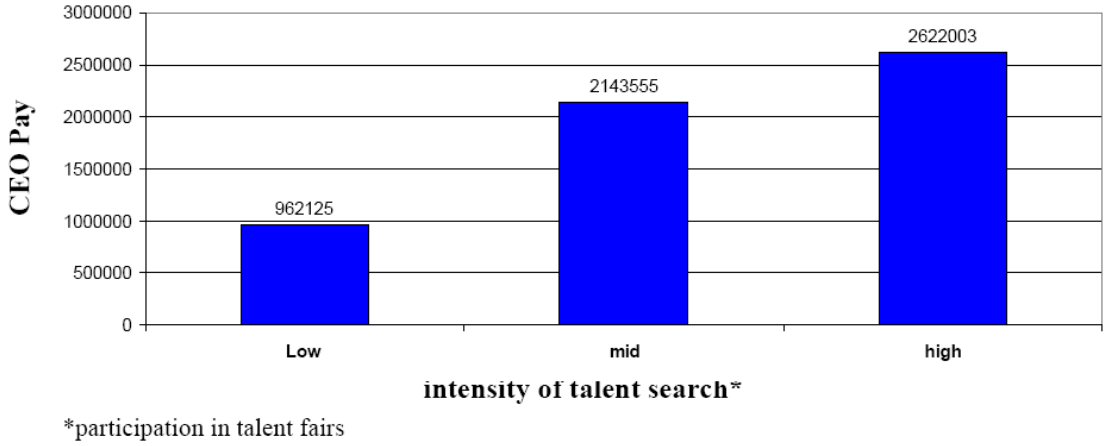

Figure 3: The "war for talent" and CEO Pay

Organizational Convergence

I am turning now to a further insight we gain from introducing the AT-firm into international trade. In Marin and Verdier (2008a, 2011) we show that international trade will lead to convergence in corporate cultures across countries. In Marin and Verdier (2008a) we examine how international trade affects corporate organization in similar countries. We show that decentralizing authority to lower levels of the corporation and the move to less hierarchical organizations emerge in equilibrium when competition is neither too tough nor too weak. The model produces multiple equilibria which arise out of strategic complementarities among firms' organizational decisions. Firms' organizational choices determine market conditions, which in turn, influence an individual firm's choice of firm organization. This feedback mechanism can account for why two otherwise identical countries may have a different corporate organization in autarky. Firms in one country may choose a particular firm organization (like Italy with a relatively more centralized organization compared to the US which is more decentralized), because they expect other firms in that country to choose this organization. In this theory, international trade may result in convergence of corporate organization across countries. However, the organizational equilibrium to which the world economy converges remains undetermined.

In Marin and Verdier (2011) we allow countries to differ in factor endowments which enable us to predict to which organizational equilibrium the integrated world economy will converge. In the integrated world economy we predict the emergence of firms with decentralized corporate hierarchies in which human capital becomes the new stakeholder of the firm.

How is convergence coming about? In the human capital rich North international trade leads to a stronger specialization in the skill intensive monitoring activity resulting in an increase in profits and more monitoring by principals. Eventually, principals decentralize authority to human capital to keep the initiative alive. In the labour rich South, trade leads to a resource reallocation towards the labour intensive sector and to a decline in profits with some firms exiting the market lowering the start-up cost of firms. As there is less at stake, principals in South firms care less about control and more about gaining the initiative of middle managers and hence delegate authority to them. This results in a shift towards decentralization. Thus, in the integrated world economy all principals in both countries decentralize authority to human capital - the emergence of the talent firm - even when no principal in any of the two countries was decentralizing in autarky.

We give conditions under which an organizational equilibrium with decentralized firms is more likely to emerge in the integrated world economy which waits to be put to an empirical test. One main prediction from Marin and Verdier (2011) is that the more different the countries are in terms of

relative factor endowments, the more they will trade with one another (controlling for country size) and thus the more likely is organizational convergence. Furthermore, from Marin and Verdier (2008a) we derive the prediction that the more a country trades with other countries which have firms with decentralized organizations the more likely it is that this country's firms will also decentralize. Hence, it is the volume of trade as well as the type of organizations which dominates in the trading partners' country which matters for convergence.

Firm Heterogeneity and Firm Organization

I turn now to the last insight we gain from incorporating AT into trade. Firm heterogeneity in size and productivity in the same industry has been widely documented in empirical firm level studies (see Bernard et al (2007)). Melitz (2003) and Antras and Helpman (2004) introduce firm heterogeneity into models of international trade by assuming an exogenous ex-ante distribution of potential productivity levels. After entry, competition provides an endogenous mechanism for selection of the equilibrium distribution of productivity within an industry. Trade integration leads to a reallocation to high productivity firms within a sector resulting in an increase in aggregate productivity.

But what determines differences in productivity and size across firms in the same industry in the first place? In Marin and Verdier (2008c) we focus on understanding the sources of firms' ex-ante heterogeneity by asking: Do firms differ in size and productivity in the same industry because they adopt different types of organizations? We introduce organizational choices in a Melitz and Ottaviano (2008) model of trade. Our model simultaneously determines firms' organizational choices and heterogeneity across firms in size and productivity. To understand how firm heterogeneity in the same industry emerges in our model, it is important to recall the distinction between "formal" and "real" authority in Aghion and Tirole (1997). In AT there are two sources of authority: authority allocated by contract - "formal authority", and authority obtained by being better informed -"real authority". Recall also that the manager/agent chooses a high cost project when he has authority in the firm rather than the low cost project that maximizes the firm's profits (which gets chosen when the owner has authority in the firm). In an organizational equilibrium in which the principal/owner has "formal authority" in the firm (which will arise when trade is not too open or very open), there will be firms – depending on the amount of information collection by both the owner and the manager – in which the manager/agent has "real authority". In these firms, the manager implements the high cost project that maximizes his private benefit. Similarly, in an organizational equilibrium in which the manager/agent has "formal authority" (which will arise when the trade shock is at an intermediate level) there will be firms in which the owner has "real authority". In these firms, the owner implements the low cost project that maximizes the profits of the firm. This way, low cost and high cost firms coexist in equilibrium, although the equilibrium is unique in "formal authority".

We provide further interesting results. We show that the firms' organizational choice feeds back to the market place. The toughness of competition becomes a function of who has authority in the firm, principals or agents. Furthermore, we propose two new margins of trade adjustment: the monitoring margin and the organizational margin. Depending on which of these margins dominates, trade liberalization may lead to higher or lower aggregate productivity.

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[i] As discussed by Pol, intra-firm trade - trade within the boundaries of the firm – accounts for about 40 percent of world trade. But among some of the European countries it may account for almost all trade between pairs of countries, such as between Austria and Hungary, see Marin (2006).

[ii] I am not discussing the papers by Antras, Garicano and Rossi-Hansberg (2006, 2008), Caliendo and Rossi-Hansberg (2011), and Marin, Rousova, Verdier (2012) here, since they are not based on incomplete contracting but rather on a theory of knowledge hierarchies which does not belong to the tradition of GH. Marin and Verdier (2009) and Puga and Trefler (2010) use Aghion and Tirole (1997) to explain the organization of multinational firms, and Marin and Rousova (2011) document the internal organization of European multinationals.