International outsourcing and incomplete contracts

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Abstract. International outsourcing to lower cost countries such as China and India can best be understood through the enrichment of trade models to include concepts from industrial organization and contract theory that explain the vertical organization of production. The combination of trade with the choice of organizational form represents an important new area for both theoretical and empirical research. This survey paper provides a perspective on this new literature so as to gain insights into the forces driving international outsourcing. The paper focuses on relationship-specific investment, incomplete contracts, and also search and matching, as fundamental concepts that explain outsourcing decisions. JEL classification: F1, L14

Sous-traitance internationale et contrats incomplets. On peut mieux comprendre le processus de sous-traitance internationale vers des pays à coûts plus bas comme la Chine et l'Inde en enrichissant les modèles de commerce international par des concepts empruntés aux théories de l'organisation industrielle et des contrats qui sont au coeur des explications de l'organisation verticale de la production. La combinaison du commerce international et du choix d'une forme organisationnelle définit une nouvelle zone de recherche tant pour le travail théorique qu'empirique. Ce texte synthèse fait une revue de cette nouvelle littérature spécialisée pour chercher à comprendre les forces sous-jacentes au processus de sous-traitance internationale. Ce mémoire met l'accent sur l'investissement spécifique à une relation, les contrats incomplets, et sur les processus de recherche et d'arrimage comme autant de concepts fondamentaux pour expliquer les décisions de sous-traitance.

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1. Introduction

The rising volume of imports from low-wage countries, such as China and India, has fuelled public concern in the United States and other high-wage countries that jobs will be lost and wages eroded.[1] A growing segment of this trade and in world trade more generally, has been in intermediate inputs, such as components and equipment. For example, from 1974 to 1993, imports as a share of total purchases of electrical equipment and machinery rose from 4.5% to 11.6 % in the United States and 13.2% to 30.9% in Canada.[2] As explained by Hummels, Ishii, and Yi (2001) and Yi (2003), there has been a growth in the vertical fragmentation of production leading to a vertical supply chain stretching over more than one country. Intermediate inputs are exported to a country, processed and then re-exported, perhaps for further processing in another country.

A common motive is to reduce costs through production in low-wage countries.[3] Figure 1 shows the enormous growth of manufacturing exports from China for the period 1988 to 2003.[4] Manufacturing exports are categorized as either *processing exports* (the sum of the black and grey areas) or ordinary exports (the white area). *Processing exports* are exports that have been produced using imported inputs, such as raw materials or specialized parts supplied by a foreign manufacturer. Manufacturing exports from China rose from $39 billion to $398 billion US, but processing exports grew even more rapidly from 35% of manufacturing exports in 1988 to 57% in 2003. The black area of each bar in figure 1 represents the value of processing exports due to FIEs (Foreign Invested Enterprises), which are wholly foreign-owned enterprises or equity joint ventures with at least 25% foreign ownership. The grey area represents processing exports that can be characterized as arising from outsourcing contracts between foreign buyers and independent Chinese firms.[5]

The growing importance of the international procurement of intermediate inputs either through outsourcing or within the firm, through foreign direct investment, cannot be explained by traditional trade theories that abstract from vertical fragmentation and contractual relationships between buyers and suppliers. Consequently, researchers have been motivated to enrich

1 As reported by Amiti and Wei (2005), there were 2,634 articles in US newspapers on service outsourcing alone, just in the first five months of 2004. However, the outsourcing of business services is still quite small (about 0.4% of GDP in 1995).

2 See Campa and Goldberg (1997) and also Feenstra and Hanson (2003). Other evidence can be found in Yeats (2001), Feenstra (1998), and Yi (2003).

3 Particularly for developing countries, the share of processing exports to the United States, based on data from the 'US Offshore Assembly Program' is sensitive to cost (Swenson, 2005).

4 I am grateful to Robert C. Feenstra for the data.

5 There are various, sometimes contradictory, definitions of outsourcing in the literature. The term is used here to indicate the procurement of inputs outside the firm (either through a contractual arrangement or a spot market), as opposed to vertically integrated production. The term encompasses both domestic and foreign purchases. The latter purchases are referred to as international outsourcing.

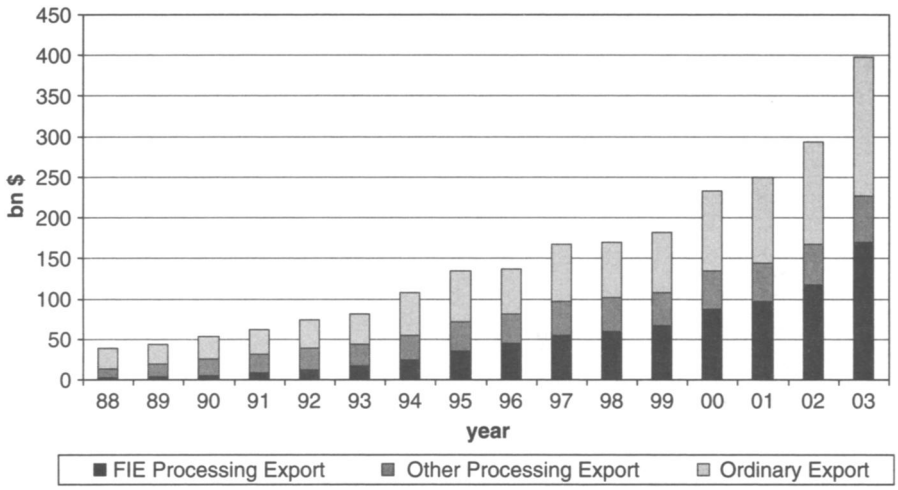

FIGURE 1 Manufacturing exports from China (bn $US), 1988–2003

international trade theory with concepts from industrial organization and contract theory that explain the organizational form of the firm. The combination of trade with the choice of organizational form represents an important new area for both theoretical and empirical research. The objective of this survey paper is to provide a perspective on this growing literature so as to gain insight into the forces driving international outsourcing.[6]

Relationship-specific investment, incomplete contracts, and search and matching are fundamental concepts that help to explain outsourcing decisions.[7] In this context, an outsourcing contract is incomplete if a supplier undertakes relationship-specific investment so as to specialize production to the needs of a buyer or vice versa, but contracts cannot be written conditional on the level of investment. For example, if a Chinese supplier can sell its processed goods only to the particular buyer that provided the inputs, then the supplier's investment in this production can be viewed as relationship specific. If is it not possible to specify this investment in the contract, then the outsourcing contract is incomplete. The importance of search and matching arises from the idea that independent (non-integrated) final-good producers need to match with a suitable supplier of a specialized input for production to take place.

6 The literature also addresses other issues such as the formation of multinational firms. An important paper is Antràs, Garicano and Rossi-Hansberg (2006). Globalization increases wage inequality in the South,owing to the formation of cross-country teams involving Northern managers and Southern workers (multinationals). See Feenstra and Hanson (2003) for a survey of the trade and wages literature.

7 Incomplete contracts can arise because of unforeseen contingencies, the excessive cost of specification of a large number of contingencies, or the inability of the courts to enforce the contract.

The literature draws from various models of the boundary of the firm to explain the decision to contract out the provision of a specialized input rather than produce under vertical integration. A second branch of the literature assumes that the alternative to an outsourcing contract for a specialized input is to buy a standard or generic version of the input through a spot market transaction. The literature also differs as to whether international outsourcing is driven by lower foreign costs or by some other difference across countries, such as the quality of legal institutions. In the next section, I use these different modelling approaches to devise an overview and classification of the papers to be discussed. The organization and outline of the paper is provided at the end of the section.

2. Overview and classification of papers

In classifying papers, I use four theories of the boundary of the firm: property rights, transaction costs, incentive systems, and delegation of authority. The *property rights* theory of Grossman and Hart (1986) and Hart and Moore (1990) defines a firm as a set of assets under common ownership or control. The theory emphasizes that regardless of ownership structure, relationship-specific investment is distorted by the hold-up problem, which arises from the inability to fully reward investment under incomplete contracts. This applies to investment or effort by managers within the firm as well as outsourcing contracts. Ownership and control should be allocated so as to minimize the loss in surplus due to investment distortions.

Under the earlier *transaction cost* approach, the boundary of the firm is determined so as to minimize transaction costs.[8] At the extreme, integration eliminates transaction costs leading to efficient levels of investment within the firm. In the context of international trade models, an important determinant of transactions costs is the *thickness of the market*. A thicker market increases the ease with which an independent final-good producer can match with a producer of a specialized input and hence reduces the advantage of vertical integration over outsourcing.[9]

A further possibility is an *incentive systems* approach in which a principal designs optimal contracts to induce effort by managers under costly monitoring.[10] The greater ease of monitoring within the firm favours vertical

8 Coase (1937) and Williamson (1975, 1985) emphasize that when uncertainty and asset specificity are high, transaction costs are reduced by giving one party control over both sides of a transaction within a hierarchical firm rather than operating through the market.

9 Details differ across papers, but for unintegrated final-good producers, the *market is thicker* if there is a greater chance of a match with a supplier that meets its technological requirements. Conversely, *markets are thicker* for suppliers if there are more potential buyers of their input.

10 The fact that principal-agent contracts cannot be written conditional on unobserved effort levels suggests that the contracts are incomplete. However, Hart (1995, 20–3) argues that the contracts are 'comprehensive': the distortion in effort is due to the cost of observing variables rather than the inability to write contracts, and there is no need for renegotiation, since all future obligations are specified.

integration over outsourcing. Finally, since formal delegation of authority by a principal to an agent can be interpreted as an outsourcing decision, the *theory of delegation of authority* due to Aghion and Tirole (1997) represents an extension of property rights theory that is relevant for the literature on trade and organizational form. However, since the efforts of the principal and agent are directed at obtaining information so as to decide between competing 'projects,' this approach is valuable for understanding the roles of information and knowledge creation for vertical organizational form and power within the corporation rather than the best way to procure specialized intermediate inputs.

The papers selected for detailed consideration are classified in table 1 into a number of boxes according to various options for procurement as determined by organizational form and theoretical approach (columns) and the geographic source of intermediate inputs or components (rows). As shown in the notes to table 1, the papers are organized into five groups, which are discussed in detail below. Each paper is denoted by the initials of the last names of their authors followed by a two-digit specification of the year in brackets and can appear in multiple categories. Papers identified with an asterisk include empirical analysis.

As shown by the columns of table 1, an intermediate input or component can be produced within a vertically integrated firm or can be purchased through outsourcing. Vertical integration is split into two categories depending on the underlying theory. Papers in column 1 take a property rights, transaction costs, or incentive systems approach to vertical integration. Papers based on the theory of delegation of authority are listed separately in column 2, because of their different focus. The table also shows two categories of outsourcing: a spot market transaction for a generic version of an intermediate input in column 3 or a contract for a specialized intermediate input in column 4.

The rows of table 1 specify the location of input production as domestic (row A), in an integrated world economy where factor costs, such as wages, are equalized across countries (row B), or as foreign at lower cost (row C). Although aggregate international outsourcing may be determinate for papers in row B, individual firms may be indifferent, making it indeterminate as to whether any particular firm outsources abroad. Identifying boxes in the table by the row letter followed by the column number, papers in box C1 involve FDI (foreign direct investment), since they combine vertical integration with foreign production.

For ease of discussion, the papers are organized into five groups, roughly categorized as to topic. All five papers in the first group, Antràs (2003, 2005), Antràs and Helpman (2004), Grossman and Helpman (2004), and Feenstra and Hanson (2005), address the choice between vertical integration (column 1) and the purchase of a specialized input through contractual outsourcing (column 4). A(03*, 05) and AH(04) take a property rights approach which they embed into general equilibrium models of trade. Comparison is made with

TABLE 1
Options for procurement

Organization forms / Source of components	Vertical integration: domestic or FDI		Outsourcing	
	(1) Property rights/ incentive systems/ transaction costs	(2) Delegation of authority	(3) Generic spot market	(4) Contract for specialized input
(A) Domestic	A(05), AH(04) M(00) GH(02, 04)	MV(02, 05*) PT(02)	SQ(01)	A(05), AH(04) GH(02, 04, 05) SQ(01), QS(02) HRS(04)*, FS(05)*
(B) Integrated world economy	A(03)*, M(00)	MV(03)		A(03)* L(04)*, N(05)*
(C) Foreign at lower cost	A(05), AH(04) GH(04), FH(05)*, FS(05)*		SQ(01) QS(02) HRS(04)* FS(05)*	A(05), AH(04) GH(04, 05) FH(05)*, FS(05)*

NOTES
Group 1: Antràs (2003, 2005), Antràs & Helpman (2004), Grossman & Helpman (2004), Feenstra & Hanson (2005), denoted by A(03)*, A(05), AH(04), GH(04), FH(05)*.
Group 2: McLaren (2000), Grossman & Helpman (2002, 2005), denoted by M(00), GH(02, 05).
Group 3: Spencer & Qiu (2001), Qiu & Spencer (2002), Head, Ries & Spencer (2004), Feenstra & Spencer (2005), denoted by SQ(01), QS(02), HRS(04)*, FS(05)*.
Group 4: Levchenko (2004), Nunn (2005), denoted by L(04)*, N(05)*.
Group 5: Puga & Trefler (2002), Marin & Verdier (2002, 2003, 2005), denoted by PT(02), MV-02,03, 05). An asterisk denotes empirical analysis.

the incentive systems approach taken by GH(04). Using export processing data from China, FH(05)* contrasts both these approaches. A(05), AH(04) and GH(04) are listed in the four boxes, A1, A4, C1, C4, indicating that firms can choose between vertical integration and contractual outsourcing and also between domestic and foreign production. A(03)* includes empirical analysis (as shown by the asterisk) and appears in B1 and B4, owing to its modelling of an integrated world economy. Since FH(05)* abstracts from the possibility of domestic production of the input, it is listed in boxes, C1 and C4.

All the papers in the second group, namely, McLaren (2000) and Grossman and Helpman (2002, 2005), examine the outsourcing of specialized inputs, taking into account general equilibrium effects arising from the *thickness of the market*. These papers take a transactions cost approach in which vertical integration removes distortions in managerial effort. Outsourcing contracts are incomplete in GH(02) and GH(05) (column 4), whereas the outsourcing in M(00) involves bidding rather than contracting. Both GH(02) and M(00) consider the trade-off with vertical integration (column 1). GH(02) is listed in boxes A1 and A4, owing to its purely domestic context, but since M(00)

considers the integration of multiple markets, it is listed in A1 and B1. By contrast, GH(05) models domestic versus international contractual outsourcing, but not vertical integration, and appears in boxes A4 and C4.

Prior to consideration of incomplete contracts, *arm's length* international outsourcing between unrelated parties mostly assumed perfectly competitive markets.[11] A third group of papers, Spencer and Qiu (2001), Qiu and Spencer (2002), Head, Ries, and Spencer (2004), and Feenstra and Spencer (2005), bridges these two literatures by endogenizing the choice between specialized components produced under incomplete contracts (column 4) and generic components purchased from a spot market (column 3). The papers take a partial equilibrium approach in which a final-good firm procures a continuum of parts or components. All parts are outsourced, but since relationship-specific investments are made only by suppliers, the property rights approach would suggest outsourcing rather than vertical integration. All four papers, SQ(01), QS(02), HRS(04)*, and FS(05)*, are listed in boxes A4 and C3, owing to consideration of domestic contractual outsourcing and the import of lower-cost generic inputs. Since a range of generic parts is produced domestically, SQ(01) also appears in A3. Since FS(05)* extends the theory to international contractual outsourcing and FDI by component suppliers, it is listed in C1 and C4.

Levchenko (2004) and Nunn (2005), denoted by L(04)* and N(05)*, respectively, are discussed in a fourth group of papers concerned with country-specific institutional differences that affect the quality of contract enforcement and hence the pattern of trade in contract intensive goods. Since both L(04)* and N(05)* assume an integrated world economy and do not address the choice between vertical integration and outsourcing, they are listed only in B4.

Finally, Puga and Trefler (2002) and Marin and Verdier (2002, 2003, 2005) form a fifth group that draws on the theory of delegation of authority to consider the choice between control by a principal and outsourcing. However, since the papers are not concerned with contracts for an intermediate good, they are included only in column 2. Analysis of an integrated world economy leads MV(03) to be listed in boxes A2 and B2. MV(02, 05*) address international integration, but do not explicitly model trade.

Papers in groups 1 to 5 are discussed in separate sections. Section 3 concerns the choice between vertical integration under the property rights or incentive systems approach (column 1) and contractual outsourcing (column 4). Section 4 focuses on the thickness of the market. Section 5 introduces the more applied papers in sections 6 and 7 by explaining the practical difficulties associated with the use of efficient contracts involving lump-sum payments in international transactions. Section 6 examines the choice between generic and

11 There is also a literature concerning international outsourcing under imperfect competition, but incomplete contracts are not considered. See, for example, Spencer and Jones (1991, 1992), Ishikawa and Spencer (1999), and Chen, Ishikawa, and Yu (2004). Friedman and Fung (1996) examine the effects of trade on U.S.-type and Japanese-type firms.

contractual outsourcing (columns 3 and 4), whereas section 7 is concerned with the role of institutions and contract enforcement (column 4). Discussion of the theory of delegation of authority (column 2) is deferred to section 8. Finally, section 9 asks: where are we now and where should we go?

3. Vertical integration versus outsourcing: property rights/incentive systems

The five papers in group 1 are considered in two subsections. Antràs (2003, 2005) and Antràs and Helpman (2004) are considered in 3.1, which focuses on the trade-off between vertical integration and international outsourcing under the property rights approach. Section 3.2 provides a comparison with the incentive systems approach based on Grossman and Helpman (2004) and Feenstra and Hanson (2005).

3.1. Property rights approach to international outsourcing

Under the property rights approach, relationship-specific investments are distorted because enforceable agreements take place only ex post or after investment is sunk. The surplus or economic rent created by the relationship is distributed through ex post *Nash bargaining*.[12] The ownership of assets is fundamental to each party's incentive to invest, since it determines the residual rights of control and hence the 'outside option' or 'threat point' of each party. Grossman and Hart (1986) emphasize that ownership and control should be allocated so as to minimize the loss in surplus due to investment distortions. Thus if each of two agents makes an investment relevant to a different dimension of the business, ownership should be given to just one of the agents (vertical integration), or the two dimensions of the business should be separated (non-integration or outsourcing), depending on which arrangement minimizes the loss in surplus. Generally, the agent that is most important in raising surplus should gain ownership rather than operate as a manager.

Hart and Moore (1990) add the idea that workers, as well as management, contribute to the productivity of an asset and that a key right provided by ownership is the ability to exclude people from the use of assets. Under integration or ownership, workers can be selectively fired, whereas if an outsourcing contract breaks down, unintegrated firms lose the entire benefit from the assets owned by the other party. The incentive for a principal to choose vertical integration is increased by the more favourable outside option.

12 Suppose parties A and B with bargaining powers, $\alpha \geq 0$ and $1-\alpha \geq 0$, respectively, bargain over the value of x, which could represent a lump-sum payment or a price per unit. Letting $\pi^i(x)$ and π^{i0} represent party i's utility from agreement and threat point (utility from no agreement), respectively, the generalized Nash bargaining solution is obtained by choosing x to maximize the product $(\pi^A(x) - \pi^{A0})^{\alpha}(\pi^B(x) - \pi^{B0})^{1-\alpha}$, where $\pi^i(x) - \pi^{i0}$ is party i's surplus from agreement. The solution satisfies a number of axioms such as independence from the scale in which utility is measured. Under ordinary Nash bargaining, the parties share equally ($\alpha = \frac{1}{2}$). As shown by Binmore, Rubinstein, and Wolinski (1986), this solution has a foundation in non-cooperative bargaining theory.

A major achievement of the new literature has been to embed contracting models into the standard general equilibrium models that explain trade based on differences in endowments of factors across countries and monopolistic competition arising from consumer demand for variety. Antràs (2003) develops a property-rights model of the boundaries of the firm and embeds it into a general equilibrium monopolistic competition model of trade in which countries differ in their endowments of labour and capital. Antràs and Helpman (2004) introduce heterogeneity or dispersion in the productivity of final-good firms as pioneered by Melitz (2003), but abstract from differences in factor proportions. Antràs (2005) combines incomplete international outsourcing contracts with a dynamic general equilibrium of trade so as to explain the development of product cycles in which new goods are initially designed and produced in the North, with later production moving to the South. These contributions are explored in more detail in the rest of the section.

Antràs (2003) provides evidence that capital-intensive intermediate goods, such as chemical products, tend to be imported into the United States within the boundaries of multinational firms, while labour-intensive goods, such as textiles, are imported from unaffiliated parties. Also, the share of intrafirm imports by multinationals as a proportion of total U.S. imports is higher, the higher the capital-labour ratio in the exporting country. Thus U.S. imports from capital-abundant countries, such as Switzerland, tend to involve multinationals, whereas imports from capital-scarce countries, such as Egypt, occur mostly at arms length. To explain these results, Antràs (2003) assumes a continuum of varieties of final goods in each of two sectors, which differ by capital intensity, owing to a requirement for a specialized intermediate input produced with both capital and labour. The opening of trade leads to an integrated world economy in which factor prices are equalized, as in Helpman and Krugman (1985), but since final goods are assumed to be non-tradable, the entire volume of world trade is in intermediate inputs.

The costs of production of specialized inputs are non-contractible and hence are sunk prior to ex post Nash bargaining as to each party's share in the relationship. Vertical integration and capital intensity are linked by assuming that final-good producers can alleviate the hold-up problem by contributing capital up front so as to aid in the production of the specialized input. Such cost sharing could involve the provision of specialized tools and equipment and pre-financing of capital expenses. If cost-sharing is large enough, then it is efficient to assign the residual rights of control to the final-good producer leading to vertical integration. Conversely, the model predicts outsourcing if the contribution of the final-good producer is relatively minor. Cost sharing and the attractiveness of vertical integration is shown to be increasing in the capital intensity of intermediate-good production, with the result that final goods in the capital-intensive sector are produced under vertical integration, whereas those in the labour-intensive sector are outsourced. The model

predicts that for any pair of countries, the share of a country's intrafirm imports is an increasing function of the capital-labour ratio of the exporting country.

To introduce differences in productivity across firms, Antràs and Helpman (2004) follow Melitz (2003) in assuming that firms make a random draw as to their productivity level after paying a fixed cost of entry. In contrast to Antràs (2003), wages are lower in the South than the North and labour is the only factor of production. Final goods are produced in the North using headquarter services from the North as well as manufactured components, which can be produced in the North or the South. The choice of organizational form depends on the importance of headquarter services, which varies by sector. In sectors with high headquarter intensity, the property rights approach suggests vertical integration so as to motivate final-good firms to supply these services. Otherwise, outsourcing is the preferred organizational form, since it increases the incentive for component production.[13]

In addition to the fixed cost of entry, final-good producers incur *fixed organizational costs* that vary with organizational form. Fixed costs are higher in the South than in the North, potentially offsetting the lower marginal costs in the South. Also, within any country, vertical integration involves higher fixed costs than outsourcing does. Since greater productivity increases the benefit from low-cost production, it is the more productive firms within the sector that choose to pay the higher fixed cost of production in the South. Also, since higher productivity is associated with increased revenue, more productive firms are also willing to pay the higher fixed cost of vertical integration so as to obtain a greater share of that revenue.

Figure 2 illustrates the four organizational forms that arise if headquarter intensity is sufficient to induce vertical integration. As shown in the column under AH(04), the most productive firms vertically integrate and produce via FDI in the South, the next most productive outsource in the South, lower-productivity firms vertically integrate in the North, even lower-productivity firms outsource in the North. The least productive firms exit. The ranking from highest to lowest productivity corresponds to the ranking from highest to lowest fixed cost.[14]

13 Since all production costs are assumed to be relationship specific, the revenues from the sale of the final good are allocated to final-good firms and manufacturers of components (whether or not they are vertically integrated) on the basis of ex post Nash bargaining after all costs of production are sunk. In accordance with Hart and Moore (1990), final-good firms have a better outside option and hence a larger share of revenue under vertical integration than under outsourcing because of the ability to fire the manufacturer and seize some fraction of components. However, aggregate revenue is reduced by the weaker incentive for component production within the firm.

14 Grossman, Helpman, and Szeidl (2005) develop a related model in which the fixed organizational cost of integration is less than the fixed cost of outsourcing. The most productive firms outsource in the South and the least productive vertically integrate in the North. The paper identifies conditions under which outsourcing and foreign sourcing are positively correlated.

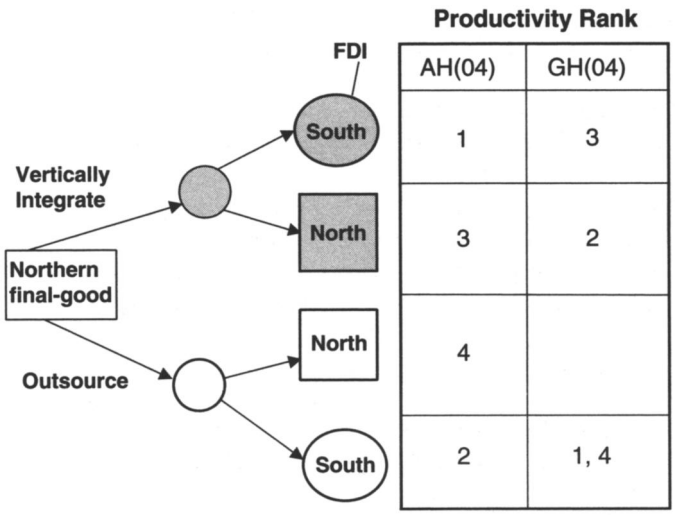

FIGURE 2 Organizational form and productivity rank

The prevalence of each type of organizational form is shown to depend on a number of parameters, such as headquarter intensity and the degree of productivity dispersion across firms. In particular, a reduction in transport costs or a lower Southern wage causes some of the lower-productivity firms that previously produced through vertical integration in the North to switch to outsourcing contracts in the South. This result is particularly interesting in the light of the argument, often presented in the media, that outsourcing has increased, owing to a reduction in the cost of doing business in the South.

Antràs (2005) develops a dynamic general equilibrium Ricardian model of North-South trade in which the incompleteness of international contracts leads to the emergence of product cycles. Northern firms produce goods by combining a hi-tech input or R&D from the North with a low-tech input, capturing simple assembly or manufacturing. The low-tech input can be produced either through vertically integration or outsourcing, with production taking place either in the North or the South. An important role is played by the proximity of production of the two inputs. If both inputs are produced in the North, the organizational form (whether vertical integration or outsourcing) is made irrelevant, owing to the assumption that quality-contingent contracts can be enforced ex post. By contrast, if production is split between the North and the South, quality-contingent contracts are not enforceable: the parties bargain over the surplus on the basis of an incomplete contracting model that is similar to Antràs (2003).

Product cycles arise from the incomplete nature of international contracts in the South and from a decline in the importance (reduction in output elasticity) of the high-tech input with the age or maturity of the good. Since incomplete contracts reduce product development, goods are initially manufactured in the North, where contracting is efficient. Manufacture of the low-tech input is later shifted to the South to take advantage of the lower wage. Conditions are specified under which this shift to the South occurs first within the boundaries of the firm through FDI and, at a later stage, through outsourcing to independent firms in the South. The general equilibrium model demonstrates that incomplete contracting in the South leads to an equilibrium wage that is higher in the North than the South.

In the three papers discussed in this subsection, a final-good producer controls the choice of organizational form and also provides an input (capital in Antràs 2003, headquarter services in Antràs and Helpman 2004, and a hi-tech input in Antràs 2005). Production also requires a second, intermediate input or component that can be manufactured by a manager under vertical integration or outsourced to an independent firm. Because the full cost of production of the intermediate input is assumed to be relationship specific and non-contractible, the intermediate-good producer (whether a manager or a firm) determines the quantity supplied. Output of the final good is then jointly determined by the quantities of inputs supplied by the two parties based on various formulations of production functions (mostly Cobb Douglas). This is a useful and elegantly simple way to specify the contributions of both parties. However, since the two parties contribute so as to jointly determine output and are compensated through lump-sum payment of a share of the revenue, this model of outsourcing may better describe a joint venture rather than an arm's length relationship. In typical arm's length contracts, the buyer has an opportunity to order more components at some positive price.

3.2. Incentive systems versus property rights

Rather than ex-post bargaining after investment has been sunk, an incentive systems approach involves optimal incentive contracts designed by a principal to induce investment or effort by managers. The first-best level of effort is typically not achieved, owing to the inability to observe effort and imperfect monitoring. Since vertical integration is assumed to reduce the cost of monitoring, it is possible that vertical integration is preferred to arm's length contracting even if the property rights approach would suggest outsourcing because of the importance of the agent's effort to overall surplus.

Grossman and Helpman (2004) take an incentive systems approach to explore the trade-off between vertical integration and international outsourcing. A principal can manufacture a given quantity of a final good if she can obtain the necessary intermediate good from an agent. Delivery requires that the agent be successful in multiple tasks, where the probability of delivery is increasing in the effort of the agent, as in Holstrom and Milgrom (1991). The

effort of the agent can be perfectly monitored for some fraction of the many tasks (ensuring success is those tasks) within a vertically integrated firm, but cannot be monitored if the agent is an independent contractor.[15] However, independent contractors, but not internal managers, are responsible for the up-front cost of inputs and are out-of pocket in the event production is not successful. Consequently, there is a trade-off between greater monitoring under vertical integration and higher-powered incentives for effort under outsourcing.

There are two countries, North and South. Differentiated final goods are produced only in the North, but the intermediate good can be produced in both countries. The principal has a greater ability to monitor managerial effort under vertical integration in the North than through FDI in the South, but production costs are lower in the South. As in Melitz (2003), productivity varies across final-good producers with the more productive firms earning higher revenues. The ranking of organizational forms from highest to lowest productivity is illustrated figure 2 (above) in the column under AH(04).[16] At the highest productivity levels, production is outsourced to the South because the principal is willing to pay so as to make delivery a certainty, but pays less under outsourcing because the up-front costs of production are shifted to the independent contractor. As productivity decreases, the preferred organizational form becomes vertical integration in the North, then FDI, and again outsourcing in the South. In the last case, both the lower cost in the South and higher level of effort made by independent contractors are needed to make production viable. It is never profitable to outsource in the North. Since the ordering of organizational forms in terms of final-good productivity in Grossman and Helpman (2004) differs substantially from that in Antràs and Helpman (2004), it would seem that, like a number of results that draw from models of industrial organization, the outcome is highly sensitive to the model.

The final paper in this group, Feenstra and Hanson (2005), contrasts the implications of both property rights and incentive systems approaches for the ownership and control structure of firms engaged in the export-processing trade from China. Production can involve *pure assembly* in which a foreign buyer of the processed good both owns and supplies the inputs required for processing, or *import and assembly*, in which the processing plant is responsible for finding and purchasing the imported inputs. The processing plant itself can be foreign or locally owned. Under a range of parameter values, the property rights approach implies that ownership and control should be split: the local manager should be given control rights over the input so as to increase his effort. By contrast, if managerial rewards can be tailored to effort through monitoring, as

15 In both cases, the contract involves an up-front payment plus a bonus on successful delivery.

16 The ordering is not determined by the size of fixed costs (as in Antràs and Helpman 2004) because the effort of the agent varies, depending on who is responsible for the fixed costs.

in the incentive systems approach, then it is more efficient to allocate both ownership and control to the foreign firm. Based on four-digit SITC product data for the years 1997–99 for processing exports from China and detailed data as to firm type, the paper provides support for the property rights approach by showing that the most common organizational form is to combine at least partial foreign ownership with the purchase of inputs controlled by local management.

4. The thickness of the market and the outsourcing decision

McLaren (2000) and Grossman and Helpman (2002, 2005) emphasize the importance of the 'thickness of the market' in determining the probability that final-good firms and suppliers of specialized inputs find an appropriate match so that investment and production can take place. In keeping with simple transaction cost models, there are fixed costs of vertical integration and, in Grossman and Helpman (2002), higher marginal costs, but otherwise the internal operation of firm is left as an efficient black box. The choice between vertical integration and domestic outsourcing is considered in 4.1, whereas 4.2 focuses on the choice between domestic and international outsourcing.

4.1. Vertical integration versus domestic outsourcing

In McLaren (2000), final-good firms can obtain a specialized, indivisible input either through the market based on a bidding model or through 'integrated' procurement in which the firm merges with a supplier.[17] Since the disadvantage from merger is simply a fixed cost, the model follows the 'transaction cost' approach to the theory of the firm. Unintegrated suppliers face a hold-up problem, since the inability to observe quality ex ante implies that bidding takes place only after suppliers have sunk their costs.[18]

For independent suppliers, the probability of an attractive outside buyer is increasing in the, thickness of the market,' as determined by the number of unintegrated final-good producers. Since vertical integration reduces the number of unintegrated firms, there is a negative externality from vertical integration that makes arm's-length arrangements less attractive. Multiple equilibria are possible. Since the opening of countries to trade increases the number of available, trade serves to thicken the market and raise welfare. Also, procurement systems across countries tend to converge as transport costs fall.

17 McLaren (1999) considers incomplete contracts in a similar setting and discusses the potential effects of differences in contracting across countries, but trade is not modelled.

18 In bidding models, price is determined by the value of the good in its most attractive alternative use, which implies a zero price for a fully specialized input. Thus, in McLaren (2000), unintegrated suppliers choose to use a 'flexible technology' that is of less value to the primary buyer but increases the probability of an outside buyer. By contrast, Nash bargaining would allow a firm supplying a fully specialized input to receive a share of the rents created by the relationship.

McLaren (2000) provides a rich formulation of the role of the thickness of markets, but since countries differ only in their numbers of integrated and unintegrated producers and the choice of organizational form matters only for fixed costs, the paper abstracts from effects on final-good output and also from features of general equilibrium trade models such as differences in factor endowments.

Grossman and Helpman (2002) build on the ideas in McLaren (2000), but the choice between vertical integration and outsourcing is developed in a general equilibrium, monopolistic competitive framework in which final-good industries differ in the degree of product differentiation. However, the closed-economy setting precludes consideration of international outsourcing. The costs of search for a partner under outsourcing are counterbalanced by higher fixed and marginal costs under vertical integration. Similar to McLaren (2000), the benefit of a 'thicker' market makes outsourcing more viable in large economies or large industries. Also, equilibrium involves either vertical integration by all producers or outsourcing by all producers. Arm's length sales are made through incomplete contracts rather than bidding. Since the entire cost of the specialized (or partially specialized) component is sunk prior to bargaining, payment takes the form of a share of profits with components purchased at a zero price. Final-good output is limited by the number of components that intermediate-good producers choose to supply.[19]

An interesting question concerns the role of the intensity of competition in shaping organizational form. Although the effects of variation in the degree of substitutability between final products are complex, for the case in which consumer products are highly substitutable, outsourcing occurs only if specialized producers have a large per unit cost advantage.

4.2. Domestic versus international outsourcing

Grossman and Helpman (2005) develops the choice between domestic and international outsourcing under incomplete contracts in a general equilibrium setting of monopolistic competition and trade. Differentiated final goods are designed and produced only in the North, but each final-good firm must find an independent supplier in the North or the South willing to customize and produce a specialized component. Vertical integration is not considered. Labour is the only factor of production and the South is favoured by a lower wage. Consistency with general equilibrium wage determination and balanced trade is maintained by assuming that a homogeneous final good is produced only in the South.

Final-good firms are represented as being located symmetrically around a unit circle with respect to the specialized component that they require, whereas suppliers are located on the circle based on their particular expertise. Unlike

19 In the version of the model in which intermediate-good producers can choose the degree to which they specialize their components, final-good firms face marginal adaptation costs so as to make the components 'fit.' These costs reduce equilibrium output.

Grossman and Helpman (2002), where final-good firms had to customize components to make them fit, in Grossman and Helpman (2005), suppliers invest so as to develop a prototype component that is an exact fit. The required relationship-specific investment is increasing in the distance between the supplier's expertise and the final producer's input needs. Owing to an inability to write contracts on the full amount of investment, suppliers are compensated through a share of profits. Components are purchased at marginal cost through an efficient order contract.

Final-good firms incur a fixed cost of search, but since component suppliers incur higher fixed costs of entry and investment, there are fewer suppliers than final-good firms in both the North and the South. Since each supplier provides components for more than one final good, the 'thickness of the market' is defined by the number of suppliers. There is a positive feedback between entry by suppliers, which thickens the market, and the extent of search by final-good producers, but increases in the wage limit the extent of entry. Multiple equilibria with different patterns of outsourcing are a possibility.

As might be expected, economies with a greater endowment of labour tend to have thicker markets, which favours outsourcing in those markets. However, other results driven by complex general equilibrium responses affecting wages and the numbers of each type of firm are not obvious. In particular, increasing returns in outsourcing are sufficiently strong that an expansion in Southern labour supply actually reduces the wage gap between the North and the South. Also, an improvement in a country's legal environment (which makes a larger fraction of relationship-specific investment contractible) increases the country's share of outsourcing, holding the wage and number of firms fixed; but general equilibrium responses to a global improvement favour outsourcing in the North.

5. Efficient lump-sum payments versus price contracts

All the papers in groups 1 and 2 (sections 3 and 4) concerned with incomplete contracts follow Grossman and Hart (1986) in assuming that ex post bargaining is efficient. Thus, components are purchased through the combination of a lump-sum payment and a price set at marginal cost. If all production costs are sunk prior to bargaining, then price is reduced to zero. Marginal-cost pricing is efficient in that it avoids 'double-marginalization,' in which the mark-up of the intermediate-good producer is included in price and hence reduces the output of the final-good producer. However, the transfer of rents through lump-sum payments is not typical of arm's length purchases within a country and the need to pass customs and ensure payment across borders serves to magnify any difficulties in an international trading context. Customs officials would view shipments listed as having a zero price (with a lump sum paid through other means) as particularly suspicious.

To import a good, the total value, including price, quantity, insurance, and shipping costs, needs to be listed on the commercial invoice or letter of credit for insurance and customs purposes.[20] For the supplier, full disclosure of the terms of the contract facilitates payment on delivery and, if that fails, a better prospect of a successful appeal to the courts.[21] In theory, rents could be transferred to the seller through a high price for the first unit (or spread over other inframarginal units). However, rather than a schedule in which different units have different prices, quantity discounting typically involves a reduction in the price per unit with the order of a larger quantity.[22]

The use of lump-sum payments rather than price to reward relationship-specific investment also abstracts from possible links between the level of investment, the price of components, and final-good output. This is helpful for the tractability of general equilibrium modelling, but may or may not be a good thing, depending on whether these output effects are important. The papers considered in the next section take a partial equilibrium approach, but they include these links by assuming that the parties bargain over price, and there are no lump-sum transfers.

6. Contractual versus generic outsourcing

The third group of papers, namely, Spencer and Qiu (2001), Qiu and Spencer (2002), Head, Ries, and Spencer (2004), and Feenstra and Spencer (2005), involve a trade-off between the purchase of specialized components or parts under incomplete contracts and the purchase of standard or generic parts from a spot market. This trade-off is built into the contracting process: in bargaining with a supplier that has invested so as to specialize an input, the outside option of the final-good producer is to purchase a generic part.

Rather than requiring just one customized component, the final good is assembled by using a variety or range of parts in fixed proportion. Relationship-specific investment or RSI by a supplier reduces the marginal cost of assembly by improving the fit of the particular part with the other parts used in production. Since it is not possible to contract on the level of RSI, each supplier shares in the economic rent from the relationship through Nash bargaining over the price of the part after investment is sunk. As a result, suppliers undertake too little RSI and too many parts are purchased as generics. Lump-sum transfers are ruled out, which, as discussed in section 5, may better reflect practical realities. An increase in RSI increases the bargained

20 Typically, the seller first issues a pro forma invoice containing this information. The buyer then uses the invoice to arrange for funds, usually through a letter of credit, which is an undertaking by the buyer's bank to pay the seller's bank only after certification that the specified goods have been delivered. The actual transaction is governed by a commercial invoice or contract.

21 The difficulty in enforcing payments across borders also suggests the importance of the trust generated by business and social networks. See Rauch (2001) for a survey.

22 One disadvantage of a high price for the first unit is that the buyer risks being forced to pay the full amount for transfer of rent when the quantity shipped is incomplete.

price because of the creation of higher rents. However, since these rents take the form of a reduction in marginal assembly cost, the net effect of RSI is to lower marginal cost, which raises final-good output. The final-good producer determines whether to bargain with a supplier and the quantity of parts to order.

Parts are ordered on a continuum based on increasing productivity of relationship-specific investment.[23] Since there is an endogenously determined cut-off in the productivity of investment below which parts are produced as generics, the size of the network of suppliers undertaking RSI is determined endogenously. Also, a greater scale of final-good production increases investment by suppliers, which, in turn, feeds back to reduce the marginal cost of final-good production and raise output. The theory abstracts from general equilibrium effects working through factor prices and consumer demand for variety, but the simpler partial equilibrium formulation facilitates consideration of a number of policy issues.

Spencer and Qiu (2001) and Qiu and Spencer (2002) consider the role of vertical *keiretsu* (Japanese vertical corporate groups) for trade with Japan. The papers focus on the auto industry, where the limited value and range of parts imported by *keiretsu*, such as Toyota and Nissan, led to claims by the United States and other countries in the mid-1990s of an 'unfair' trade barrier arising from Japanese business practices. Spencer and Qiu (2001) argue that Japanese business practices involving outsourcing to *keiretsu* suppliers under incomplete contracts could create the impression of a trade barrier, even when none exists. For example, the benefits of RSI could make it profitable for a range of parts to be procured locally in Japan, even though these parts are produced at a marginal cost that exceeds the import price. Qiu and Spencer (2002) consider the effects of policies aimed at opening the Japanese markets for imported components, such as auto parts, through a VIE (voluntary import expansion) or limit its exports of final goods, such as autos, through a VER (voluntary export restraint). Although both policies would cause Japan to import a wider range of parts, the associated fall in *keiretsu* investment and output could actually reduce the total value of Japanese imports.

Head, Ries, and Spencer (2004) develop an empirical specification of Spencer and Qiu (2001) to investigate the role of vertical networks in international trade by examining the pattern of U.S. auto parts exports to 26 countries from 1989 to 1994. The paper develops a number of proxies for network strength at the auto-parts level (for 53 parts classifications) so as to identify the parts likely to be produced within the network rather than outsourced as generics. The most interesting proxy measures the intensity of *keiretsu* involvement in the production of each part based on the fraction of

23 In Spencer and Qiu (2001) and Qiu and Spencer (2002), RSI is more productive if it is applied to a part that is responsible for a greater share of the cost of assembly. In Head, Ries, and Spencer (2004) and Feenstra and Spencer (2005), an exogenously given parameter captures productivity across parts.

keiretsu suppliers used for each part by each Japanese automaker. As predicted by the model, U.S. exports to Japan tend to be lower for parts with a greater intensity of *keiretsu* involvement. Although differences in *keiretsu* strength are significant for the composition of Japanese parts imports, after controlling for automaker scale and other country characteristics, such as distance from the United States, the paper finds that Japan's aggregate import levels are not outliers.

Other results also underscore the importance of vertical networks in trade. Countries with a greater output per automaker import fewer parts per car, which fits with the model's prediction that a greater scale of production increases the incentive for RSI by local suppliers. Also, the hypothesis that the Big Three U.S. automakers (General Motors, Ford, and Chrysler, now Daimler Chrysler) operate with networks of U.S. -based suppliers is supported by the finding that countries with a larger Big Three presence tend to import more parts from the United States for each car produced. In addition, countries whose foreign affiliates employ more automotive sector workers in the United States, tend to import more U.S. auto parts per car, presumably from these affiliates.

Figure 3 illustrates various options for outsourcing by a final-good producer in a Northern high wage country. Spencer and Qiu (2001) and Qiu and Spencer (2002) focus on two of the options in Figure 3: contractual outsourcing to a Northern firm that undertakes RSI and produces in the North, and the import of generic parts from the South. Proximity of suppliers to the final-good producer benefits RSI, owing to the need for information as to the best way to improve each part. Parts with a higher productivity of investment are produced at home and the less important parts are imported as generics. Head, Ries, and Spencer (2004) add the possibility (not shown in the figure) that final-good firms producing abroad through FDI differentially source components from their home network of suppliers.

In Feenstra and Spencer (2005), the final-good firm in the North chooses between all four organizational forms shown in figure 3. Northern suppliers can take advantage of proximity by undertaking RSI in the North, but can produce more cheaply in the South through FDI by incurring a fixed cost. The Northern final-good firm can also directly contract with suppliers in the South, who undertake RSI. The ranking of the four outsourcing options from high to low productivity of RSI is shown in figure 3. At the highest productivity levels, both RSI and production take place in the North. As productivity decreases, Northern suppliers shift production, but not RSI, to the South; then Southern suppliers undertake both RSI and production in the South; finally, parts are imported as generics from a spot market in the South. The ordering of organizational forms is again different from the orderings based on final-good productivity, as illustrated in figure 2.

Feenstra and Spencer (2005) argue that a reduction in the marginal costs of production and transport should increase the range or variety of intermediate

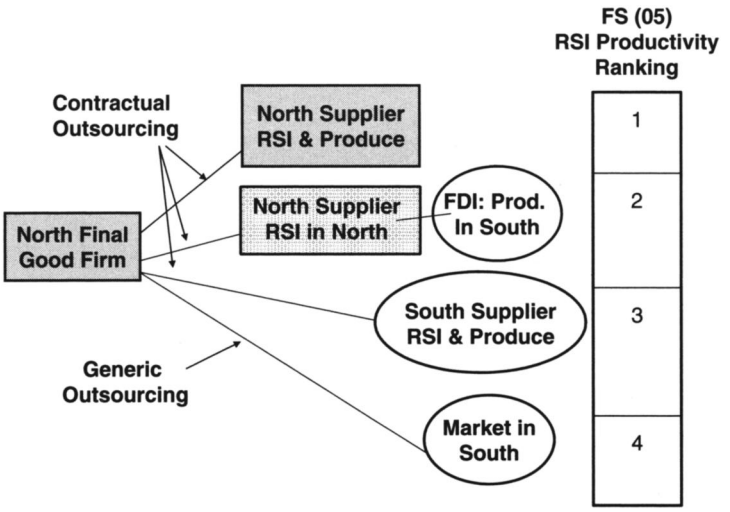

FIGURE 3 Forms of contractual and generic outsourcing

goods exported from the South through FDI by shifting production away from suppliers in the North. Such a reduction in cost should have no effect on the goods that are exported based on outsourcing contracts or spot market purchases. The paper examines this hypothesis using data from Chinese provinces to a large number of export destinations for the period 1988–2000. Transportation costs are proxied by two measures of distance: the *internal distance* from the province to the nearest shipping port or major border crossing and then the *external distance* from that port/border crossing to the destination country. Based on a gravity equation specification in which the extensive margin, representing the range of goods, is used as the dependent variable, the impact of *external distance* is insignificant in most cases, but *internal distance* tends to have a greater impact in reducing the variety of processing exports by foreign owned enterprises than domestically owned firms.

Chen and Feenstra (2005) are also concerned with the correspondence between variety in intermediate goods and the vertical structure of international trade. However, since relationship-specific investments are made by buyers rather than the suppliers, the property rights approach suggests vertical integration rather than contractual outsourcing. Buyers that do not make a specific investment to match with a particular supplier purchase the input at a price determined by Bertrand competition between the two closest suppliers.[24]

24 There is a continuum of buyers each with a preferred specification for an input represented by a point on a circle, but only a finite number of suppliers choose to enter the industry. Buyers can reduce price under outsourcing by investing so as to increase the flexibility of their input requirements.

Multiple equilibria in the variety of intermediate goods are a possibility. Thus, the observation in Feenstra, Yang, and Hamilton (1999) that South Korea exports a limited variety of goods compared with Taiwan could be an example of this phenomenon. Based on data for a broad sample of countries, the paper finds moderate support for its prediction that industries with fewer suppliers and hence less variety in intermediate goods are associated with more vertical integration and more intrafirm trade.

7. Institutions and enforcement of contracts

There is a growing literature attesting to the importance of the quality of a country's institutions for comparative advantage and the volume of trade. For example, Anderson and Marcouiller (2002) find that economic predation at the border due to corrupt institutions acts as a hidden tax on trade. Costinot (2005) develops an appealing model in which firms producing more complex goods (defined as the number of elementary tasks that must be performed to produce one unit) are larger, owing to greater gains from the division of labour, but are also more dependent on the ability of a country's institutions to enforce labour contracts within the firm. A higher quality of institutions increases the size of firms and also leads to specialization in more complex goods with the opening of trade. Both Levchenko (2004) and Nunn (2005) involve incomplete contracts for specialized inputs.

Levchenko (2004) argues that it matters for the gains from trade whether institutional differences between countries are reflected in differences in the quality of contract enforcement or, as is usually assumed, in differences in productivity. There are 'good jobs' in contract-intensive sectors, since the property rights approach implies that workers earn rents from ex post bargaining with the owners of capital.[25] If contract enforcement is better in the North than the South, then the 'good jobs' will shift to the North with the opening of trade. As a result, the South tends to gain less than the North from trade and may actually be worse off. By contrast, if the workers in the Northern institutionally dependent sector are simply more productive, closing down this sector enhances the Southern gains from trade. Using data on 1998 U.S. imports classified by industry and country of origin, Levchenko (2004) supports this analysis with evidence that better institutional quality tends to increase the extent to which a country exports goods in industries that are contract intensive.

Nunn (2005) provides additional theory and evidence that countries with a better ability to enforce contracts have a comparative advantage in the

25 Following Cabellero and Hammour (1998), two goods are produced with labour or capital alone, and a third mixed good, M, uses capital and labour in fixed proportion. Incomplete contracts lead to too little capital investment in M, but workers share in the rents arising from the restriction in output. Higher-quality institutions reduce the fraction of capital subject to incomplete contracts.

production of goods that are contract intensive. Final goods, which are produced with both customized and standardized inputs in fixed proportion, are ordered on a continuum in terms of increasing importance of the customized input, which requires relationship-specific investment. The proportion of contracts that are enforced depends on the quality of the legal system. When 1997 export data for 146 countries disaggregated into 223 industries are used, differences in judicial quality prove significant in explaining differences across country pairs in the value of exports of contract-intensive goods.

8. The theory of delegation of authority

Aghion and Tirole (1997) develop the conditions under which formal authority over the choice between a number of competing projects will be delegated to an agent (*A-formal authority*), or retained by the principal (*P-formal authority*). Each party can increase the probability that they privately learn the payoffs from the projects by exerting effort. Delegation of authority fosters the agent's incentive to acquire information, but it also involves a potentially costly loss of control for the principal, since an informed agent will choose a project partly based on private benefits (perks). If neither party becomes informed, both parties are worse off, since no project is implemented. Formal authority (the right to decide) is distinguished from real authority (effective control). If the principal is not informed (perhaps because of little effort) but retains formal authority, she gives up real authority by rubber stamping the agent's proposal. Unlike models involving monitoring of an agent's effort, greater effort by the principal tends to reduce effort by the agent.

Puga and Trefler (2002) are concerned with the implications for organizational form of the tension between creating incremental improvements in knowledge and controlling the implementation of those improvements. Similar to Aghion and Tirole (1997), the allocation of control to an agent (outsourcing) acts as an incentive device to induce effort, but it also imposes a cost on the principal, owing to a conflict as to the appropriate blueprint. Since an innovation in one component requires adaptation in other components, the principal prefers a blueprint that shifts the costs of adaptation onto the agent and vice versa.[26] The non-appropriability of knowledge is also important: if an agent creates knowledge, there is some probability that a court will award all the profits to the agent. An appealing feature of the paper is its use of real-world illustrations, such as Sony's decision to become more integrated so as to retain control over the adaptation of television components to fit with flat screen displays.

26 If the costs of adaptation are low, then the innovative efforts of the principal and agent are highly 'substitutable' and control is delegated to the agent. At lower levels of substitutability, the principal retains control over implementation, but it is possible that the agent makes no innovative effort.

Marin and Verdier (2002, 2003, 2005) are interested in explaining the recent trend towards a 'flatter hierarchy,' in which power is delegated to lower level management. Both papers model delegation as in Aghion and Tirole (1977), but the competing 'projects' are given a specific interpretation as reflecting different methods of production, where the method preferred by the agent (manager) confers private benefits at the expense of a higher marginal cost. There are three organizational forms: centralized control by the principal (P-organization or integration), delegation to the agent (A-organization or outsourcing), and the single managed firm (O-organization) with no internal hierarchy, since the agent exerts minimal effort.[27]

To examine the effects of competition, Marin and Verdier (2002) embed their model of the firm into a general equilibrium monopolistic competition framework in which labour is the only factor of production. At intermediate levels of competition, as modelled by the degree of substitutability of goods, there is a tendency to move to a flatter hierarchy (from P to A) so as to increase the effort of the agent. Multiple equilibria arise in general equilibrium from the dependence of the organizational decision of any one firm on the organizational forms of other firms. Thus, two otherwise identical countries might have different corporate cultures in the absence of trade (either an A or a P). Owing to convergence of organizational form, the move to an integrated world economy can lead to waves of outsourcing, but the outcome is indeterminate, since market size per se has no effect on the organization of the firm. With the introduction of profit mark-ups that vary with market competition, Marin and Verdier (2005) show that very large and very small countries will have integrated corporate organizations, while countries of middle size will outsource.[28] Toughness of competition eventually leads to outsourcing. It is interesting that an increase in competition also leads to outsourcing in the different context of Bertrand competition between two manufacturers located at each end of a Hotelling line (de Bettignies, 2004).[29]

Marin and Verdier (2003) extend the analysis to a two-sector, two-factor model in which two countries, the North and the South, differ in the skill intensity of their workers. As the ratio of skilled to unskilled labour increases, the organizational form tends to move from P to A and then to O. If firms in the skill-rich North choose P and firms in the skill-poor

27 If the principal's benefit from successful production is low, she chooses P, since she makes only a low effort that does not stifle the initiative (effort) of the agent. At intermediate benefit levels, the principal chooses *A* to increase the agent's initiative. At high benefit levels, the principal's effort is sufficiently high to stifle the effort by the agent, even under delegation of power, and *O* is the outcome.

28 Marin and Verdier (2005) show that firms in Austria (the smaller country) have greater centralization in internal decision making than do firms in Germany.

29 Assuming independent retailers (or alternatively producers of an input) are more efficient than the manufacturer in creating quality, de Bettignies (2004) uses a property rights approach to show that outsourcing is the response to greater substitutability of goods as consumer travel costs fall. Firms choose the same organizational form if competition is high or low, but not at intermediate levels of competition.

South choose O prior to the opening of trade, then a move to the integrated world economy can result in a wave of outsourcing as firms shift to the intermediate A organization, involving delegation of power. Since a flatter hierarchy is associated with a greater demand for skill, there is an associated 'war for talent.'

9. Where are we now and where should we go?

In an examination of where we are now, it is useful to first summarize the role of the different underlying theories in driving the choice between outsourcing and vertical integration. Under the property rights approach, relationship-specific investments are distorted regardless of organizational form. The incentive to outsource is increased if component suppliers are more important in creating surplus than final-good producers. The models of Antràs (2003, 2005), Antràs and Helpman (2004), and Feenstra and Hanson (2005) illustrate this theme in different contexts. Investment or effort levels are also distorted under the incentive systems approach, but the distortion is lower inside the firm than under arm's length relationships, owing to better monitoring. The advantage from vertical integration is potentially offset by higher-powered incentives under outsourcing (Grossman and Helpman, 2004). The theory of delegation of authority involves a trade-off for the principal between maintaining control under vertical integration and increasing the agent's effort under outsourcing. Moderate levels of competition or moderate skill intensity of the workforce leads to a flatter hierarchy (Marin and Verdier 2002, 2003, 2005). Finally, under the transaction cost approach taken by papers concerned with the 'thickness of markets,' matching between independent firms is costly, but vertical integration has higher fixed (and possibly variable) costs (McLaren 2000; Grossman and Helpman 2002). The fact that the various theories differ significantly means that there is no overarching explanation for outsourcing.

There are three primary explanations for a reliance on international outsourcing to procure specialized inputs, rather than domestic production through outsourcing or vertical integration: (1) lower costs of foreign production; (2) improvements in foreign institutions or international communications; (3) reduced costs of international transactions, which is associated with globalization or greater integration in world markets.

Lower costs of foreign production as in (1) are highly important empirically, as emphasized in the business press, and, as can be seen from table 1 in section 2, they also drive much of the theory. In particular, if the theory incorporates a higher cost for international transactions, some offsetting benefit from foreign production is needed to induce international outsourcing. The main source of lower costs is lower wages, but the effect of physical distance is also important. A low-cost country should export a greater variety of intermediate goods to physically closer countries (Feenstra and Spencer 2005). As for (2), the quality

of foreign enforcement of contracts is important (Antràs 2005; Grossman and Helpman 2005; Levchenko 2004; Nunn 2005). However, factors that reduce the size of any informational disadvantage in investment from the location of a supplier in a different country from the buyer also play a role (better communication technology in Feenstra and Spencer 2005; networks of suppliers in Head, Ries, and Spencer 2004).

The literature identifies a variety of reasons for a reduction in the cost of international transactions and hence greater international outsourcing under (3). These include (i) a reduction in trade barriers such as tariffs and (ii) reduced costs of international search and matching, leading to entry by suppliers and thicker markets (Grossman and Helpman 2005). At the extreme, the costs of international transactions may be reduced to zero, leading to a fully integrated world economy, as in standard models of international trade. Global integration per se, interpreted as a move from autarky to an integrated would economy, leads to further reasons for outsourcing under (3): (iii) thicker markets due to the combining of economies (McLaren 2000); (iv) the convergence of organizational form to outsourcing when multiple equilibria are possible (Marin and Verdier 2002, 2003, and (v) differences in factor endowments across countries (capital intensity in Antràs 2003; skill intensity in Marin and Verdier 2003; a greater labour endowment, which raises the thickness of the market, in Grossman and Helpman 2005).

Since many of the just described conditions driving international outsourcing would also enhance the profitability of foreign direct investment, it is important to identify features that distinguish these two organizational forms. Features that favour international outsourcing relative to FDI include: (1) higher fixed costs of FDI (Antràs and Helpman 2004; Feenstra and Spencer 2005); (2) shift of up-front costs of production from final-good firms to component suppliers (Grossman and Helpman, 2004); (3) differences in productivity of final-good firms (moderate productivity firms outsource and the highest productivity firms engage in FDI in Antràs and Helpman 2004, but both the lowest and the highest productivity firms outsource in Grossman and Helpman 2004); (3) low productivity of relationship-specific investment by component suppliers (contractual outsourcing at the upper end of the range and import of generics at the bottom in Feenstra and Spencer 2005); (4) lower capital intensity in intermediate-good production (Antràs 2003); (5) a greater geographic distance (reduces FDI, but not contractual outsourcing or generic outsourcing in Feenstra and Spencer 2005).

In exploring the conditions leading to international outsourcing under incomplete contracts, a major achievement has been to embed contracting models into the standard general equilibrium models that explain trade based on differences in endowments of factors across countries and monopolistic competition arising from consumer demand for variety. In particular, it is a very nice contribution to use differences in factor proportions across countries to explain not only the factor intensity of a country's exports, but also the

organizational form of production (Antràs 2003). Papers that explore the role of the thickness of markets already have a general equilibrium character, owing to the feedback between the ease of search as affected by the thickness of the market and decisions by individual firms as to organizational form. The extension to monopolistic competition and a general equilibrium model of trade adds significant complexity. Given the need to model the thickness of both a domestic and a foreign market together with general equilibrium changes in the wage, it is not surprising that Grossman and Helpman (2004) sacrificed consideration of vertical integration. Also, although relationship-specific investment is distorted by incomplete contracts, the international order contracts for the components themselves are assumed to involve efficient purchase at marginal cost. Indeed, in much of the literature, specialized components can be imported at a zero price since lump-sum transfers compensate for production costs, all of which take place up front.

In looking to the future, I would suggest that greater attention be paid to the types of transaction costs observed in international arm's length contracts, including the costs of ensuring payment across international borders, which can vary based on the quality of institutions. Recognition that outsourcing contracts typically involve a strictly positive price that exceeds marginal cost, whereas internal transactions within vertically integrated firms do not, would help to further distinguish these organizational forms. However, the use of a price mark-up to compensate for relationship-specific investment provides a link between the level of investment and final-good output, which can add significantly to the complexity of the model.

Adding complexity to the model of incomplete contracts through the inclusion of price effects may require some sacrifice elsewhere, such as the omission of a general equilibrium determination of the wage, but, in any case, I would expect to see more consideration of partial equilibrium models so as to focus on the policy implications of international outsourcing. One issue is the policies that a country may take to reduce the ability of its firms to outsource internationally. For example, during the 2004 U.S. election campaign, when fears of international outsourcing reached fever pitch, there were suggestions that the United States should tighten visa restrictions so as to reduce the ability of companies to train foreign software engineers in preparation for international outsourcing.[30] Presumably policies in developing countries towards multinational firms would also influence the relative importance of FDI and international contractual outsourcing.

Another promising direction for research is to recognize that many of the firms involved in international contractual outsourcing, such as IBM and General Electric, are extremely large and have some market power.[31] This

30 See Reuters (2004) for a discussion of the implications of tight visa rules for U.S. business.

31 See Solomon, Kranhod, and Sender (2004) for the sale by General Electric of its global business-processing operations in India to independent firms in an effort to cuts costs and streamline its business.

suggests a need to understand the strategic motives of oligopolistic firms that engage in international contractual outsourcing. One potentially important issue is the ability of firms to protect proprietary information from their rivals. There is also the more general issue of ensuring data security and protection of information when firms outsource in locations such as China, which are known for producing cheap imitations of branded goods.[32]

I would suggest two main lines for further empirical research. First, both thicker markets and better institutions for the enforcement of contracts in foreign countries are appealing explanations for greater international outsourcing. There is already some empirical support for the importance of country-specific differences in the quality of enforcement of contracts (Levchenko 2004; Nunn, 2005). However, since better institutions can also increase the thickness of markets, there is a need to exploit predictions that distinguish between the two theories. To establish the role of search and matching, one possibility is to relate the thickness of markets to the size of a country's skilled workforce, or even better, a direct measure of the number of independent suppliers of a particular intermediate good.

Second, there are likely payoffs from further empirical analysis of the relationship between the range or variety of traded intermediate goods and the choice of organizational form. The new theories of trade and organizational form emphasize the prevalence or range of firms choosing each organizational form, rather than the value or volume of trade that was the focus of traditional trade models. Feenstra and Spencer (2005) make a start by examining whether a gravity-type model can explain the variety of intermediate goods that are produced under contractual outsourcing, rather than through FDI or ordinary trade. However, the predictions of Antràs and Helpman (2004) and Grossman and Helpman (2004) that relate the range of products produced under each organizational form to firm level productivity have yet to be tested. Since both the theory and empirical work is in its infancy, we can expect very rich further developments.

References

Aghion, Phillipe, and Jean Tirole (1997) 'Formal and real authority in organizations,' *Journal of Political Economy* 105, 1–29

Amiti, Mary, and Shang-Jin Wei (2005) 'Fear of service outsourcing: is it justified?' *Economic Policy* 20, 308–48

Anderson and Marcouiller (2002) 'Insecurity and the pattern of trade: an empirical investigation,' *Review of Economics and Statistics* 84, 342–52

Antràs, Pol (2003) 'Firms, contracts, and trade structure,' *Quarterly Journal of Economics* 118, 1375–418

— (2005) 'Incomplete contracts and the product cycle,' *American Economic Review*, September, forthcoming

Antràs, Pol, and Elhanan Helpman (2004) 'Global sourcing,' *Journal of Political Economy* 112, 552–80

32 See Solomon (2004) for proposed legislation to regulate the processing of sensitive financial and medical information in countries such as India.

Antràs, Pol, Luis Garicano, and Esteban Rossi-Hansberg (2006) 'Offshoring in a knowledge economy,' *Quarterly Journal of Economics*, February, forthcoming
Binmore, Ken, Ariel Rubinstein, and Asher Wolinski (1986) 'The Nash bargaining solution in economic modelling,' *Rand Journal of Economics* 17, 176–88
Caballero, Ricardo, and Mohamad Hammour (1998) 'The macroeconomics of specificity,' *Journal of Political Economy* 106, 724–67
Campa, José, and Linda 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
Chen, Yongmin, Jota Ishikawa, and Zhihao Yu (2004) 'Trade liberalization and strategic outsourcing,' *Journal of International Economics* 63, 419–36
Chen, Yongmin, and Robert C. Feenstra (2005) 'Buyer investment, product variety and intrafirm trade,' University of Colorado at Boulder and UC Davis, mimeo
Coase, Ronald (1937) 'The nature of the firm,' *Economica* 4, 386–405
Costinot, Arnaud (2005) 'Contract enforcement, division of labor and the pattern of trade,' Department of Economics, Princeton University, mimeo
de Bettignies, Jean-Etienne (2004) 'Product market competition and the boundaries of the firm,' Sauder School of Business, University of British Columbia, mimeo
Feenstra, Robert C. (1998) 'Integration of trade and disintegration of production in the global economy,' *Journal of Economic Perspectives* 12, 31–50
Feenstra, Robert C., and Gordon H. Hanson (2003) 'Global production sharing and rising inequality: a survey of trade and wages,' in *Handbook of International Trade*, ed. E. Kwan Choi and James Harrigan (Oxford: Blackwell)
— (2005) 'Ownership and control in outsourcing to China: estimating the property-rights theory of the firm,' *Quarterly Journal of Economics* 120, 729–61
Feenstra, Robert C., and Barbara J. Spencer (2005) 'Contractual versus generic outsourcing: the role of proximity,' University of British Columbia, mimeo
Feenstra, Robert C., Tan-Han Yang, and Gary G. Hamilton (1999) 'Business groups and product variety in trade: evidence from South Korea, Taiwan and Japan,' *Journal of International Economics* 48, 71–100
Friedman, Daniel, and K.C. Fung (1996) 'International trade and the internal organization of firms: an evolutionary approach,' *Journal of International Economics* 41, 113–37
Grossman, Gene M., and Elhanan Helpman (2002) 'Integration versus outsourcing in industry equilibrium,' *Quarterly Journal of Economics* 117, 85–120
— (2004) 'Managerial incentives and international organization of production,' *Journal of International Economics* 63, 237–62
— (2005) 'Outsourcing in a global economy,' *Review of Economic Studies* 72, 135–60
Grossman, Gene M., Elhanan Helpman and Adam Szeidl (2005) 'Complementarities between outsourcing and foreign sourcing,' *American Economic Review (Papers and Proceedings)* 95, forthcoming
Grossman, Sanford J., and Oliver D. Hart (1986) 'Costs and benefits of ownership: a theory of vertical and lateral integration,' *Journal of Political Economy* 94, 691–719
Hart, Oliver (1995) *Firms, Contracts and Market Structure* (New York: Oxford University Press)
Hart, Oliver, and John Moore (1990) 'Property rights and the nature of the firm,' *Journal of Political Economy* 98, 1119–58
Head Keith, John Ries, and Barbara J. Spencer (2004) 'Vertical networks and U.S. auto parts exports: is Japan different?' *Journal of Economics and Management Strategy* 13, 37–67
Helpman, Elhanan, and Paul Krugman (1985) *Market Structure and Foreign Trade* (Cambridge, MA: MIT Press)

Holmström, Bengt, and Paul Milgrom (1991) 'Multitask principal-agent analysis: incentive contracts, asset ownership and job design,' *Journal of Law, Economics and Organization* 7, Special Issue, 24–52
Hummels, David, Jun Ishii, and Kei-Mu Yi (2001) 'The nature and growth of vertical specialization in world trade,' *Journal of International Economics* 54, 75–96
Ishikawa, Jota, and Barbara J. Spencer (1999) 'Rent-shifting export subsidies with an imported intermediate product,' *Journal of International Economics* 48, 199–232
Levchenko, Andrei (2004) 'Institutional quality and international trade,' IMF working paper WP/04/231
Marin, Dalia, and Thierry Verdier (2002) 'Power inside the firm and the market: a general equilibrium approach,' Centre for Economic Policy Research Discussion Paper No. 4358, London
Marin, Dalia, and Thierry Verdier (2003) 'Globalization and the empowerment of talent,' Centre for Economic Policy Research Discussion Paper No. 4129, London
— (2005) 'Corporate hierarchies and international trade: theory and evidence,' University of Munich, mimeo
McLaren, J. (1999) 'Supplier relations and the market context: a theory of handshakes,' *Journal of International Economics* 48, 121–38
— (2000) 'Globalization and vertical structure,' *American Economic Review* 90, 1239–54
Melitz, Marc J. (2003) 'The impact of trade on intra-industry reallocations and aggregate industry productivity,' *Econometrica* 71, 1695–725
Nunn, Nathan (2005) 'Relationship-specificity, incomplete contracts and the pattern of trade,' Department of Economics and Institute for Policy Analysis, University of Toronto, mimeo
Puga, Diego, and Daniel Trefler (2002) 'Knowledge creation and control in organizations,' National Bureau of Economic Research Working Paper No. 9121, September
Qiu, Larry D., and Barbara J. Spencer (2002) 'Keiretsu and relationship-specific investments: implications for market-opening policy,' *Journal of International Economics* 58, 49–79
Rauch, James E. (2001) 'Business and social networks in international trade,' *Journal of Economic Literature* 39, 1177–203
Reuters (2004) 'Tight visa rules hurt U.S. business,' 30 November, CNN.com
Solomon, Jay (2004) 'Indian firms step up data security,' 4 November, *Wall Street Journal online*
Solomon, Jay, Kathryn Kranhod, and Henny Sender (2004) 'As outsourcing takes off, GE steps back to refocus,' 9 November, *Wall Street Journal on line*
Spencer, Barbara J., and Ronald W. Jones (1991) 'Vertical foreclosure and international trade theory,' *Review of International Studies* 58, 153–70
— (1992) 'Trade and protection in vertically related markets,' *Journal of International Economics* 32, 31–55
Spencer, Barbara J., and Larry Qiu (2001) 'Keiretsu and relationship-specific investments: a barrier to trade?' *International Economic Review* 42, 871–901
Swenson, Deborah L. (2005) 'Overseas assembly and country sourcing choices,' *Journal of International Economics* 66, 107–30
Williamson, Oliver E. (1975) *Markets and Hierarchies: Analysis and Antitrust Implications* (New York: Free Press)
— (1985) *Economic Institutions of Capitalism* (New York: Free Press)
Yi, Kei-Mu (2003) 'Can vertical specialization explain the growth of world trade?' *Journal of Political Economy* 111, 52–102