

Globalisation, Vertical Linkages, and 'Relational Contracts'

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Abstract

This paper analyses the consequences of trade liberalisation on firms' internal organisation, with formal and informal arrangements. I extend the 'relational contract' approach of Baker, Gibbons, and Murphy (2002) in an open economy set-up. I find that freer trade in final goods increases the quasi-rents from suppliers' specific investments, leading to an increase in outsourcing. When trade liberalisation focuses more on final goods than on intermediates, a reduction in specific suppliers' opportunism implies a rise in the use of 'relational contracts' between firms. This concurs with an observed rise of hybrid organisational arrangements. I also derive testable implications on productivity dispersion, price-cost margins, and demand elasticities.

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1 Introduction

The last twenty years have seen the expansion of informal agreements within vertical relationships. On the one hand, 'hybrid' inter-firm arrangements¹ have spread, often relying on unwritten codes of conduct within close long-term relationships. On the other hand, informal agreements within firm boundaries have also developed, as acknowledged by a vast literature². These intra- and inter-firm informal agreements have been analysed as 'relational contracts'³. Several case studies and typologies of organisational forms have allowed to assess the expansion of such agreements (Ménard, 2004). However, a common cause to the emergence of these diverse business arrangements is yet to be provided.

In the same period, international trade in intermediates has been rising quickly. Yeats (2001) shows that trade in parts and components has grown faster than total trade, amounting to 30% of OECD exports. Campa and Goldberg (1997) report a significant increase of the share of imported inputs from 1974 to 1996 for the US, the UK and Canada. Feenstra and Hanson (1996) show that this growth has affected all manufacturing sectors, and that inputs enter at ever more advanced stages of processing. Importantly, this trade extensively involved multinational companies (henceforth MNCs): almost a third of world trade occurred within MNCs and another third had an MNC as one of the trading partners (Antràs, 2003). This dramatic increase has been interpreted as a new geographic division of the production value chain, known (among others) as 'fragmentation' of the production process⁴. Measuring how much of imported intermediates are incorporated in exports, Hummels, Rapoport, and Yi (1998) find a steady rise of 'vertical specialisation' in the US, the UK and France. Borga and Zeile (2004) report

¹Combining elements of pure markets and hierarchies, these forms include repeated-order procurement, vertical production networks, franchises, collective trademarks, co-operatives, alliances. For all their apparent diversity, these arrangements share common functionalities : co-ordinating efforts without losing the benefit of decentralised action ; preventing free-riding in the use of joint resources ; and imposing a lighter governance structure that reduces the cost of renegotiation.

²Gibbons (2005) provides many examples of both inter-firm informal agreements, including 'implicit contract'-like compensation. Rajan and Wulf (2003) offer recent evidence of 'flatter' hierarchies within US firms, resulting on direct control of division managers by CEOs with greater reliance on informally agreed, long-term, incentive pay.

³Relational contracts may formally be defined as informal, inter-personal, long-term agreements on a predictable way to act according to observed behaviour.

⁴This term has been coined by Ronald Jones and Henryk Kierzkowski. Jones and Kierzkowski (2001), Deardorff (2001), Harris (2001) and Yi (2003) provide theoretical foundations for this phenomenon.

a steady rise of the share of intra-firm exports in total U.S. exports over the 1966-1999 period, from 8 to 15 %, with as much as two-thirds of intra-firm exports being vertical trade. Overall, evidence suggests a structural change in imports going through firms' individual sourcing decisions, rather than some inter-sectoral shift related to comparative advantage.

Interestingly, fragmentation seems to have taken place both within and outside the boundaries of firms. There is a growing interest in quantifying the relative extent of each sourcing mode. Using a panel of US MNCs, Feinberg and Keane (2004) and Borga and Zeile (2004) report a parallel increase in intermediate imports from affiliates and independent suppliers. Numerous case studies also illustrate the ubiquity and magnitude of international outsourcing⁵ of manufacturing and business services.

Overall, evidence suggests that extensive organisational change has paralleled a strong increase of input trade, going through both internal and external trade of MNCs. This paper tries to address these phenomena in a single analytic framework. Could the dramatic fall in trade and communication costs, identified as a catalyst for fragmentation, have also played a role in the observed rise in relational contracting? Could we explain the coexistence of various organisational forms, in particular hybrid and non-hybrid, within the same sectors? The ambition of this paper is to go some way towards answering these questions.

There is now an abundant research literature explaining the twin rise of input trade and international subcontracting⁶. In McLaren (1999, 2000) and Grossman and Helpman (2005), firms' boundaries are determined the extent of upstream gains from specialisation relative to search and contractual frictions. 'Market thickness' externalities imply multiple firm structure equilibria. Antràs and Helpman (2004) predict organisational and location choices according to the relative intensity of production in head-quarter services or manufactured inputs. Marin and Verdier (2003, 2005) find a non-monotonic

⁵To avoid confusion, 'outsourcing' is defined in this paper as subcontracting the production of inputs to independent suppliers, *either* at home or abroad (domestic or international outsourcing). Prominent examples may be found in a survey by The Economist (11 November 2004 issue), or in industry case studies by the Global Value Chain Initiative, notably in the textile, automobile, pharmaceutical, and electronics industries. To cite just one example, Gereffi (1999) studies the industrial upgrading of textile and apparel commodity chains in Asia. Interestingly, he finds that learning mechanisms both between and within firms played a crucial role in gradually shaping vertical relationships in that sector.

⁶Gattai (2005) and Spencer (2005) survey and classify this literature according to which theories of the firm, and especially on which determinants of the make-or-buy choice, these papers have relied.

relationship between fiercer world market competition and the degree of delegation in organisations. In their general equilibrium model, strategic complementarity between organisational choices leads to multiple equilibria, predicting a convergence of national corporate cultures resulting from globalisation. Overall, these papers provide interesting and complimentary analytical treatments of organisational choice. However, they all focus on formal definitions of firms, neglecting the existence of informal agreements⁷.

Reviewing theories of firm boundaries, Holmström and Roberts (1998) provide three interesting insights related to our question, namely that the allocation of property rights is not relevant to all organisational decisions, that it is sensitive to more than marginal incentives to invest, and that it may be complemented by repeated interaction in the mediation of vertical relationships. Following this line of research, Baker, Gibbons, and Murphy (2001) and Baker, Gibbons, and Murphy (2002), henceforth collectively BGM, integrate hybrid inter-firm and intra-firm relationships in a single model, with a four-way choice between integration or outsourcing, with or without informal agreements viewed as self-enforced 'relational contracts'.

Lastly, there are a few papers discussing the impact of informal agreements on trade volumes. For instance, Spencer and Qiu (2001) model inter-firm keiretsu relationships to assess their supposed trade-restricting effect. Their model rationalises the reliance of Japanese exporters on (inter-firm) keiretsu arrangements in a two-country open economy. However, they do not analyse the formal and informal aspects of organisational choice in a unified framework. In another strand of literature, group membership and ethnic ties have been put forward as a determinant of trust in business relationships, stimulating trade⁸. But these authors tend to emphasise 'homogenous' ethnic groups and similarities among group members, rather than identify distinctive characteristics of agents entering such relationships.

This paper builds on BGM's infinitely-repeated version of the static Grossman and Hart (1986) and Hart and Moore (1990) models, that allows for repeated interaction. This setting makes it possible to study a four-way sourcing choice, between in-house production or subcontracting, with or without 'relational contracts' on input quality. The sustainability of relational contracts will be an instance of the Folk theorem. A first contribu-

⁷An exception is McLaren (1999), where 'handshakes' constitute an alternative to formal vertical agreements. He shows that strategic complementarities may exist in the choice *between* formal and informal agreements. However, this symmetric model cannot explain the characteristics of firms entering either type of agreement, nor does it consider formal outsourcing. Finally, it does not give a proper treatment of trade liberalisation.

⁸See Rauch (2001) for a survey.

tion of this paper is to give an endogenous value to the outside option value of specific suppliers, by modelling a parallel standard (i.e. non-specific) input market. In this model, the allocation of property rights affects marginal incentives to invest, a la Grossman-Hart-Moore, as well as incentives to honour relational contracts. Basically, in-house production is ridden with under-investment for fear of hold-up. Outsourcing restores investment incentives, but implies inefficient efforts from the supplier to raise her outside option. Relational contracts secure optimal investment, but only if the pay-offs from deviating to short-term outsourcing or integration are small.

A second contribution of this paper is to study how organisational choice is affected by trade liberalisation in the final and intermediate goods sectors. A larger final market magnifies profit differentials between diversely productive firms, which raises the reward to a specific investment. This 'market size effect', in turn, raises the propensity of outsourcing. In addition, specific suppliers' outside option should decrease. Indeed, because globalisation induces rationalisation in the final sector, the number of standard input buyers decreases by more than the increase in each input buyer's demand. This effect may be termed a 'relational stability effect', as the fall in the outside option raises the propensity to resort to long-term informal agreements.

Introducing trade liberalisation in intermediates changes the picture. Easier access to cheaper foreign standardised inputs mitigates our 'market size effect'. In addition, it also has a double effect on outside options, directly depressing the unit price of inputs, but increasing downstream entry and therefore aggregate demand for standard inputs. Finally, we find that when trade liberalisation focuses on final goods more than on intermediates, it should increase the propensity to resort to independent suppliers, particularly through hybrid organisational arrangements. We also perform numerical simulations to confirm this result.

To the best of my knowledge, the interplay between formal contracts and informal agreements has not yet been studied in an open-economy model. In doing so, I am able to relate the reported twin rise in intra- and inter-firm informal agreements and intermediate trade. I show that larger product market size and exposure to international upstream competition work as driving forces in the rise of hybrid organisations. This interplay also yields original predictions on prevalent organisational forms. In addition, the model relates firms' participation in trust-based relationships to firm characteristics, notably suppliers' productivity in relationship-specific investments.

In the next section, we describe the closed-economy version of the model. In Section 3, we study in a multi-country model how the liberalisation of international trade in final and intermediate goods affects organisational

choice in the industry. Section 4 derives empirically testable implications of the model on the effects of trade liberalisation at both the firm and industry levels. Finally, Section 5 summarises the results and concludes.

2 The Basic Model in a Closed Economy

In this section, we apply in a simplified closed-economy setting BGM's main result on organisational choice with formal and informal agreements. We derive optimal organisational forms in a population of heterogeneous firms.

2.1 Final Product Market

We model the downstream sector as a monopolistically competitive sector with endogenous mark-ups, *à la* Ottaviano, Tabuchi, and Thisse (2002). A critical implication of this modelling choice is that market size affects the size of the quasi-rents from specific vertical relationships, and hence organisational decisions.

The representative final consumer's preferences on a continuum of goods of mass N are given by:

$$U(\{y_i\}, y_0) = y_0 + \alpha \int_0^N y_i di - \frac{\eta}{2} \left[\int_0^N y_i di \right]^2 - \frac{\beta}{2} \int_0^N [y_i]^2 di$$

where α , η and β are all positive⁹. Assuming good 0 is produced competitively with one unit of labour, and taking it as the numeraire, implies that wages should equal unity. Hence the inverse demand function for variety i may be written as:

$$p_i = \alpha - \beta y_i - \eta \int_0^N y_i di$$

Summing over available varieties, this yields a residual demand curve for each producer:

$$y_i(p_i, \bar{p}) = \frac{1}{\beta} \left(\alpha - p_i - \frac{\eta N}{\eta N + \beta} (\alpha - \bar{p}) \right)$$

⁹ η represents how much consumers value product diversity. A value equal to zero amounts to (perceived) homogenous goods.

The average price \bar{p} is treated as a constant by each single-variety producer, consistent with the continuum-of-firms assumption. We may now compute for each variety the price, output, and profit:

$$p_i(c) = \frac{A(\bar{p}, N) + c}{2} \quad (1)$$

$$y_i(c) = \frac{L}{\beta} \left(\frac{A(\bar{p}, N) - c}{2} \right) \quad (2)$$

$$\Pi_i(c) = \frac{L}{\beta} \left(\frac{A(\bar{p}, N) - c}{2} \right)^2 - f \quad (3)$$

with

$$A(\bar{p}, N) = \frac{\alpha\beta + \eta N\bar{p}}{\eta N + \beta} \quad (4)$$

where L denotes population size and labour income. Using (1) to compute the average industry price and plugging it into (4) yields

$$A(\bar{c}, N) = \frac{2\alpha\beta + \eta N\bar{c}}{\eta N + 2\beta}$$

where \bar{c} denotes the average variable cost over all existing downstream producers. Note that $A(\bar{c}, N)$ is directly increasing in \bar{c} and decreasing in N . Therefore the price elasticity of demand is not constant and increases with the number of available varieties, N .

We assume free entry in the downstream sector. As we will shortly explain, three technologies are available to downstream firms, allowing them to produce at fixed cost f and marginal costs c_L, c_H or k , with

$$c_L < c_H < k$$

The total number of varieties, N , is determined by a zero-profit condition on the least efficient producers.

$$\frac{L}{4\beta} [A(\bar{c}, N) - k]^2 - f = 0 \quad (5)$$

Solving for the free-entry equilibrium number of firms yields:

$$N(\bar{c}, L) = 2 \frac{\beta \alpha - k - \sqrt{\frac{4\beta f}{L}}}{\eta \left(k + \sqrt{\frac{4\beta f}{L}} - \bar{c} \right)} \quad (6)$$

$$A(k, L) \equiv A(\bar{c}, N(\bar{c}, L)) = k + 2\sqrt{\frac{\beta f}{L}} \quad (7)$$

Importantly, in this monopolistic competition model, $N(\bar{c}, L)$ is increasing and concave in L ¹⁰.

Finally, we may rewrite profits at the free-entry equilibrium as:

$$\Pi_i(c) = \frac{L}{4\beta} \left(k - c + 2\sqrt{\frac{\beta f}{L}} \right)^2 - f = 0 \quad (8)$$

$$\Delta\Pi \equiv \Pi(c_L) - \Pi(c_H) = \frac{L}{4\beta} (c_H - c_L) \left(2k - c_H - c_L + 4\sqrt{\frac{\beta f}{L}} \right) \quad (9)$$

We now endogenise technological differences between firms as consequences of organisational decisions.

2.2 The Vertical Relationship

We now describe vertical relations between input suppliers from sector u (upstream) and buyers from the monopolistically competitive sector d (downstream). The latter produce a final good using one unit of input per unit of output. Sourcing these inputs may be achieved either by means of specific relationships with a particular supplier, or anonymous transactions on a standardised input market. A standardised input enables the downstream firm to produce at constant marginal cost k . By contrast, a specific input implies a random but strictly lower marginal cost that may take value c_H , or c_L , if some specific effort has been successfully made by the supplier.

¹⁰In both the Krugman (1980) representative firm and the Melitz (2003) heterogeneous firm monopolistic competition models with CES utility, the price-elasticity of demand remains constant. Consequently, an increase in country size leaves individual prices and (expected) output invariant, simply allowing for a proportional increase in the number of created varieties. By contrast, in this model, the price-elasticity of demand increases with the number of available varieties. Therefore, profits rise in proportion to country size only in the short run, as in (5), while in the long-run the consecutive increased entry depresses profit margins. Thus a given increase in country size causes less-than-proportional increases in the number of firms.

Another important assumption made throughout is that all suppliers and buyers are risk-neutral, and that utility is perfectly transferrable between parties through an ex ante upfront payment.

We model the upstream sector as a continuum of potential suppliers of mass $\gamma^{max}r^{max}$, indexed by their idiosyncratic cost of exerting a specific effort, γ , as well as their subjective discount rate r . The pool of suppliers is assumed to be large in the sense that $\gamma^{max} > N$. This ensures that all downstream firms can enter specific (one-to-one) relationships with suppliers, if they choose to do so. A sufficient condition on parameters is:

$$f \geq \frac{L}{4\beta} \left(\frac{\alpha - k}{1 + \frac{\eta}{2\beta}\gamma^{max}} \right)^2 \quad (\text{Assumption 1})$$

In other words, the fixed costs required to produce a variety of the final product must be sufficiently large, compared to the size of both the pool of suppliers and the final market.

2.2.1 The specific relationship

Specific relationships are modelled in an incomplete contract set-up, essentially an infinitely-repeated version of the Grossman and Hart (1986) model. Over time, hold-up problems may be alleviated by the existence of self-enforcing contracts. To make things simple, consider a vertical relationship involving only one specific asset and one specific effort. The specific asset may either be owned by U ('outsourcing') or by D (backward integration, or 'employment'). In these specific relationships, two types of discrete efforts may be exerted by U :

- a specific effort e_s , to enhance the quality of the supplied input, and allow D to produce at cost c_L with probability q , c_H otherwise. It costs the upstream party γ .
- a non-specific effort e_{ns} to adapt the input to the standard input market. This recycling effort costs the upstream party Γ .

Efforts¹¹ are not observable in the model. Outcomes are observable but not contractible. There is a hold-up problem in the sense that D may refuse to pay party U even if it made an effort to fine-tune the input's

¹¹The specific effort may consist in acquiring information on the specific needs of its partner to customise the design of the input, training the partner's workforce to use the input, or improve delivery delays. The non-specific effort may consist in acquiring information on the standard market, certifying the input's quality, or enhancing its compatibility.

specification. This deters party U from exerting the specific effort in the first place. However, ex post efficient renegotiation is available, with an outcome modelled as the Nash bargaining solution with equal weights $\frac{1}{2}$. D has no outside option. Note that a plausible outside option for D may have been to produce standard inputs in-house, but because of free entry this would lead to zero profits. Hence this assumption is innocuous. U , unlike D , has the option to sell its recycled inputs for some value V .

Thus far, we have been formulating an 'unproductive multi-tasking problem' in a static Grossman-Hart-Moore set-up: property rights confer residual rights of control that should limit the severity of under-investment. Following BGM, we extend this approach in a repeated interaction framework, allowing for self-enforceable informal agreements ('relational contracts') between parties, in order to solve the hold-up problem. More specifically, the timing of the game between parties U and D is the following:

1. U and D decide on an allocation of property rights (integration or contracting out) is chosen, with the appropriate upfront payments, and on whether to agree on a relational contract.
2. then the relationship follows a repeated two-stage procedure: in the first stage, U chooses effort levels. Then the value of c is observed by both parties. In the second stage, D either gives U her informally agreed payment ('relational contract'), or re-negotiates a price ('spot outsourcing'), or seizes the input and pays nothing¹² ('spot employment').

To summarise, under 'employment', too little effort is made by U for fear of hold-up ; under 'outsourcing', she exerts some efforts that are of no value to the partnership. By contrast, self-enforcing relational contracts help achieve the joint-profit maximising efforts, by providing the correct incentives to pay and exert specific efforts. Due to future gains from cooperation, parties circumvent the static hold-up problem stemming from contract incompleteness. The initial allocation of property rights determines the viability of such relational contracts.

¹²The supplier is paid nothing with 'employment' because of the simplifying assumption of fully non-contractible tasks. Indeed, what we are interested in is the difference in payments across organisational forms, rather than their absolute levels. However, the model is robust to the introduction of contractible tasks with a corresponding fixed salary.

2.2.2 The market for standardised inputs

The (anonymous) spot market for standardised inputs is assumed to be perfectly competitive. Suppliers sell inputs at the given market price k , which becomes downstream producers' marginal cost. Thanks to price transparency, a specific supplier who has made the non-specific effort may immediately and costlessly know the outside option value of her inputs. She may sell these inputs at market price k , incurring no additional production costs, hence her outside option equals:

$$V = ky(k)s(k) = k \sqrt{\frac{f}{\beta} \mu L} \underbrace{\left(\frac{G(N) - G(q\Delta\Pi)}{1 - G(q\Delta\Pi)} \right)}_{s(k)}$$

where $s(k)$ denotes the size of the upstream firm's hypothetical customer base on the standard input market. This is equal to downstream firms' demand for standard inputs divided by the mass of suppliers outside a specific relationship. Obviously this ratio depends on k , and will be endogenously determined (see Appendix 1 for a derivation). $G(\cdot)$ denotes the cumulative distribution function of fixed costs γ in the upstream industry.

We now turn to the determination of optimal efforts according to the chosen organisational form.

2.3 The four-way organisational choice for an individual firm

Each specific vertical partnership is faced with a choice between four alternatives, depending property rights and informal agreements. 'Outsourcing' with a relational contract will be termed 'Relational Outsourcing', as opposed to 'Spot Outsourcing'. Similarly, 'Relational Employment' will be opposed to 'Spot Employment'. Besides, non-specific relationships will be termed 'anonymous' transactions.

2.3.1 Organisational choice for a typical vertical partnership

Organisational choice will be determined by the solution to the infinitely-repeated game between U and D . For each firm, this solution will depend on endogenous $\Delta\Pi$ and V , and exogenous firm characteristics γ and r .

In Appendix 1, we give a characterisation of all possible equilibria of this game. Solving the multi-stage game makes it possible to construct a decision rule $R(\cdot)$ assigning an optimal organisational outcome to a particular fixed cost of exerting the specific effort γ , and the discount rate

r . Threshold values γ_S and γ_{STD} are also defined in the Appendix. This allows us to characterise organisational choice in the closed economy:

Proposition 1 (Baker, Gibbons, and Murphy, 2002) *At the subgame-perfect equilibrium, the organisational choice of each vertical pair may be summarised according to the cost of the specific effort and the time preference. More specifically:*

- If $\gamma \in [0, \gamma_S]$ then $R(\gamma, r) = \begin{cases} SO & \text{if } r > \bar{r}_1^{RO}(\gamma) \\ RO & \text{if } r \in [\bar{r}_1^{RE}(\gamma), \bar{r}_1^{RO}(\gamma)] \\ RO \text{ or } RE & \text{if } r < \bar{r}_1^{RE}(\gamma) \end{cases}$
- If $\gamma \in [\gamma_S, \gamma_{STD}]$ then $R(\gamma, r) = \begin{cases} SE & \text{if } r > \bar{r}_2^{RO}(\gamma) \\ RO & \text{if } r \in [\bar{r}_2^{RE}(\gamma), \bar{r}_2^{RO}(\gamma)] \\ RO \text{ or } RE & \text{if } r < \bar{r}_2^{RE}(\gamma) \end{cases}$
- If $\gamma \in [\gamma_{STD}, \gamma^{max}]$ then inputs are supplied through the standardised input market.

Proof. See Appendix 1. ■

Taking the cost of effort and the time preference rate as firm characteristics, the breakdown of the industry by organisational forms may be summarised in Figure 1.

One comment is now in order. In this model, the boundaries of firms are responsive to more than investment incentives. Consider these firms with fixed costs in the range $[\gamma_S, \gamma_{STD}]$. In the absence of relational contracts, employment would be the preferred mode of organisation, as in a standard Grossman-Hart-Moore static model. But whenever the time preference rate allows for relational contracts, outsourcing is found to be optimal. In effect, outsourcing ensures that renegeing on the informal agreement is too costly for the upstream party. This finding suggests another rationale for outsourcing, when vertical relationships are expected to be long-term.

2.3.2 Simple comparative statics

Finally, we perform here a simple comparative exercise that will be helpful to disentangle the effects of trade liberalisation in the following section. We consider how organisational decisions are affected by changes in fundamentals of the model that affect $\Delta\Pi$ and V . Recall that each producer, being of negligible mass, neglects the feedback effects of its own choice on the industry average price and cost.

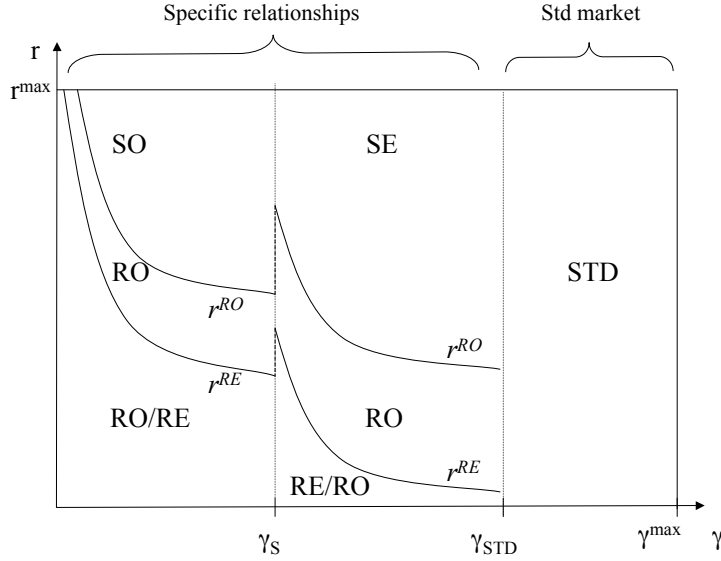


Figure 1: Composition of the upstream sector by organisational arrangement

Corollary 1 (*Comparative statics*) *An exogenous rise in profit differentials causes a rise in specific relationships, in particular outsourcing as opposed as employment, and relational contracts as opposed as 'spot' relationships. An exogenous rise in U 's outside option causes some relational outsourcing relationships to break, while it leaves other relationships unchanged.*

Proof. By Equations (22) and (23) a rise in $\Delta\Pi$ leads to a rise in $\bar{r}_1^{RO}(\gamma)$, $\bar{r}_2^{RO}(\gamma)$, $\bar{r}_2^{RE}(\gamma)$ and hence by Proposition 1 to a rise in γ_S and γ_{STD} . By Equations (22) and (23) a rise in V causes a fall in $\bar{r}_1^{RO}(\gamma)$, $\bar{r}_2^{RO}(\gamma)$, leaving other conditions unchanged. Hence by Proposition 1 it should lead to a fall in relational outsourcing to the benefit of spot employment or outsourcing. ■

We are now ready to fully explore the consequences of trade liberalisation.

3 Organisational choice in the world economy

We now analyse the consequences of trade integration on organisational choice in a μ -country version of our model. We begin by focussing on perfect trade integration in the final goods sector between an arbitrary number μ of symmetric economies, creating a world economy of size $L^* = \mu L$. In the following subsection, we introduce an asymmetry in the production of standard intermediate goods. With perfect competition, trade liberalisation will result in complete specialisation in standardised intermediates, with a world price equal to $k^* = \lambda k$, with λ between zero and one. Increases in μ will symbolise trade liberalisation of final markets, while decreases in λ will represent trade liberalisation in intermediates. This admittedly simple treatment of trade integration will help us focus on its consequences for corporate organisational choice.

3.1 Trade integration between symmetric economies

We will examine symmetric trade integration as the replication of μ identical domestic economies similar to the one described in the last section¹³, i.e. $\lambda = 1$. Hence analogues of Equations (1)-(3), (6)-(7) and (9) hold for $L^* = \mu L$. The free-entry number of downstream firms and varieties and the profit differential both increase after trade liberalisation ; by contrast, price-cost margins (being increasing functions of A) decrease. This may be termed the competition effect of freer trade.

Trade liberalisation also affects aggregate variables through organisational decisions. Key determinants of organisational choice will be variables $\Delta\Pi^*$ and V^* .

$$\Delta\Pi^*(\mu) = \frac{\mu L}{4\beta}(c_H - c_L) \left[2k - c_H - c_L + 4\sqrt{\frac{\beta}{\mu L}f} \right] \quad (10)$$

$$V^*(\mu) = k\sqrt{\frac{f}{\beta}}\mu L \left(\frac{G(\frac{N^*(\mu)}{\mu}) - G(q\Delta\Pi^*(\mu))}{1 - G(q\Delta\Pi^*(\mu))} \right) \quad (11)$$

We will show how globalisation leads to organisational change through a *market size* effect and through a *relational stability* effect. We will try to simplify the exposition by artificially separating these effects, temporarily holding the outside option value of inputs constant while stating the market

¹³Starred variables will consistently denote world analogues of autarkic variables.

size effect. We will later see under which conditions the latter relational stability effect reinforces the former market size effect.

3.1.1 Market size effect

An increase in the size of the final market magnifies profit differentials between diversely efficient firms. Quantities increase more than proportionately for efficient firms, and so do profits. If specific efforts are necessary to gain access to more efficient technologies, then their marginal product should increase as a result of globalisation. This simple market size effect affects the pattern of organisational choice, as explained in the following Lemma.

Lemma 1 *Holding U 's outside option constant, symmetric trade liberalisation implies:*

- (a) *a rise in specific vertical relationships;*
- (b) *a rise in Outsourcing;*
- (c) *a rise in the propensity to resort to relational contracts.*

Proof. See Appendix. ■

Since the costs of specific efforts are left unchanged by globalisation, a rise in profit differentials increases the proportion of firms being able to exert (part a), or effectively exerting these efforts (part b and c). The latter may be induced to do so by the allocation of residual rights of control (part b) or by self-enforcing agreements between trusting partners (part c).

The crucial mechanism at work is the efficiency-enhancing competition effect of trade liberalisation. An increase in final market size results in an increased elasticity of demand for each variety. As more efficient producers set lower prices, market share differences with less efficient rivals are magnified. Because of this intra-sectorial re-allocation, specific investments yields a higher expected return. This leads to organisational change.

In graphical terms, a move towards trade liberalisation - an increase in world market size - shifts all frontiers between organisational forms towards the north-east, and both cutoffs γ_S and γ_{STD} to the right.

3.1.2 Relational stability effect

We now consider the impact of trade liberalisation on the stability of relational contracts through the change in specific suppliers' outside options. Symmetric integration has two opposite effects on specific suppliers' outside options. On the one hand, access to a larger world market increases the demand for standard inputs of each individual producer. This '*individual demand effect*' raises upstream firms' outside option. On the other hand, the free-entry number of producers in the world economy may not increase in proportion to the number of suppliers. In particular, when globalisation leads to significant economies of scale, the number of available varieties increases less than proportionally to the increase in market size. This '*production scale effect*' should cause a decrease of suppliers' outside option.

Hence we predict a non-monotonic effect of trade liberalisation on this outside option:

Lemma 2 *Trade liberalisation has a non-monotonic effect on the outside option value of specific inputs. This value decreases at the beginning of the integration process, then increases as the integrated world market reaches a certain scale. Ultimately, this implies a rise in the propensity of Relational Outsourcing at the expense of Spot Outsourcing and Spot Employment.*

Proof. See Appendix ■

Symmetric integration implies more competitive pressure on standard input producers. The number of rival suppliers remains the same, while the number of standard input buyers shrinks, reducing each supplier's market share. However, the individual demand of each buyer rises with integration.

When the market share effect offsets the individual demand effect, the value of specific inputs outside the relationship diminishes. In purely formal (Spot) relationships, this value is simply transferred between parties, therefore it does not affect overall efficiency. By contrast, it certainly affects suppliers' temptation to renege on relational contracts, and hence their feasibility. In other words, upstream competition disciplines specific suppliers by deterring opportunistic ex post behavior.

At the beginning of the integration process, the larger number of downstream firms translates into a larger market for standardised inputs. This rise of suppliers' outside option reduces suppliers' payoff from honoring their relational contracts. However, after a certain level of integration, the relational stability effect must be smaller than the market size effect. This

implies corporate re-organisation, in the direction of increased outsourcing, particularly with long-term informal agreements.

We may now summarise our findings on the effects of symmetric trade integration in the following Proposition:

Proposition 2 *Trade integration of symmetric economies provides economic incentives for corporate re-organisation. It should lead to an increase in specific vertical relationships, and an increase in outsourcing relationships. Furthermore, it has non-monotonic effects on the sustainability of long-term informal agreements:*

- *At early stages of globalisation, the relational stability effect may dominate the market size effect, resulting in fewer long-term informal agreements.*
- *When globalisation reaches some critical scale, the market size effect dominates the relational stability effect, resulting in more long-term agreements between firms.*

Proof. See Appendix ■

The overall effect of symmetric trade integration on the composition of the industry by organisational forms is illustrated in Figure 2, for the case of substantial trade integration.

We pause here to comment on this Proposition. First, we have highlighted the importance of global downstream competition in shaping organisations, by affecting the size of quasi-rents accruing from specific investments.

Second, we predict that organisational consequences of trade integration should depend on the scale of the integration process. Small-scale integration should provide new opportunities for specific suppliers to disrupt existing relationships. With large-scale integration, however, the rationalisation of the downstream sector should shrink the standard input market and make upstream competition more stringent, discouraging suppliers' opportunism.

Third, for a given scale of trade liberalisation, its effect will vary for each country, according to its size. Large countries integrating with similar but smaller countries should first see an increase in intra-firm trade rather than more intensive arms' length trade. In addition, corporate re-organisation following liberalisation should be more intense in smaller economies. Another implication is that multilateral trade integration (between a large number of countries) should lead to convergence in organisational forms.

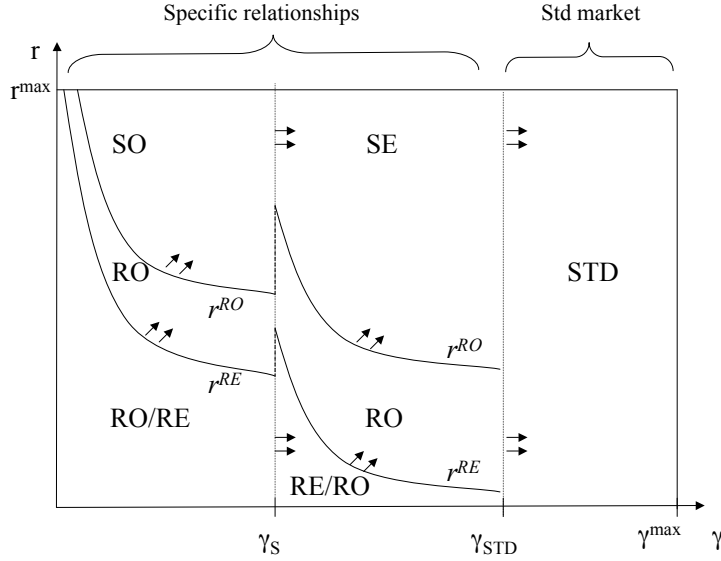


Figure 2: Large-scale symmetric integration and corporate reorganisation in the upstream industry

Finally, we should point at the absence of trade frictions in this simple model. Despite the obvious limitation that the proportion of cross-border relationships is indeterminate, the model still suggests that imported inputs should become less standardised over the course of globalisation. This concurs with previously cited evidence on the growing degree of sophistication in imported inputs. But this also calls for introducing some asymmetry in our model.

3.2 Trade integration between asymmetric countries

Symmetric trade liberalisation provides a useful benchmark. Still, we would like to understand how the availability of cheaper imported intermediates affects the pattern of organisation in the home country.

To keep things simple, we restrict country differences to the costs of producing standardised inputs. Denote by $k^* = \lambda k$ this world price, with $0 < \lambda < 1$. We also suppose, without loss of generality¹⁴, that $c_H < k^* < k$.

¹⁴If $k < c_L$ the specific effort of input customisation yields no quasi-rents. If $k \in [c_L, c_H]$,

Because of perfect competition, the world price of standard inputs should equal the most efficient producer's marginal cost. In some countries, freer trade should therefore lead to the exit of some producers. We will denote by m the number of countries experiencing such exit, with $m < \mu$, and from now on will adopt the viewpoint of one of these countries.

The consequences of trade liberalisation for organisational choice will depend on its extent. This will be adequately summarised by parameters μ , the ratio of a country's size to the world's size, and λ , the ratio of the autarkic standard input price to the world price. To see this, let us express the profit differential and U 's outside option as functions¹⁵ of μ and λ .

$$\Delta\Pi^*(\lambda, \mu) = \frac{\mu L}{4\beta}(c_H - c_L) \left[2\lambda k - c_H - c_L + 4\sqrt{\frac{\beta}{\mu L}f} \right] \quad (12)$$

$$V^*(\lambda, \mu) = \lambda k \sqrt{\frac{f}{\beta}\mu L} \underbrace{\frac{\mu}{\mu - m(\lambda)} \left(\frac{G(\frac{N^*(\lambda, \mu)}{\mu}) - G(q\Delta\Pi^*(\lambda, \mu))}{1 - G(q\Delta\Pi^*(\lambda, \mu))} \right)}_{s^*(\lambda, \mu)} \quad (13)$$

where $N^*(\lambda, \mu)$ is the free-entry number of downstream firms on the world market, and $m(\lambda)$ is the number of countries where the autarky price of standard inputs exceeds the world price.

As in the symmetric model, it is helpful to disentangle a quantity and a relational stability effect.

3.2.1 Market size effect

Again, analogues of Equations (1-3), (6-7) and (9) hold for a world market size L^* and a world standard input price $k^* < k$.

It is easily seen from Equation (12) that trade integration has now two conflicting effects on profit differentials. As before, an increase in world market size yields a positive *market size effect*. In addition, cheaper imported intermediates now make standard input buyers more efficient. This results translates into a negative *downstream market share reallocation effect* for specific input users. Which effects dominates on profit differentials

specific investments yield risky quasi-rents, potentially negative rents w.r.t standard input production. The (interesting) study of such investment uncertainty goes beyond the scope of this paper.

¹⁵The expression for the profit differential should look familiar. The expression for the outside option less so, because of the reduction of potential upstream competition due to the exit of home producers.

depends on the extent of trade liberalisation in intermediates. A modest fall is consistent with rising profit differentials, as shown by the following condition.

Lemma 3 *The effect of trade liberalisation on profit differentials depends on the world price of standard inputs. Starting from the autarky price, the fall must be low enough, in the sense that*

$$|d\lambda| \leq \frac{2\beta(c_H - c_L)}{\mu k L} \left(\frac{L}{4\beta}(2\lambda k - c_H - c_L) + \sqrt{\frac{L}{\beta}} f \frac{1}{2\sqrt{\mu}} \right) d\mu$$

for profit differentials to rise after liberalisation. In that case, a result similar to Lemma 1 applies. Otherwise, profit differentials fall.

Proof. See Appendix. ■

Obviously, this condition was automatically met in the symmetric integration case, as it corresponds to the case $d\lambda = 0$. When the fall in the standard input price is limited, in the sense that this condition holds, then Lemma 1 still applies: the market size effect raises the proportion of informal and outsourcing relationships. Put another way, we should expect the market size effect to be at work when trade liberalisation is stronger for final goods than for intermediates.

3.2.2 Relational stability effect

We now turn to our relational stability effect. Perfect trade integration of the standard input market implies that the world competitive price must equal $k^* = \lambda k$. Therefore domestic standard input producers must exit. However, domestic specific input producers could virtually produce, were their specific relationship to break. The outside option of their specific inputs does not vanish as trade in intermediates is liberalised. Thus imports of standard inputs have interesting implications on the organisational design of specific relationships.

Consider the value of suppliers' outside option after liberalisation by rewriting Equation (13), defining $s^*(\lambda, \mu)$ as the market share of an active supplier.

$$V^*(\lambda, \mu) = \lambda\sqrt{\mu} \left(k\sqrt{\frac{fL}{\beta}} \right) s^*(\lambda, \mu)$$

Trade liberalisation in final goods (captured by a rise in μ) has the same qualitative effects as in the previous subsection. Besides, trade liberalisation

in intermediate goods (captured by a fall in λ) also has a non-monotonic effect on specific suppliers' outside options.

Notice in the above expression that at a free entry equilibrium, the individual demand for standard inputs will be independent of their price. Therefore, the overall effect of a decrease in λ may be decomposed into a direct effect and an indirect effect. The direct effect comes from a lower price actually paid for each demanded input, proportionally reducing the outside option. The indirect effect comes from an increase in each supplier's market share. To understand the latter effect, we may decompose it further into two effects: a pro-competitive effect of cheaper inputs, raising the number of final producers N , and hence the potential market for standard inputs; and a depressing effect of cheaper inputs on quasi-rents in specific relationships, raising the proportion of standard input buyers in the downstream sector. Straightforward calculations, using world analogues of Equations (6) and (7), confirm that $s^*(\lambda, \mu)$ is decreasing in λ .

Summarising, and comparing with the symmetric model, liberalising input trade has two additional effects on the outside option: a *depressing effect on the input price k^** itself, and a *positive effect on any supplier's market share $s^*(\lambda, \mu)$* . Which effect dominates depends on the elasticity of a supplier's market share $s^*(\lambda, \mu)$ with respect to λ less than unity, as may be seen from:

$$\frac{\partial V^*(\lambda, \mu)}{\partial \lambda} = k \sqrt{\frac{f}{\beta} \mu L} \left[s^*(\lambda, \mu) + \lambda \frac{\partial s^*(\lambda, \mu)}{\partial \lambda} \right]$$

If this elasticity is lower than one, then the competitive pressure of imported standard inputs should reinforce the effect of large-scale final sector liberalisation on the expansion of relational outsourcing in the home country.

To conclude this discussion, trade liberalisation in the final goods sector and in the intermediate goods sector are likely to have contradictory effects on organisational change. We summarise our findings in the following Proposition:

Proposition 3 *The policy mix between trade liberalisation in final and intermediate goods matters for the pattern of corporate re-organisation:*

- *if trade liberalisation focuses on the final sector (modest fall in input prices relative to the market size increase), then specific relationships will spread in the industry. Outsourcing, in particular relational outsourcing, will expand.*

- *if trade liberalisation focuses on the intermediate sector (strong fall in input prices relative to the market size increase), then specific relationships, in particular outsourcing will decay in the industry. More transactions will go through the market for standardised inputs. The effect on relational contracts will be indeterminate.*
- *if trade liberalisation does not focus on one particular sector, the pattern of re-organisations will be indeterminate.*

Proof. See Appendix 2. ■

This result calls for a few comments. First, the Proposition reveals a role for trade liberalisation to influence the pattern of corporate re-organisation. Remarkably, the literature reviewed in the Introduction has relatively little to say about the policy mix between trade liberalisation in the final and intermediate sectors. Indeed, most theoretical models discuss organisational choice in an perfectly integrated world economy, possibly for reasons of tractability¹⁶. By contrast, we find a role for trade policy by making outside options endogenously depend on input trade integration.

Second, variations in λ could be interpreted not only as the extent of input trade integration, but also at the type of trading partner with whom integration has been achieved. Trade with low-wage countries selling labor-intensive standard inputs would then reduce the amount of specific outsourcing and increase the anonymity of input transactions. Interestingly, relational contracts should be on the rise, compared to autarky, despite increased pressure from standard imports competition.

Finally, this result could be related to Spencer and Qiu (2001), who study the effect of keiretsu vertical relationships on input trade. In particular, this is reminiscent of their finding that, despite the availability of cheaper foreign inputs, hybrid vertical relationships could develop between home firms, without any loss of efficiency. As in the present paper, key to the argument is the existence of quasi-rents accruing from specific investments, that exclude imports of cheaper but non-specific inputs.

¹⁶To be fair, two papers deal with one instrument or the other. Grossman and Helpman (2004) show that falling intermediate trade costs should favour integration, when outsourcing is performed by high-productivity firms, or outsourcing, when it is performed by low-productivity firms. McLaren (2000) predicts that symmetric integration should 'thicken' upstream markets and create the possibility of an all-outsourcing equilibrium.

3.3 Selected results from numerical simulations

How strong are the distinct effects on organisational change of trade liberalisation in intermediates and in final goods? First, we will examine the effects of changes in λ and μ on the prevalence of each type of organisational form, using open-economy analogues to Equations (24) to (27) from the Appendix. A second simulation exercise will consist in varying the dispersion of upstream productivity. This will allow us to assess how much heterogeneity in the ability to perform specific efforts may explain heterogeneity in organisational forms. The set of parameters used in both exercises is described in the Appendix.

3.3.1 Relative prevalence of organisational forms

A first way to assess the effect of trade liberalisation on organisational choice is to compare the repartition of organisational forms in three scenarios: autarky, quasi-symmetric integration (where an infinitesimal fall in input trade barriers causes the exit of domestic producers), and asymmetric integration.

Figures 3, 4, and 5 represent this repartition by displaying, *from left to right, the proportion of Spot Outsourcing, Spot Employment, pure market exchange of Standard inputs, and Relational contracts.*

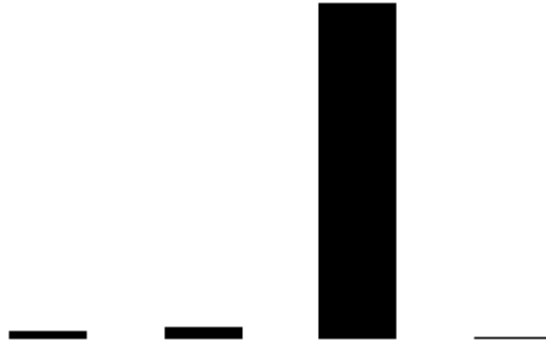


Figure 3: Repartition of organisational forms in autarky ($\lambda = 1, \mu = 1$)

Compared to autarky, 'quasi-symmetric' integration increases the scope for specific outsourcing as opposed to integration and to pure market exchange. But the major effect of such liberalisation should be on the use of relational contracts.

Compared to quasi-symmetric integration, 'asymmetric' integration strongly reduces the proportion of relational contracts within the industry. By con-

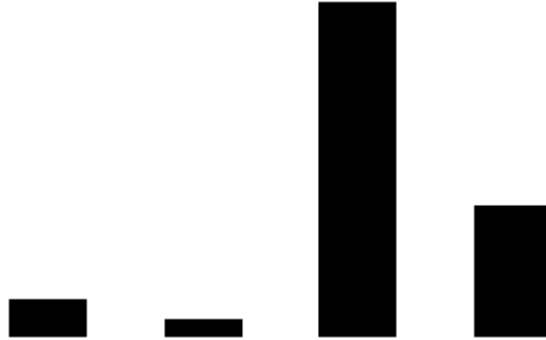


Figure 4: Repartition of organisational forms under quasi-symmetric integration ($\lambda = 0.99$, $\mu = 4$)

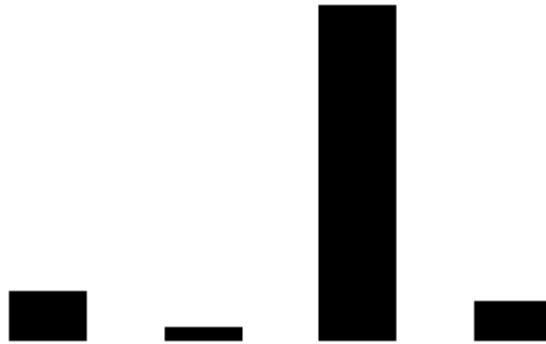


Figure 5: Repartition of organisational forms under asymmetric integration ($\lambda = 0.8$, $\mu = 4$)

trast, spot outsourcing relationships are on the rise, while pure exchange of standard inputs increases, though not at pre-integration levels.

To further analyse the interplay between the two instruments of trade liberalisation, we may now examine Figure 6. The proportion of each organisational form is displayed as a function of λ and μ , where lighter shades mean higher proportions and darker shades mean lower proportions.

In Figure 6, the effect of trade liberalisation on organisational choice may be read by comparing the south-east corner of the box (autarky) to the north-west (asymmetric integration)¹⁷. It is easily seen that specific

¹⁷Asymmetric liberalisation leads to the exit of the home country's standard input industry, hence to a discontinuity in the number of producers. To make our comparative statics more meaningful, we take μ to be larger than 2 : one country or more will still

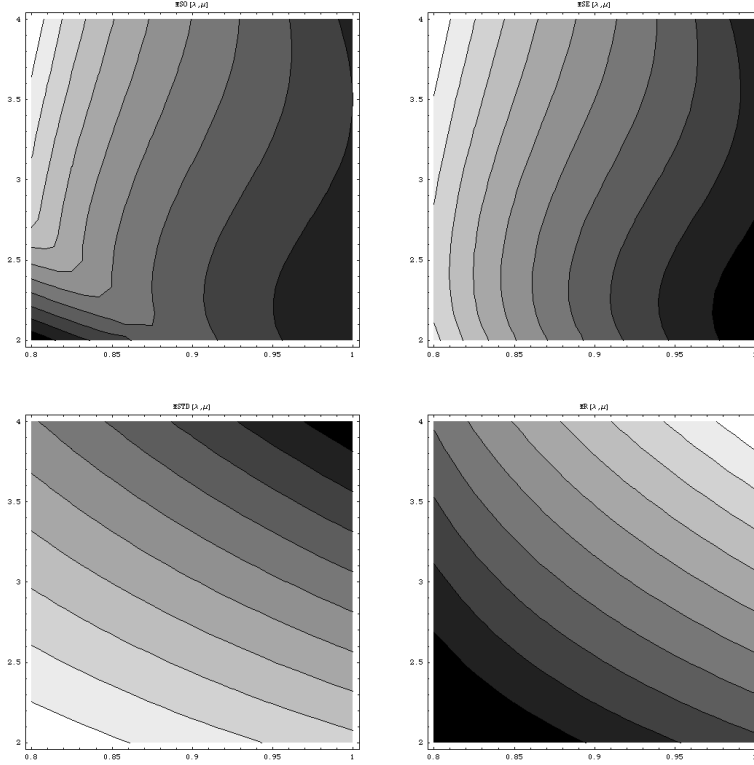


Figure 6: Organisational forms (SO, SE, STD and R, in clockwise order) and the extent of trade liberalisation. Lighter shades denote higher proportions.

relationships are strongly sensitive to trade liberalisation, in particular liberalisation of intermediate trade. However, the two instruments for trade liberalisation have opposite effects on standard input trade, on the one hand, and on relational contracts, on the other hand. Freer trade in final products leads to an increase in relational contracting, and a decrease in the use of standard inputs, while freer trade in intermediates has the opposite effect.

We now interpret these changes using the analysis of the previous subsection. First, our 'market size effect' is at work. Specific relationships expand when trade liberalisation puts more emphasis on the final sector than the intermediate sector. This results from the positive effect on profit differentials, i.e. the size of quasi-rents accruing from specific investments. However,

host standard input production.

this effect is mitigated by the downstream market share reallocation. For a given world market size, cheaper inputs imply more competitive pressure from standard input users, and hence more anonymous transactions, all else equal.

Second, our 'relational stability effect' is also at work. With near-symmetric integration, we observe the predicted fall in the outside option, and therefore a rise in relational outsourcing. By contrast, continuous decreases in the standard input price lead to less relational outsourcing. We may infer that input trade liberalisation has raised the value of the outside option. In other words, the standard input market share effect dominates the direct effect on the standard input price. This finding is interesting as it shows that market structure effects may dominate direct relational stability effects in determining the value of the outside option.

To summarise, simulations support two propositions:

- Trade liberalisation between relatively similar countries should promote specific relationships at the expense of pure market transactions. This could foster local vertical partnerships despite the availability of cheaper imported inputs.
- Strong input trade liberalisation may lead to the disruption of existing non-market relationships. But the more similar the trade partners, the more likely the expansion of hybrid organisational arrangements.

We now turn to our second simulation exercise.

3.3.2 The origin of heterogeneity

We try to assess how much the dispersion of suppliers' productivity (in performing specific investments) may explain the dispersion in organisational forms, and therefore the dispersion of final producers' productivity.

How can we measure dispersion for a discrete qualitative choice? Our suggestion is to compute an 'Organisational Concentration Index', that measures the propensity of firms to choose the same organisational forms. High values of this index indicate *concentration*, i.e. organisational dispersion is small. This index is a version of the famous Herfindahl-Hirschman Index, that measures market share concentration by computing the sum of squared market shares. Here we apply the same formula to the proportions of organisational forms in the industry. The Organisational Concentration Index (OCI) is thus equal to:

$$OCI = (\Phi_{SO})^2 + (\Phi_{SE})^2 + (\Phi_{STD})^2 + (\Phi_R)^2$$

This Index may take values between $\frac{1}{4}$ and 1, the latter representing the same organisational arrangement for all firms in the industry.

We now try to relate upstream productivity dispersion and this OCI. The assumption of a uniform distribution of γ lends itself to measuring dispersion by using mean-preserving spreads (henceforth MPS). Recall that any random variable with uniform distribution on the interval $[x, y]$ has mean $\frac{y+x}{2}$ and variance $\frac{(y-x)^2}{12}$. Therefore, a spread around the mean increases the variance without changing the mean. Starting from our benchmark parameters, we show how reducing the dispersion of productivity parameters reduces the dispersion of chosen organisational forms.

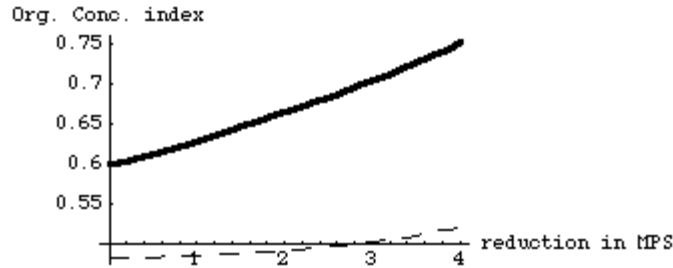


Figure 7: Lower productivity dispersion and organisational concentration, with 'asymmetric' (thick) and 'quasi-symmetric' integration (dotted).

This figure shows that reductions in the MPS (reduced dispersion of upstream productivity parameters) leads to reduced dispersion of organisational forms. Therefore, productivity dispersion between suppliers matters for the pattern of organisational choice within the industry. The effect is even stronger when trade liberalisation in intermediates occurs, as it expands pure market relationships at the expense of specific partnerships.

In the model, final producers' heterogeneity directly depends on organisational choice. In expected terms, there is even a deterministic link between the two. The following graph shows how productivity dispersion in the upstream sector may be transmitted to the downstream sector. (Again, the thick line represents the 'asymmetric' liberalisation experiment, while the dotted line represents the 'quasi-symmetric' liberalisation experiment.)

A reduction in the MPS (reduced dispersion of upstream productivity) leads to a reduced downstream cost dispersion. The effect is again stronger

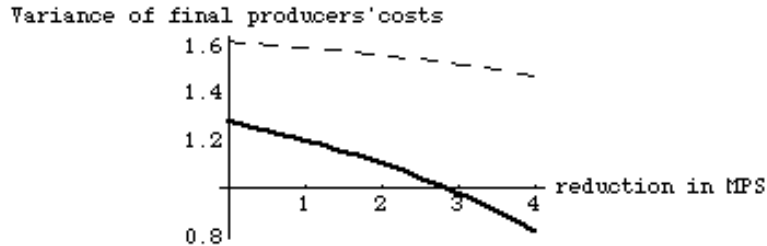


Figure 8: Effect of decreased upstream productivity dispersion on downstream productivity dispersion

when input trade liberalisation takes place.

Summarising, part of the heterogeneity in productivity among final goods producers could come from their suppliers' heterogeneous ability to create quasi-rents from specific partnerships. If this is the case, then organisational choice matters to understand these productivity differences. Simulations suggest that the transmission of this upstream heterogeneity to the downstream sector, through organisational choice, is affected by the extent of trade liberalisation. With freer trade in both final and intermediate goods, the transmission of productivity differences is stronger.

4 Testable predictions: firm- and industry-level effects of trade liberalisation

The open-economy model, in particular Propositions 2 and 3, lends itself to many testable implications, related to the effects of trade liberalisation. Two observable variables of interest are the price-cost margin, which we define as $m(c)$, and the price-elasticity of demand $\epsilon(\bar{p}, N)$:

$$m(c) \equiv p(c) - c = \sqrt{\frac{\beta}{fL}} + \frac{k - c}{2} \quad (14)$$

$$\epsilon(p, \bar{p}, N) \equiv -\frac{p}{\alpha - p + \frac{\eta N}{\eta N + \beta}(\alpha - \bar{p})} \quad (15)$$

Corollary 2 (Technological conditions) *In industries experiencing organisational change, industry average production costs should decrease by more after liberalisation than in industries knowing no such change.*

Proof. The proof follows straightforwardly from the deterministic link between organisational change and efficiency gains, and Propositions 2 and 3. ■

Trade liberalisation offers efficient reorganisation possibilities for some firms. As they take advantage of them, the industry average cost should decrease. Some of this efficiency gain is passed on to the final consumer, as shown below.

Corollary 3 (Price-cost margins) *Trade liberalisation has heterogeneous effects on price-cost margins, related to organisational change.*

- *In a population of firms resorting to specific suppliers in autarky, trade liberalisation causes a less severe fall in price-cost margins, on average, to those firms that have switched to outsourcing.*
- *Among firms that did not experience any organisational change, the post-liberalisation fall in price-cost margins should be identical across organisational forms. Among the other firms, the fall should be smaller on average and vary across post-liberalisation organisational forms.*

Proof. By Lemma 2 and Propositions 2 and 3, producers using specific inputs in autarky and entering outsourcing relationships after trade liberalisation must be switching from SE to SO, or SE to RO. These firms improve their productive efficiency. On average, this implies a more severe fall of price-cost margins in this group. This proves the first part of the corollary.

The price-cost margin $m(c)$ is decreasing with μ and increasing with λ . Besides, firms experiencing no organisational change produce at the same cost c before and after trade liberalisation. Therefore, trade liberalisation entails a decrease in price-cost margins for these firms. In particular, $m^*(c) - m(c) = -\frac{(1-\lambda)k}{2} - \sqrt{\frac{\beta L}{f}}(1 - \frac{1}{\sqrt{\mu}})$ which is unambiguously negative.

By contrast, firms that experience organisational change after trade liberalisation produce at a smaller variable cost. This implies a lower fall in margins as $m(c)$ is decreasing in c . Besides, organisational decisions result in different efficiency gains. This proves the second part of the corollary. ■

This corollary uses a property of the model according to which, due to market power, more efficient firms are able to set lower prices, without passing on to the consumer their whole cost advantage. Hence they enjoy larger price-cost margins.

Meanwhile, trade liberalisation entails an industry-wide decrease in price-cost margins, due to entry and a larger elasticity of demand¹⁸. This corollary states that, on average, those firms who have experienced an efficiency gain through corporate re-organisation will suffer from a less severe fall than the others. Provided reliable measures of individual price-cost margins are available, this prediction could be tested directly, leaving aside industry-level effects. With sector-level data on margins, it should still be possible to estimate how much differences in margins over time are explained by re-organisations.

Corollary 4 (Price-elasticity of demand) *In a cross-section of industries, the absolute value of the price-elasticity of demand should increase in all tradable sectors, even more so in industries having experienced post-liberalisation organisational change.*

Proof. By Equation (15), the price-elasticity of demand faced by each producer is an increasing function of the number of firms and a decreasing function of the industry price. By Corollary 2 we know that the average cost in industries experiencing organisational change should decrease. Lastly, by Equation (6) the free-entry number of firms is increasing with market size and decreasing with the industry average cost. Therefore, the price-elasticity *function* increases as a result of globalisation. Noting that it is an increasing function of the individual price, (the absolute values of) the observable industry price-elasticities should increase in tradable sectors. The rise should be more dramatic in reorganised industries. ■

Trade liberalisation increases the (absolute value of the) price-elasticity of demand through a competition effect and an efficiency effect reinforcing each other. In a cross-section of industries, the competition effect should work in all tradable sectors ; the efficiency effect should be peculiar to reorganised industries.

¹⁸All the corollaries depend on the prediction of fiercer downstream competition after trade liberalisation. This prediction would result from any model of imperfect competition and is supported by empirical evidence, surveyed in Tybout (2003).

5 Conclusion

In this paper, I have tried to explain the simultaneous rise of intermediate imports and of hybrid organisational forms. To do so, I extended the Baker, Gibbons, and Murphy (2002) model of organisational choice with formal and informal (relational contracts) arrangements. By applying this view of organisations in an open-economy monopolistic competition model, I was able to endogenise the value of quasi-rents from specific investments as well as outside options available to specific suppliers. The theoretical framework also allowed to go beyond the traditional property-rights model of the firm (as proposed by Antràs and Helpman (2004), for instance), enriching the prediction on the boundaries of the firm by including the stability of relational contracts as a possible determinant.

The model has shed light on two channels by which trade liberalisation affects organisational choice. First, a larger final market raises quasi-rents from specific investments: this market size effect causes a rise in the propensity of outsourcing and the sustainability of informal agreements both within and between firms. Second, tougher competition on standard input markets reduces opportunism in informally linked independent firms. This relational stability effect goes through the outside option of specific input suppliers. Hence globalisation, by affecting upstream and downstream market structure, is likely to powerfully affect key variables in organisational choice.

I have found the effects of trade liberalisation to be dependent on its sectoral structure. When liberalisation only affects the final sector, it has been found to cause a rise in outsourcing, at home and abroad, and a rise in the use of informal agreements to manage vertical relationships. Indeed, both the market size effect, increasing the size of quasi-rents, and the relational stability effect, reducing suppliers' opportunism, are at work. The prediction then concurs with the observed rise in hybrid organisational forms.

When trade liberalisation occurs both in the upstream and downstream sectors, its effect on organisational choice is in principle indeterminate. However, when trade policy puts stronger emphasis on one sector rather than the other, it is possible to predict the direction of organisational change. In particular, when the emphasis is on the final sector, the previous result is left unchanged. Interestingly, the condition for this result to still hold may be interpreted as a limit on the extent of input trade liberalisation, as well as a condition on the characteristics of trade partners. In particular, the previous result would hold with full input trade liberalisation as long as cost advantages between producers in the partner countries are not too different. Therefore, this result could be seen as stressing the importance of the trade

policy mix, as much as the identity of the trading partners, for the direction of organisational change.

The model also provides some original testable predictions on industry characteristics such as productivity dispersion, price-cost margins, and demand elasticities. First, the transmission of upstream productivity dispersion into downstream productivity dispersion becomes stronger as trade integration proceeds. Part of the trade-related reduction in productivity dispersion, usually attributed to a 'selection effect'¹⁹, might have gone through organisational change. Second, in industries experiencing organisational change, liberalisation should cause a larger decrease in production costs, in price-cost margins, and an absolute increase in the price-elasticity of demand, on average. Obviously, these implications call for empirical testing on firm-level panel data, the subject of future research.

Finally, the approach taken in this paper has been intentionally oversimplified, and some aspects of organisational decisions have been overlooked: the working of the vertical matching process; the existence of economies of scope with multi-supplier platforms; the existence of specific relationships between foreign partners with different technologies. Last but not least, a general equilibrium analysis would be necessary to assess the welfare consequences of corporate re-organisation following liberalisation. The investigation of these aspects is also left for future research.

References

- ANTRÀS, P. (2003): "Firms, Contracts, and Trade Structure," *Quarterly Journal of Economics*, 118(4), 1375–1418.
- ANTRÀS, P., AND E. HELPMAN (2004): "Global Sourcing," *Journal of Political Economy*, 112(3), 552–580.
- ARNDT, S. W., AND H. KIERZKOWSKI (eds.) (2001): *Fragmentation: New Production and Trade Patterns in the World Economy*. Oxford University Press.
- BAKER, G., R. GIBBONS, AND K. J. MURPHY (2001): "Bringing the Market Inside the Firm ?," *American Economic Review, Papers and Proceedings*, 91(2), 212–218.
- (2002): "Relational Contracts and the Theory of the Firm," *Quarterly Journal of Economics*, 117(1), 39–84.

¹⁹Bernard and Jensen (1999), among others, show how trade liberalisation has led to the exit of the least efficient producers in the US.

- BERNARD, A. B., AND J. B. JENSEN (1999): "Exceptional Exporter Performance: Cause, Effect, or Both?," *Journal of International Economics*, 47, 1–25.
- BORGA, M., AND W. J. ZEILE (2004): "International Fragmentation of Production and the Intrafirm Trade of U.S. Multinational Companies," Bureau of Economic Analysis Working Paper WP2004-02.
- CAMPA, J. M., AND L. S. GOLDBERG (1997): "The Evolving External Orientation of Manufacturing : A Profile of Four Countries," *Federal Reserve Bank of New York Economic Policy Review*, 3, 53–81.
- FEENSTRA, R. C., AND G. H. HANSON (1996): "Globalization, Outsourcing and Wage Inequality," *American Economic Review, Papers and Proceedings*, 86(2).
- FEINBERG, S. E., AND M. P. KEANE (2004): "Accounting for the Growth of MNC-based Trade Using a Structural Model of U.S. MNCs," mimeo Yale University.
- GATTAI, V. (2005): "From the Theory of the Firm to FDI and Internalisation: A Survey," *Nota Di Lavoro della Fondazione Enrico Mattei* 51.2005.
- GEREFFI, G. (1999): "International trade and industrial upgrading in the apparel commodity chain," *Journal of International Economics*, 48, 37–70.
- GIBBONS, R. (2005): "Incentives Between Firms (and Within)," *Management Science*, 51(1), 2–17.
- GROSSMAN, G. M., AND E. HELPMAN (2004): "Managerial Incentives and the International Organization of Production," *Journal of International Economics*, 63, 237–262.
- (2005): "Outsourcing in a Global Economy," *Review of Economic Studies*, 72(1).
- GROSSMAN, S. J., AND O. D. HART (1986): "The Costs and Benefits of Ownership : a Theory of Vertical and Lateral Integration," *Journal of Political Economy*, 94(4), 691–719.
- HART, O. D., AND J. H. MOORE (1990): "Property Rights and the Nature of the Firm," *Journal of Political Economy*, 98(6), 1119–1158.
- HOLMSTRÖM, B., AND J. ROBERTS (1998): "The Boundaries of the Firm Revisited," *Journal of Economic Perspectives*, 12(4), 73–94.
- HUMMELS, D., D. RAPOPORT, AND K.-M. YI (1998): "Vertical Specialization and the Changing Nature of World Trade," *Federal Reserve Bank of New York Economic Policy Review*, pp. 79–99.
- JONES, R., AND H. KIERZKOWSKI (2001): *A Framework for Fragmentation*, chap. 2, pp. 17–34, in Arndt and Kierzkowski (2001).

- KRUGMAN, P. R. (1980): "Scale Economies, Product Differentiation and the Pattern of Trade," *American Economic Review*, 70(5), 950–959.
- MARIN, D., AND T. VERDIER (2003): "Globalisation and the 'New Enterprise'," *Journal of the European Economic Association*, 1(2-3), 337–344, DELTA Working Paper 2003-31.
- (2005): "Corporate Hierarchies and International Trade: Theory and Evidence," mimeo PSE.
- MCLAREN, J. (1999): "Supplier Relations and the Market Context : A Theory of Handshakes," *Journal of International Economics*, 48.
- (2000): "'Globalization" and Vertical Structure," *American Economic Review*, 90(5), 1239–1254.
- MELITZ, M. J. (2003): "The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity," *Econometrica*, 71(6), 1695–1725.
- MÉNARD, C. (2004): "The Economics of Hybrid Organizations," *Journal of Institutional and Theoretical Economics*, 160, 345–376.
- OTTAVIANO, G. I., T. TABUCHI, AND J.-F. THISSE (2002): "Agglomeration and Trade Revisited," *International Economic Review*, 43, 409–436.
- RAJAN, R. G., AND J. WULF (2003): "The Flattening Firm: Evidence from Panel Data on the Changing Nature of Corporate Hierarchies," NBER Working Paper No. 9633.
- RAUCH, J. E. (2001): "Business and Social Networks in International Trade," *Journal of Economic Literature*, 39(4), 1177–1203.
- SPENCER, B. J. (2005): "International Outsourcing and Incomplete Contracts," NBER Working Paper.
- SPENCER, B. J., AND L. D. QIU (2001): "Keiretsu and Relationship-Specific Investment: A Barrier to Trade?," *International Economic Review*, 42(4), 871–901.
- TYBOUT, J. R. (2003): "Plant- and Firm-Level Evidence on "New" Trade Theories," in *Handbook of International Trade*, ed. by E. K. Choi, and J. Harrigan, chap. 13, pp. 388–415. Blackwell Publishing.
- YEATS, A. J. (2001): *Just How Big Is Global Production Sharing?* chap. 7, pp. 108–143, in Arndt and Kierzkowski (2001).
- YI, K.-M. (2003): "Can Vertical Specialization Explain the Growth of World Trade?," *Journal of Political Economy*, pp. 52–102.

Appendix 1: Organisational choice in a typical vertical relationship

Preliminary calculations

Consistent with the continuum-of-firms assumption, upstream producers will treat the industry average cost and number of buyers as constant. Therefore Equation (9) is the relevant profit differential for individual organisational choice. Notice that this expression does only depend on market size and not on the number of active firms.

Denote by $1_{e_s=1}$ and $1_{e_{ns}=1}$ the indicator functions that take value one when the specific and non-specific effort are made, respectively. Joint surplus from the bilateral relationship may then be expressed as a function of efforts:

$$S(e_s, e_{ns}) \equiv \Pi(c_H) + (q\Delta\Pi - \gamma) * 1_{e_s=1} - \Gamma * 1_{e_{ns}=1} \quad (16)$$

Recall the timing of the game:

- choice of the allocation of property rights (integration or contracting out) to maximise joint surplus, joint decision to enter a relational contract.
- repeated two-stage procedure: in the first stage, U chooses efforts e_s and e_{ns} . Upon observation of c , in the second stage, D compensates U : either with the informally agreed payment ('relational contract'), or with a negotiated price ('spot outsourcing'), or with nothing, if D is entitled to seize the input ('spot employment').

We now solve for the subgame-perfect equilibrium of the organisational game.

A resolution of the game by backward induction

This subsection proves Proposition 1.

Compensation

Under spot outsourcing, U will receive the Nash bargaining price equal to $\frac{\Pi_i + V_j}{2}$ where i and j denote observed the realisations of the two variables. These realisations, on average, will depend on the efforts chosen in the previous stage.

Under spot employment, U will receive nothing.

Under relational contracts, U will receive a discretionary payment b_i contingent on the observed value of c . For relational contracts to be self-enforceable, honouring the relational contract must be the subgame-perfect equilibrium strategy for both parties, in the infinitely repeated procedure game. In other words, the temptations to renege must be lower than the gains from playing equilibrium strategies. Hence the following condition:

$$\begin{aligned} \forall i, b_i + \frac{U^R(1, 0)}{r} &\geq \frac{1}{r} \max \{U^{SO}(1, 1), U^{SE}(0, 0)\} \\ \forall i, \Pi(c_i) - b_i + \frac{D^R(1, 0)}{r} &\geq \Pi(c_i) + \frac{1}{r} \max \{D^{SO}(1, 1), D^{SE}(0, 0)\} \end{aligned}$$

for relational employment and

$$\begin{aligned} \forall i, j, b_i + \frac{U^R(1, 0)}{r} &\geq \frac{\Pi_i + V_j}{2} + \frac{1}{r} \max \{U^{SO}(1, 1), U^{SE}(0, 0)\} \\ \forall i, j, \Pi(c_i) - b_i + \frac{D^R(1, 0)}{r} &\geq \Pi(c_i) - \left(\frac{\Pi_i + V_j}{2}\right) + \frac{1}{r} \max \{D^{SO}(1, 1), D^{SE}(0, 0)\} \end{aligned}$$

for relational outsourcing.

i denotes the realisation of input quality (good, G , or bad, B). $U(\cdot)$ and $D(\cdot)$ denote the expected and infinitely discounted surplus as a function of efforts for both parties. Their sum $S(\cdot)$ is the joint surplus function. r denotes the probability of exogenous destruction of the bilateral relationship²⁰.

For U , the temptation to renege amounts to an instantaneous payoff (zero under SE or the negotiated price under SO) plus the expected infinitely discounted surplus under SO or SE. By contrast, the gain from honouring the relational contract amounts to an instantaneous (and conditional) bonus payment plus the expected discounted sum of bonuses. For D , the temptation to renege amounts to instantaneous minimum profits (minus the negotiated price if SO) plus the expected infinitely discounted surplus under SO or SE. The gain from honouring the agreement equals the expected discounted surplus net of bonus payments.

We may deduce two *sufficient* conditions for the existence of relational contracts, by summing the two inequalities in each case. Denoting by Δb the

²⁰With a (time-invariant) shadow interest rate equal to r , infinitely discounted gains from time 1 on are indeed equal to $\frac{1}{r}$ times the constant gain from honoring relational contracts. Yet another interpretation is possible. With a $1 - r$ probability of survival per period, the sum of future expected gains is indeed equal to $\frac{1}{r}$ times the constant gain from honoring relational contracts.

difference between payments contingent on a low c and a high c , respectively, we obtain:

$$|\Delta b| \leq \frac{1}{r} \min\{q\Delta\Pi - \gamma, \Gamma\} \quad (17)$$

$$\left| \Delta b - \frac{\Delta\Pi}{2} \right| + \frac{V}{2} \leq \frac{1}{r} \min\{q\Delta\Pi - \gamma, \Gamma\} \quad (18)$$

This characterises U 's compensation in the last stage.

Specific investment choice

We know that for all upstream producers with $\gamma \leq q\Delta\Pi$, the joint-surplus-maximising effort combination is $\{e_s = 1, e_{ns} = 0\}$. Other suppliers are deemed to offer standard inputs. Denote by γ_{STD} this threshold fixed cost.

To avoid being in the trivial case where first-best efforts are chosen under spot outsourcing, and therefore organisational choice being one-sided, we make the following assumption:

$$V > 2\Gamma \quad (\text{Assumption 2})$$

This assumption ensures there is a multi-tasking problem: the expected reward to non-specific efforts is important enough for U to engage in socially unproductive efforts. Committing not to engage in non-specific efforts, through relational contracts, strictly raises joint surplus compared to Spot Outsourcing.

U will choose its specific efforts in order to maximise its private surplus function. In all three organisational arrangements, this will amount to solving the following program:

$$\max_{e_s, e_{ns}} \left\{ \frac{1}{2} [\Pi(c_H) + q\Delta\Pi * 1_{e_s=1}] + \frac{1}{2} [V + V * 1_{e_{ns}=1}] - \gamma * 1_{e_s=1} - \Gamma * 1_{e_{ns}=1} \right\} \quad (\text{SO})$$

$$\max_{e_s, e_{ns}} \{0 - \gamma * 1_{e_s=1} - \Gamma * 1_{e_{ns}=1}\} \quad (\text{SE})$$

$$\max_{e_s, e_{ns}} \{b_B + (q\Delta b - \gamma) * 1_{e_s=1} - \Gamma * 1_{e_{ns}=1}\} \quad (\text{Relational contracts})$$

Under Spot Outsourcing, optimal efforts will be equal to $\{1, 1\}$, given Assumption 2, if and only if

$$\begin{aligned}\frac{q\Delta\Pi}{2} &\geq \gamma \\ q\Delta\Pi - \Gamma &\geq \gamma\end{aligned}$$

Under Spot employment the chosen effort combination will be $\{0, 0\}$. U does not make any effort for fear of being held up by D , since ownership rights allow D to seize U 's production in any contingency²¹

Under relational contracts the chosen effort combination will be $\{1, 0\}$, provided that:

$$b_B + (q\Delta b - \gamma) \geq 0 \quad (19)$$

This last condition completes the characterisation of relational contracts.

Individual organisational choice

In the first stage, parties U and D choose the allocation of property rights and whether they want to enter an informal agreement. By construction of the model, relational contracts will always be chosen if sustainable. If not, then the costs of exerting the specific effort will be crucial to determine the allocation of property rights.

Define γ_{STD} as the threshold fixed cost of investment above which specific efforts are not credible, or simply:

$$\gamma_{STD} = q\Delta\Pi \quad (20)$$

All upstream producers with a fixed cost beyond this threshold may not credibly enter specific relationships with downstream producers, and sell standardised inputs on an anonymous market.

Further define γ_S as the cut-off fixed cost of investment that equates expected joint surplus under SE and SO:

$$\Pi(c_H) + q\Delta\Pi - \gamma - \Gamma = \Pi(c_H) \Leftrightarrow \gamma = \min\left\{\frac{q\Delta\Pi}{2}, q\Delta\Pi - \Gamma\right\} \quad (21)$$

²¹Because we rule out contractible efforts, upstream efforts under spot employment, and thus spot employment payments, are simply normalised to zero. Allowing for contractible efforts would make U exert some additional efforts under employment as well as outsourcing, which would not change organisational choice.

where the right-hand-side is defined as γ_S . All vertical relationships with upstream parties facing fixed costs in excess of γ_S should lead to spot employment instead of spot outsourcing.

Note that these cut-off fixed costs determine the composition of spot (purely formal) specific relationships, as well as relational-contract ones. Indeed, fixed costs affect the payoff from reneging on a relational contract. For example, when the fixed cost exceeds γ_S , 'employment' is the best 'fallback' to the relational contract.

We may now derive conditions under which relational contracts are sustainable. Using Equation (19), we may rearrange Equations (17-18) as, respectively:

$$\begin{aligned}\gamma &\leq \frac{q^2 \Delta \Pi}{r + q} \\ \gamma &\leq \frac{q^2 \Delta \Pi}{r + q} + \frac{rq(\Delta \Pi - V)}{2(r + q)}\end{aligned}$$

whenever Outsourcing is the best 'fallback' in case one party reneges, and

$$\begin{aligned}\gamma &\leq \frac{q\Gamma}{r} \\ \gamma &\leq \frac{q\Gamma}{r} + q \frac{\Delta \Pi - V}{2}\end{aligned}$$

whenever Employment is the best 'fallback'.

These conditions may be rewritten as conditions on exogenous rates of destruction of existing relational contracts. Since they depend on the jointly optimal organisational choice under spot contracts, their functional form has a discontinuous two-part structure:

$$\bar{r}_{RE}(\gamma) = \begin{cases} \frac{q^2 \Delta \Pi - q}{\gamma} & \text{if } \gamma \leq \gamma_S \\ \frac{q\Gamma}{\gamma} & \text{if } \gamma > \gamma_S \end{cases} \quad (22)$$

$$\bar{r}_{RO}(\gamma) = \begin{cases} \frac{q(q\Delta \Pi - \gamma)}{\gamma - q \frac{\Delta \Pi - V}{2}} & \text{if } \gamma \leq \gamma_S \\ \frac{q\Gamma}{\gamma - q \frac{\Delta \Pi - V}{2}} & \text{if } \gamma > \gamma_S \end{cases} \quad (23)$$

This completes the proof of Proposition 1.

To close the model, we must make a final assumption on the distribution of firm characteristics γ and r . To simplify things, we will posit that these two characteristics are independently distributed, with γ having c.d.f. $G(\gamma)$ over $[0, \gamma^{max}]$ and r being uniformly distributed over $[0, r^{max}]$.

The distribution of organisational forms across the population of *suppliers* may then be denoted by proportions $\Phi_{SO}, \Phi_{SE}, \Phi_R, \Phi_{STD}$, with all proportions summing to unity. It straightforwardly follows from Proposition 1 and the assumption on distributions that:

$$\Phi_{SO} = \frac{1}{r^{max}} \int_{\frac{q\Gamma}{r^{max}} + \frac{q}{2}(\Delta\Pi - V)}^{\gamma_S} [r^{max} - \bar{r}_1^{RO}(\gamma)] dG(\gamma) \quad (24)$$

$$\Phi_{SE} = \frac{1}{r^{max}} \int_{\gamma_S}^{\gamma_{STD}} [r^{max} - \bar{r}_2^{RO}(\gamma)] dG(\gamma) \quad (25)$$

$$\Phi_{STD} = 1 - G(\gamma_{STD}) \quad (26)$$

$$\Phi_R = G(\gamma_{STD}) - \Phi_{SO} - \Phi_{SE} \quad (27)$$

and that

$$\bar{c} = (qc_L + (1 - q)c_H)(\Phi_{SO} + \Phi_R) + c_H\Phi_{SE} + k\Phi_{STD} \quad (28)$$

Finally, we are able to compute the value of specific suppliers' outside option. At the free entry equilibrium, output by firms using standard inputs is simply equal to $\sqrt{\frac{fL}{\beta}}$. Since the price at which the input sells is k and that no additional cost is incurred in case the supplier exerts its outside option, V simply equals individual expenditure multiplied by each seller's market share $s(k)$. Since suppliers are distributed with c.d.f. $G(\cdot)$ and that the free entry number of downstream firms under autarky is equal to N , we have that:

$$s(k) = \frac{\frac{N}{\gamma^{max}} - G(q\Delta\Pi)}{1 - G(q\Delta\Pi)} \quad (29)$$

$$V = k\sqrt{L} \sqrt{\frac{f}{\beta} \frac{\frac{N}{\gamma^{max}} - G(q\Delta\Pi)}{1 - G(q\Delta\Pi)}} \quad (30)$$

Appendix 2: Organisational choice in the open economy

Proof of Lemma 1

Evaluating the derivative of the expression in Equation (10) with respect to μ yields:

$$\frac{\partial \Delta \Pi^*(\mu)}{\partial \mu} = \frac{(c_H - c_L)L}{4\beta} \left[2k - c_H - c_L + 2\sqrt{\frac{\beta}{\mu L} f} \right]$$

which is unambiguously positive.

Using Equations (21) and (20) from the previous Appendix, it is easily seen that both cut-offs increase with trade liberalisation, as profit differentials are higher. This simply proves results (a) and (b).

Lastly, inspection of equations (22) and (23) shows that threshold values of r for a given γ increase with profit differentials.

Proof of Lemma 2

This simple proof has three steps. First, by Corollary 1, we know that a fall in V leads to an increase in Relational Outsourcing, while a rise in V implies a decrease in Relational Outsourcing.

Second, we may rewrite Equation (11) in the following way:

$$V^*(\mu) = \left(k \sqrt{\frac{f}{\beta} L} \right) \sqrt{\mu} s(\mu)$$

where $s(\mu)$ represents the market share of a standard input producer as a function of final market size. Straightforward though tedious calculations show that $N^*(\mu)$ is an increasing function, implying that $s(\mu)$ is decreasing in μ . Rewriting the derivative of $V^*(\mu)$ with respect to μ yields:

$$\frac{\partial V^*(\mu)}{\partial \mu} = \left(k \sqrt{\frac{f}{\beta} L} \right) \left[\frac{s(\mu)}{2\sqrt{\mu}} + \sqrt{\mu} s'(\mu) \right]$$

The first term in square brackets is positive (the individual demand effect), while the second is negative (the production scale effect). Notice that this derivative has the same sign as $\frac{s(\mu)}{2} + \mu s'(\mu)$. Notice further that because $s(\mu)$ is a market share, it is bounded above by 1, while $\mu s'(\mu)$ is not. Hence the derivative must be negative for a large enough μ .

Third, inspection of Equations (20)-(23) reveals that other thresholds are left unchanged by the variation of the outside option. This is a consequence of perfect *ex ante* income transferability within specific relationships.

Proof of Proposition 2

The subgame-perfect equilibrium of the organisational game is found as in the Proof of Proposition 1. However, profit differentials, outside options, and therefore threshold values of the time preference rate differ. By Equation (9) profit differentials increase. Hence by Lemma 1, this leads to an increase in γ_S and γ_{STD} .

Furthermore, by Lemma 2, the outside option should decrease for low enough values of μ , going against the market size effect. By Equation (23) this implies a larger value of $\bar{r}_{RO}(\gamma)$, and fewer firms relying on RO. To the contrary, when trade integration reaches a certain scale (beyond a certain μ), the market size effect must dominate the relational stability effect. By a similar reasoning, this should trigger more relational outsourcing. By continuity, there must exist a threshold value of μ such that relational outsourcing rises compared to autarky. This completes the proof.

Proof of Lemma 3

Using Equation (12), we may compute

$$d\Delta\Pi^*(\lambda, \mu) = \left(\frac{k(c_H - c_L)L}{2\beta} \right) \mu d\lambda + (c_H - c_L) \left(\frac{L}{4\beta} (2\lambda k - c_H - c_L) + \sqrt{\frac{L}{\beta}} f \frac{1}{2\sqrt{\mu}} \right) d\mu$$

from which it straightforwardly follows that a necessary and sufficient condition for $d\Delta\Pi^*(\lambda, \mu)$ to be positive is:

$$-d\lambda \leq \frac{2\beta(c_H - c_L)}{\mu k L} \left(\frac{L}{4\beta} (2\lambda k - c_H - c_L) + \sqrt{\frac{L}{\beta}} f \frac{1}{2\sqrt{\mu}} \right) d\mu$$

Noting that the term in large brackets is unambiguously positive, for parameter values consistent with positive outputs, we are indeed left with an upper bound on the intensity of trade liberalisation in intermediates.

5.1 Proof of Proposition 3

We may rewrite (20) and (21), as well as (22) and (23) as functions of λ and μ , characterising organisational choice according to trade liberalisation.

Remark that in all these equations, the only endogenous variables are $q\Delta\Pi^*$ and V^* . In particular, γ_S and γ_{STD} increase with $q\Delta\Pi^*$ but are invariant to changes in V . $\bar{r}_1^{ER}(\gamma)$ and $\bar{r}_2^{ER}(\gamma)$, whose graphs represent the frontiers of organisational choice in the population of firms, are increasing functions of the *difference* between $q\Delta\Pi^*$ and V .

The proof is based on a comparison of several integration scenarios varying by the relative intensity of liberalisation in each sector.

Integration biased towards the downstream sector This part of the proof relies on Proposition 2 and a continuity argument.

Recall Figure 2. With symmetric integration, threshold values of the fixed costs γ_S and γ_{STD} shift rightwards while the $\bar{r}_1^{ER}(\gamma)$ and $\bar{r}_2^{ER}(\gamma)$ shift to the north-east. The condition in Lemma 3 imposes an upper bound on trade liberalisation in the intermediate sector relative to that in the final sector, such that profit differentials rise. Under this condition, threshold values of the fixed costs still shift rightwards.

Moreover, by continuity, we may find a stronger condition such that the outside option decreases. Given what is needed for an expansion in relational contracting is a growing *difference* in $\Delta\Pi^* - V^*$, we end up with a sufficient condition. Indeed, a $|d\lambda| > 0$ increases $s^*(\lambda, \mu)$, as explained in the main text, as well as a decrease in λ . If this condition $|d\lambda| > 0$ is modest compared to $d\mu$, then s^* will decrease if the pro-competitive effect on N of integration is more than offset by the market size effect on $q\Delta\Pi^*$. Therefore the share of downstream firms relying on standard inputs decreases, and the outside option falls.

To summarise, re-organisations should go in the general direction of more RO, an equal share of SE, and fewer transactions on the anonymous market. While the effect on SO is ambiguous, we know that the share of outsourcing in the industry (SO+RO) should increase.

Integration biased towards the upstream sector When the opposite condition as that of Lemma 3 is met, profit differentials decrease with integration. This is because the efficiency gain for standard input users is too strong. Therefore both threshold values of γ decrease, implying more transactions on the anonymous market. Meanwhile, careful inspection of $s(\lambda, \mu)$ tells us that this market share rises with integration, under the same opposite condition. How the outside option varies should depend on the magnitude of the direct effect of a smaller λ and the indirect effect of a greater $s(\lambda, \mu)$. By continuity there exists a sufficiently small λ such that

the latter effect dominates the former. A condition on $|d\lambda|$ may therefore be found that ensures a rise in the outside option. Again, this is a sufficient condition for a decrease in relational contracting.

To summarise, re-organisations should go in the general direction of less RO and RE, substituted by some SO and SE, and some other SE relationships substituted by transactions on the anonymous market.

Appendix 3: Simulation parameters

I simulate a slightly amended version of the open-economy asymmetric model where the fixed cost of specific efforts belongs to an interval $[\gamma^{min}, \gamma^{max}]$ where γ^{min} is strictly positive. This modification does not qualitatively affect the results. However, it allows me to compare similar trade liberalisation experiments with varying degrees of heterogeneity among specific suppliers.

The chosen parameter values are the following:

Table 1: Benchmark parameter values

Preferences		Technologies (D)		Technologies (U)		Other	
α	30	c_L	3/2	f	3	q	1/6
η	2	c_H	5/2	Γ	1	r^{max}	2
β	1	k	5	γ^{max}	30	m	1
				γ^{min}	5/3	L	10

Finally, we choose $G(\cdot)$ to be the uniform distribution over $[\gamma^{min}, \gamma^{max}]$.