Boundaries of the Multinational Firm

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  - Model of industrial structure in which the organization of firms is endogenous.
  - Differentiated products can be produced either by vertically integrated firms or by pairs of specialized companies.
  - Production of each variety requires a specialized component.
  - Vertically integrated firms face a relatively high cost of governance.
  - Specialized firms can produce at lower cost, but search for partners is costly, and input suppliers face a potential holdup problem.
The "make-or-buy" decision is fundamental to industrial organization. Hundreds of activities go into the sale of a finished product, from basic research to product design, from preparation and installation of machinery and the production of components, to assembly, packing, marketing, and shipping. A producer must decide whether to undertake each activity in-house or to purchase the input or service from the outside. All these decisions define the boundaries of the firm.

Outsourcing is more prevalent in some industries than others. Pervasive outsourcing of parts by U. S. automobile producers. Firms in Pittsburgh typically engage in a wider range of activities than similar firms located in New York City. Greater prevalence of vertical integration in the Japanese and Korean consumer electronics industries as compared with the United States. Outsourcing seems to be on the rise in recent years.
Economists who have studied the make-or-buy decision have focused on the bilateral relationship between a single producer and a potential supplier. A body of literature has developed that clarifies the role of transactions costs, asset specificity, and incomplete contracts in guiding a firm's choice of whether to undertake an activity in-house or to seek to fill the need from the outside. Yet, this work has been can provide only a starting point for understanding cross-sectional or cross-regional differences in outsourcing behavior, or for evaluating explanations for recent trends.

This is because a decision-theoretic approach treats the industry environment as given, and thereby neglects the interdependence among the choices facing the various firms in an industry. For example, the attractiveness of outsourcing to a certain producer may well depend on how many firms potentially can provide the inputs it needs, which in turn may depend on whether other firms in the industry have chosen to be vertically integrated or to buy their inputs from others.
• Examines industrial structure when integration and outsourcing are equilibrium phenomena.
• In determining the mode of organization, there is a trade-off between the costs of running a larger and less specialized organization and costs that arise from search frictions and imperfect contracting.
• A vertically integrated firm may face a higher cost of producing components and services, because such a firm has many divisions to manage, and because the organization does not benefit from the learning that comes with specializing in a single activity.

• A firm that opts to outsource its components must search for a suitable partner, and if successful, must try to provide its partner with incentives to produce inputs to its specifications and in the quantity it demands.
• Search is costly and does not always end in success.
• Contracting may be imperfect, if some attributes of the input are not verifiable by third parties.
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- Model incorporates search frictions and contractual incompleteness.
- Requires that all firms' entry, contracting, and pricing decisions are optimal given the choices made by others.
- Identifies feedback mechanisms by which a firm's choices affect market conditions, which in turn influence other firms' decisions about organizational form.

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- Builds a multi-industry model in which differentiated consumer products can be produced either by vertically integrated firms or by pairs of specialized companies.
  - In the latter case, one firm manufactures an intermediate input while the other designs and assembles a variety of the final product.
- The production of each variety of consumer good requires a unique, specialized component. Vertically integrated firms manufacture their own components in the quantity and design that maximizes profits.
- Such firms face relatively high fixed and variable production costs, due to their lack of complete specialization and the extra governance costs associated with their extensive organizations.
• Specialized firms may be able to produce at lower cost, but they suffer from two potential disadvantages.
• First, a specialized final good producer must find a suitable supplier of inputs, while a specialized component producer must find a potential customer.
  – Models search as a matching process, in which some firms are successful in locating partners and others are not.
• Second, the specialized firms may suffer from an inability to prove the quality and other attributes of an input to outside parties.
  – This limits contracting possibilities and creates a potential holdup problem.

• Focus on how the efficiency of the search technology, the degree of substitutability between an industry’s consumer products, and the distribution of bargaining power between intermediate and final-good producers affect the viability of each organizational form.
• Improvements in the matching of buyers and suppliers of specialized inputs and business services can give rise to an increase in outsourcing activity.
• The greater prevalence of outsourcing in the United States compared with Japan or Korea might be explained by the relatively greater degree of competition in the U. S. market, but only if the cost advantage of specialized producers is relatively large or the share of the surplus in a bilateral relationship that accrues to the final producer is relatively small.
With constant returns to matching, neither the size of an industry nor the size of the aggregate economy favors one mode of industrial organization over the other. But size can matter when there are increasing returns to scale in matching. When the chances of finding a suitable partner improve for a given firm as the number of firms on each side of the market grows, there can be two stable equilibria for an industry, one with vertical integration and the other with pervasive outsourcing. Outsourcing is more likely to be viable in large industries and in large economies, due to the benefits of having a "thicker" market.

This might help to explain the greater specialization of firms in New York City compared with Pittsburgh, and perhaps in the United States compared with elsewhere in the world.

Extends model to allow for a secondary market in intermediate inputs. Overstates the holdup problem for many industries, because input producers have no option to sell their wares to any firm other than the one for whom the components were designed, but often possible to recoup some of the investment if have to find a new business partner. To create a weaker version of the holdup problem, introduce components that differ in their degree of specialization. Each final good an ideal component, which is the one most suitable for producing that good. Final producers can use inputs of different specifications at an additional cost. Now the bargaining between supplier and final producer takes place against a backdrop in which each side has an outside option.
Component producers choose the degree to which they specialize their inputs for their prospective customers. A more specialized input offers greater profit opportunities in its intended use. But a more generic input enhances outside options and so improves the input producer's bargaining power. In equilibrium the producer strikes a balance between the opposing forces, and manufactures a component that is partially specialized. We describe the determinants of the equilibrium degree of specialization and the mode of organization.

Now the sensitivity of manufacturing costs of final goods to the specifications of the component matters. Contrary to what one might have expected, a greater sensitivity of manufacturing costs of final goods to the specifications of the components does not necessarily favor vertical integration as an equilibrium mode of organization. When sensitivity of production costs to input specifications rises, this strengthens the bargaining position of potential input providers, which may enhance their profitability despite the direct effect of a decline in the efficiency of arm's-length dealing.
The Model

- In the simple model, intermediate inputs must be fully tailored to a particular product or else they are worthless to the final producer.
- With this assumption, an input producer has no choice but to sell its output to the firm for whom it was designed.
- Later, will allow final producers to use components that are not built exactly to their specifications.
- Then will treat the degree of specialization as a choice variable for the input providers.

The economy has $J$ industries. In each industry, firms produce a continuum of different varieties.

- The production of a unit of any final good requires one unit of a specialized component.
- For now, the component must be exact in its specifications, and the different final goods require distinct components.
- An input must also be of suitably high quality, or else it is useless for producing final output.
- Besides the intermediate goods, there are no other variable inputs into final production.
- However, there are fixed costs associated with entering the market and searching for a potential supplier.
• Final goods may be produced by vertically integrated firms or by specialized producers that purchase their inputs at arm’s length.
• A firm that specializes in manufacturing intermediates can produce a high quality input with one unit of labor per unit of output.
• Alternatively, it can produce a low quality (and therefore useless) input at some lower cost.
• An integrated firm in industry $j$ requires $\lambda_j > 1$ units of labor to produce a unit of the (high quality) intermediate.
• The possibility that production may be more costly for an integrated firm reflects the fact that its activities are not so highly specialized and that the bureaucratic cost of managing a larger operation may be higher.

• Fixed costs vary by type of firm and mode of organization.
• The fixed input required of a vertically integrated firm in industry $j$ is $k_{jv}$ units of labor.
  – Includes the resources needed to enter the market (researching the market opportunities and setting up an organization), those needed to design a product, and those necessary for corporate governance.
• The fixed input required for a specialized producer of intermediates in industry $j$ is $k_{jm}$ units of labor.
  – Includes similar costs to those for a vertically integrated firm, and also the resources required to search for a potential partner.
• A specialized producer of final goods in industry $j$ has a fixed input requirement of $k_{js}$ units of labor.
• Assume the fixed costs for an integrated firm are no lower than those for a pair of specialized producers: $k_{js} + k_{jm} \leq k_{jv}$
• Assumes that incomplete contracts are an unavoidable fact of commercial life.
• To include incomplete contracting, suppose that the quality of an intermediate input can be observed by the collaborating partners, but cannot be verified by a court of law.
• The lack of verifiability precludes contracts between input suppliers and potential customers that stipulate a given price for an agreed quantity.
• If such a contract were signed, an intermediate producer could lower its costs by shaving quality and the buyer would be obliged to buy the inferior products without recourse.
• Allows for some diseconomies of scope that are independent of the volume of output and others that affect per unit costs.

• The absence of complete contracts creates a potential holdup problem.
• Once a component producer specializes its production for a particular final good, these inputs have no value to other firms.
• The final producer can threaten to refuse delivery of the components unless the price is sufficiently low.
• Foreseeing this prospect, the intermediate producer has insufficient incentive to produce the efficient quantity.
• This inefficiency that results from the holdup problem gives a reason for vertical integration, which must be weighed against any excess production and governance costs that such an organizational structure might entail.
Sequence of events in the economy:

- First, firms enter as either intermediate producers, final-good producers, or vertically integrated entities. In each case, an entrant pays the relevant entry cost.
- Next, the specialized firms search for partners. A firm that has entered as a specialized component producer seeks a producer of final-goods to serve with inputs.
- A manufacturer of finished goods seeks an input provider. Matches occur randomly.
  - Assume that every specialized producer of final goods has the same probability of finding a supplier. Similarly, every potential producer of components has the same probability of finding a customer.
- The two probabilities are not equal, however; firms on the "short end" of the market have a greater chance of achieving a match.
  - The search frictions and associated uncertainties give a second advantage to vertical integration.

- When specialized firms are paired in a match, the final-good producer describes its input requirements.
- Then all integrated firms and component producers manufacture their specialized inputs.
- These may be of high quality or of low quality, and they may be produced in any quantity.
- Firms that have failed in their search efforts have no choice but to exit the market.
• Next, the specialized input producers bring their components to their potential customers, and the partners negotiate over the terms of trade.
• Bargaining results in the input producer in industry $j$ capturing a fraction $\omega_j$ of the surplus in its relationship with the final producer. The bargaining weights are exogenous.
• After the negotiations have been concluded and the inputs turned over to the final-goods producers, these producers and the vertically integrated firms assemble their differentiated varieties.
• Finally, the goods are sold to consumers.

Five stages:
1. entry, at which time a portion of the fixed costs are incurred;
2. search, at which time the remaining fixed costs are incurred and firms that do not find partners exit the market;
3. production of intermediate inputs;
4. bargaining; and
5. production and sale of final goods.
In this setting, seek a general equilibrium in which the aggregate labor market and all product markets clear.

Free entry ensures zero expected profits for each type of firm that enters a market.

If some type of firm does not enter in equilibrium, then its expected profits must be zero or negative.

The supply of labor is fixed and equal to $L$.

Labor is numeraire, so that the wage equals one.

Let $v$ be the number of firms that enter as vertically integrated enterprises, $s$ the number that enter as specialized producers of final goods, and $m$ the number that enter as specialized suppliers of intermediate products.

The specialized producers of final goods seek partners among the potential input producers and vice versa.

Not all firms are successful in their searches. $n(s,m)$ pairings are formed, where $n(s,m) = \min\{s,m\}$.

Assume constant-returns-to-scale in matching; i.e., a doubling in the number of firms on each side of the market results in a doubling in the number of partnerships.

The case of increasing returns is considered separately.
Consider what happens after a match takes place between a certain intermediate-good producer and a firm that has developed a certain differentiated product, say good $i$.

If the input provider produces $x(i)$ units of the specified component, its partner will have the ability to produce $y(i) = x(i)$ units of variety $i$.

The potential revenue from sales of these goods is $p(i)x(i)$.

Once the $x(i)$ units of the intermediate good have been manufactured, the two firms meet to negotiate an exchange.

At this point, all costs are sunk. If the exchange takes place, the final producer stands to realize revenues of $p(i)x(i)$.

If instead the firms go their separate ways, revenues for each side are zero.

This is because the final producer has no alternative source for components, while the intermediate producer has a quantity of specialized inputs that is of no value to any other producer.

It follows that the exchange generates a joint surplus of $p(i)x(i)$.

In the bargain, the firms divide this surplus, with a share $\omega$ going to the producer of intermediates and the rest to the final producer.
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  - Studies the determinants of the location of subcontracted activity in a general equilibrium model of outsourcing and trade.
  - Models outsourcing as an activity that requires search for a partner and relationship-specific investments that are governed by incomplete contracts.
  - The extent of international outsourcing depends on the thickness of the domestic and foreign market for input suppliers, the relative cost of searching in each market, the relative cost of customizing inputs and the nature of the contracting environment in each country.

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  - The share of intrafirm imports in total U. S. imports is significantly higher, the higher the capital intensity of the exporting industry.
  - The share of intrafirm imports in total U. S. imports is significantly higher, the higher the capital-labor ratio of the exporting country.
  - These patterns can be fit by an incomplete-contracting, property-rights model of the boundaries of the firm, incorporated into a trade model with imperfect competition and product differentiation.
  - The model pins down the boundaries of multinational firms as well as the international location of production, and predicts the patterns of intrafirm trade identified above.
  - Econometric evidence reveals that the model is consistent with other qualitative and quantitative features of the data.
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• Relative to the total volume of trade, intrafirm trade
  – is heavily concentrated in capital-intensive industries and
  – flows mostly between capital-abundant countries.

• Figure 1. Share of Intrafirm U.S. Imports and Relative Factor Intensities
  – The X-axis measures the average log of that industry's ratio of capital stock to total employment, using U.S. data.

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• In a cross section of 23 manufacturing industries, the share of intrafirm imports in total U.S. imports is significantly higher, the higher the capital intensity of the exporting industry.

• Firms in the United States tend to import capital-intensive goods, such as chemical products, within the boundaries of their firms, while they tend to import labor-intensive goods, such as textile products, from unaffiliated parties.
• Figure 2. Share of Intrafirm U. S. Imports and Relative Factor Endowments
  – The X-axis measures the log of the exporting country's physical capital stock divided by its total number of workers.
• In a cross section of 28 countries, the share of intrafirm imports in total U.S. imports is significantly higher, the higher the capital-labor ratio of the exporting country.

• U.S. imports from capital-abundant countries, such as Switzerland, tend to take place between affiliated units of multinational firms, while U.S. imports from capital-scarce countries, such as Egypt, occur mostly at arm's length.
• This second fact indicates that the well-known predominance of North-North trade in total world trade is even more pronounced within the intrafirm component of trade.
• Why are capital-intensive goods transacted within the boundaries of multinational firms, while labor-intensive goods are traded at arm's length?
• If firm boundaries had no bearing on the pattern of international trade, one would expect only random differences between the behavior of the volume of intrafirm trade and that of the total volume of trade.
  – In particular, the share of intrafirm trade in total trade would not be expected to correlate significantly with any of the classical determinants of international trade, including capital intensity.

• Build a property-rights model of the theory of the firm in which activities take place wherever transaction costs are minimized.
• In equilibrium, transaction costs of using the market are increasing in the capital intensity of the imported good.
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- Embed this framework in a general-equilibrium, factor-proportions model of international trade, with imperfect competition and product differentiation.
- Capital-intensive goods are transacted within firm boundaries, while labor-intensive goods are traded at arm's length.
- Pins down the boundaries of multinational firms as well as the international location of production.
- Bilateral trade flows between any two countries are uniquely determined, with capital-abundant countries capturing relatively large shares of a country's imports of capital-intensive goods.
- Transaction-cost minimization and comparative advantage give rise to the relationship between intrafirm trade and relative factor endowments in Figure 2.

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- In drawing firm boundaries, consider a world of incomplete contracts in which final-good producers need to obtain specialized intermediate inputs from their suppliers.
- Production of these intermediate inputs requires a combination of noncontractible and relationship-specific investments in capital and labor.
- Ownership of their suppliers entitles final-good producers to some rights of control, thus improving their ex post bargaining position, but reducing the suppliers' ex ante incentives to make relationship-specific investments.
- When all investments in production are incurred by suppliers, efficiency dictates that final good producers always give up these residual rights of control and engage in arm's length transactions.
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- To explain the higher propensity to integrate in capital intensive industries, allow transferability of capital investment decisions.
- In situations in which the bargaining power of suppliers is low, giving up these residual rights of control may not suffice to induce suppliers to undertake adequate levels of investment.
- In such situations, final-good producers will find it optimal to alleviate the holdup problem faced by suppliers by contributing to their relationship-specific investments in capital.

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- Investment-sharing reduces the holdup faced by suppliers, but naturally increases the exposure of final-good producers to opportunistic behavior, with the exposure being an increasing function of the contribution to investment costs.
- If capital cost sharing is large enough, as it will naturally be the case in capital-intensive processes, ex ante efficiency is shown to command that residual rights of control, and thus ownership, be assigned to the final-good producer, thus giving rise to vertical integration.
- *The attractiveness of vertical integration is increasing in the capital intensity of the intermediate input production.*
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• The argument is based on the premise that investments related to the labor input are harder to share than investments in physical capital.
• This may be the result of suppliers having superior local knowledge in hiring workers, or it may be explained by the fact that managing workers requires a physical presence in the production plant.
• Business practices indeed suggest that cost sharing is more prevalent in capital investments.
• Several cost-sharing practices of multinational firms in their relations with independent subcontractors include provision of used machinery and specialized tools and equipment, prefinancing of machinery and tools, and procurement assistance in obtaining capital equipment.

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• Little or no cost sharing in labor costs, other than in labor training.
• General Motors pays for firm- and product-specific capital equipment needed by their suppliers, even when this equipment is located in the suppliers' facilities.
• Even within firm boundaries, cost sharing seems to mostly take place when capital investments are involved.
• Table I indicates that British affiliates of U.S.-based multinationals tend to have much more independence in their employment decisions (hiring of workers) than in their financial decisions (choice of capital investment projects).
The existing literature had developed models rationalizing the emergence of multinational firms:
- in the presence of international factor-price differentials whenever transport costs are high (Helpman [1984]), and
- whenever firm-specific economies of scale are high relative to plant-specific economies of scale (Markusen [1984] and Brainard [1997]).

These approaches explain why a firm might have an incentive to produce abroad, but they fail to model internalization.
- Why does the foreign production occur within firm boundaries rather than through arm's length subcontracting or licensing?

This purely organizational, property-rights model of the multinational firm makes no distinction between firm-specific and plant-specific economies of scale.
- Trade will be costless, and factor prices will not differ across countries.
- Yet multinationals will emerge in equilibrium, and their implied intrafirm trade flows will match the clear patterns identified earlier.
Model

- Two factors of production, capital and labor, to produce a continuum of varieties in two sectors, Y and Z.
- Capital and labor are inelastically supplied and freely mobile across sectors.
- The economy is inhabited by a unit measure of identical consumers who view the varieties in each industry as differentiated.

- Goods are also differentiated in the eyes of producers.
  - Each variety y(i) requires a special and distinct intermediate input.
  - Similarly, each variety z(i) requires a distinct component.
- The specialized intermediate input must be high quality, otherwise the output of the final good is zero.
- If the input is of high quality, production of the final good requires no further costs
• Production of a high-quality intermediate input requires capital and labor.
  – The technology is assumed to be Cobb-Douglas.
• Assume that industry Y is more capital-intensive than industry Z.
• Low-quality intermediate inputs can be produced at a negligible cost in both sectors.

• There are fixed costs associated with the production of an intermediate input.
• Assume that fixed costs in each industry have the same factor intensity as variable costs, so that the total cost functions are homothetic.
  – r is the rental rate of capital and w the wage rate.
There are two types of producers: final-good producers and suppliers of intermediate inputs. Before any investment is made, a final-good producer decides whether it wants to enter a given market, and if so, whether to obtain the component from a vertically integrated supplier or from a stand-alone supplier. An integrated supplier is a division of the final-good producer and has no control rights over the amount of input produced, whereas a stand-alone supplier has rights of control. Integrated and nonintegrated suppliers differ only in the residual rights they are entitled to. Both have access to the same technology for production.

A premise of this paper is that investments in physical capital are easier to share than investments in labor input. Assume that while the labor input is always provided by the supplier, capital expenditures are transferable. The final-good producer can decide whether to let the supplier incur this factor cost too, or rent the capital itself and hand it to the supplier. Irrespective of who bears their cost, the investments in capital and labor are chosen simultaneously and noncooperatively. Once a final-good producer and its supplier enter the market, they are locked into the relationship: the investments in capital and labor are incurred upon entry and are useless outside the relationship. The initially competitive environment becomes a bilateral monopoly.
• Free entry into each sector ensures zero expected profits for a potential entrant.
• Assume that upon entry the supplier makes a lump-sum transfer to the final-good producer, which can vary by industry and variety.
• Ex ante, there are a large number of identical, potential suppliers for each variety in each industry, so that competition among these suppliers will make the transfer adjust so as to make them break even.
• This is in contrast with the transaction-cost literature that usually assumes that integration leads to an exogenous increase in variable costs.

• The final good producer chooses the mode of organization so as to maximize its ex ante profits, which include the transfer.
• The setting is one of incomplete contracts. Take the existence of contract incompleteness as a fact of life.
• It is assumed that an outside party cannot distinguish between a high-quality and a low-quality intermediate input.
• Hence, input suppliers and final good producers cannot sign enforceable contracts specifying the purchase of a certain type of intermediate input for a certain price.
• If they did, input suppliers would have an incentive to produce a low-quality input at the lower cost and still cash the same revenues.
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• It is equally assumed that no outside party can verify the amount of ex ante investments in capital and labor.
• If these were verifiable, then final-good producers and suppliers could contract on them, and the cost-reducing benefit of producing a low-quality input would disappear.
• For the same reason, it is assumed that the parties cannot write contracts contingent on sale revenues.
• The only contractible items ex ante are the allocation of residual rights and the ex ante transfer.

Antras AER 2005

  – A model in which the incomplete nature of contracts limits the extent that the production process can be fragmented across borders.
  – Due to these contractual frictions, goods are initially manufactured in the same country as product development.
  – Once the good becomes sufficiently standardized, the manufacturing stage of production shifts to a low-wage foreign location.
  – The optimal organizational structure involves a product cycle in which manufacturing is shifted abroad first within firm boundaries, and later to independent foreign firms.
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  – Reviews the literature that models alternative forms of involvement of business firms in foreign activities.
  – Focus on choices of the individual firm, such as sourcing strategies, in response to its own characteristics, the nature of the industry in which it operates, and the opportunities afforded by foreign trade and investment.
  – Provides new explanations for trade structure and patterns of foreign direct investment, both within and across industries, and has identified new sources of comparative advantage.

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• The fast expansion of trade in services has been accompanied by fast-growing trade in intermediate inputs.
• The growth of input trade has taken place both within and across the boundaries of the firm, i.e., as intrafirm and arm's-length trade.
  – In the United States, the latter has grown particularly fast.
• Many studies have documented the growth of international vertical specialization, as reflected in the flows of inputs across national borders for further processing and final assembly.
• These trends are closely related to the growing fragmentation of production, in which multinational corporations play a central role.
• Technological change, such as computer-aided design and computer-aided manufacturing, contributed to this process.
• The same technological changes also contributed to growing outsourcing within and across national borders.

• Especially important is the finding that a systematic relationship exists between the characteristics of business firms and their participation in foreign trade and investment.
• Exporting firms are not a random sample of the population of firms in an industry, and neither are firms engaged in FDI.
• Only a small fraction of firms export, they are larger and more productive than firms that serve only the domestic market, and more firms export to larger markets.
• A small fraction of firms engage in FDI, and these firms are larger and more productive than exporting firms.
Sourcing strategies of business firms have become more complex than ever before, and so have the integration strategies of multinational corporations. As a result, the traditional classification of FDI into vertical and horizontal forms has become less meaningful in practice. Large multinationals invest in low-cost countries to create export platforms from which they serve other countries around the world, and the large flows of FDI across industrial countries cannot be satisfactorily classified as horizontal FDI.

By focusing on the characteristics of individual firms, the theory can address new questions:

- Which firms serve foreign markets?
- How do they serve them, i.e., which choose to export and which choose to serve foreign markets via FDI?
- How do they choose to organize production, do they outsource or integrate?
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• Under what circumstances do they outsource in a foreign country rather than at home?
• And if they choose integration, under what circumstances do they choose to integrate in a foreign country, via FDI, rather than to integrate at home?
• Begin with insights from models of heterogeneous firms in which the internalization decision, when outsourcing versus integration, is put aside.

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• The resulting predictions go a long way toward explaining why firms sort into exclusive domestic producers, exporters, or foreign direct investors, and the structure of complex integration strategies.
• Outsourcing means the acquisition of an intermediate input or service from an unaffiliated supplier.
• Integration means production of the intermediate input or service within the boundary of the firm.
• These choices are distinct from the choice of country in which to engage in these activities, because outsourcing can be carried out in the home country of the firm, or in any number of foreign countries, and similarly for integration.
• Then examine the implications of the theory of incomplete contracts for internalization and offshoring decisions.
• Results in a trade theory with rich sourcing patterns.

• Many studies build on the assumption that some inputs are highly specific to a final product and that their supply is not fully contractible.
• This assumption is enough to study (1) the impact of variations across industries in the intensity of inputs that suffer from agency problems;
• (2) Ricardian-type comparative advantage that arises when legal systems of different quality interact with sectoral differences in contract dependency;
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• (3) the impact of different degrees of contract incompleteness, which may vary across countries;
• (4) the role of matching between buyers and sellers of intermediate inputs, and the resulting "thick market" effect; and
• (5) the interaction between within-industry heterogeneity with incomplete contracts, which yields joint predictions about internalization and offshoring.

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• Predicts the relative prevalence of the four main organizational forms: integration at home, outsourcing at home, integration abroad, and outsourcing abroad.
• The interplay between theory and empirics is particularly important here because many of these theoretical studies have been motivated by evidence.
• The theoretical models deliver new empirical implications that can be confronted with data.
• Melitz (2003) developed a theoretical model of monopolistic competition with heterogeneous firms that was designed to explain these features of the data.
• His model has become the cornerstone of a growing literature that examines the role of heterogeneity in international trade and foreign direct investment.
• The success of Melitz's model derives from the fact that, when combined with old and new approaches to trade theory, it yields rich predictions that can be confronted with data, and so far the model has performed admirably well.

• The main insights from Melitz's model are derived from an interaction between productivity differences across firms and fixed costs of exporting.
• The fixed export costs are interpreted as distribution and servicing costs in foreign markets, and a firm has to bear them in every country to which it exports.
• As a result, the total fixed export costs are larger the more foreign countries the firm chooses to serve.
• Melitz's (2003) model can be generalized to handle horizontal foreign direct investment, as in Helpman, Melitz, and Yeaple (2004).
• The traditional classification of FDI has been into horizontal FDI and vertical FDI,
  – where the former concerns subsidiaries that serve the local market in the host country while
  – the latter concerns subsidiaries that add value to products that are not destined (necessarily) for the host country market.

• By choosing FDI instead of exporting the firm gives up concentration of production, which raises its fixed costs, but saves on variable unit costs by avoiding trade costs (and possibly on unit production costs).
• The most productive firms serve the foreign market via subsidiary sales; lower productivity firms serve the foreign market via export; and still lower productivity firms serve only the domestic market.
• This sorting pattern is consistent with the empirical evidence that multinational corporations are more productive than exporters who are not multinationals, and exporters who are not multinationals are more productive than firms who serve only the domestic market.

• Since more productive firms produce more output, this sorting pattern also implies that multinational firms are larger than exporters, and exporters are larger than firms who serve only the domestic market.

• When the distribution of productivity is characterized by a Pareto distribution, the size distribution of firms also is Pareto, and the model then predicts more subsidiary sales relative to export sales in sectors with greater productivity (and therefore size) dispersion.

• Suggests that heterogeneity can be a source of comparative advantage.

• The use of a Pareto distribution is compelling in this case because the actual size distribution of firms is well approximated by such a distribution.
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• Using these measures of dispersion, they estimate the impact of heterogeneity on the ratio of subsidiary sales to export sales of U.S. firms in a sample of twenty-seven countries, and a broader sample of thirty-eight countries, both in 1994.
• Their estimates, which control for the variation in fixed costs and other relevant variables, are precise and consistent with the theory.
• Moreover, the estimates are large economically; they compare in size to the impact of freight, tariffs, and measures of fixed costs on the ratio of export to subsidiary sales, which have been routinely used in studies of the proximity-concentration trade-off.

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Complex Integration Strategies
• Although horizontal FDI is prevalent, evidence points to a growing importance of more complex integration strategies by multinational corporations.
• Among U.S. multinationals with affiliates in Canada,
  – only 12 percent are of the purely horizontal type (i.e., they have negligible intrafirm flows of intermediate inputs) and
  – only 19 percent are of the purely vertical type (i.e., they have negligible intrafirm flows of intermediate inputs in one direction only).
  – remaining 69 percent of the firms pursue more complex integration strategies.
• Yeaple (2003) provides the first analysis of such complex strategies, identifying an important complementarity between the two types of FDI.
• Feenstra and Hanson (1996) find more than a doubling of the share of imports in total purchases of intermediates from 1972 to 1990 in the United States (from 5.0 percent to 11.6 percent).
  – Campa and Goldberg (1997) find similar trends in Canada and the United Kingdom.

• Hummels, Ishii, and Yi (2001) and Yeats (2001) find that foreign trade in components has grown faster than foreign trade in final goods.
• Feinberg and Keane (2005) report that sales of U.S. parent firms to their Canadian affiliates as a fraction of the affiliates' total sales, as well as sales of the Canadian affiliates to their U.S. parents as a fraction of the parents' total sales, have almost doubled between 1984 and 1995.
The Incomplete Contracts Approach

• An analysis of these issues by means of the incomplete contracts approach to the theory of the firm helps in understanding why some companies source inputs abroad primarily via FDI, while other companies source them abroad primarily via outsourcing.

• It also helps in understanding why intrafirm trade as a fraction of total trade is positively correlated with capital-labor ratios across U.S. industries and capital-labor ratios across countries from which the U.S. imports (see Antras 2003).

• Moreover, this approach helps in understanding why differences across countries in the quality of legal systems generate comparative advantage, and thereby impact the patterns of trade.

• Finally, when combined with productivity variation across firms within industries, this approach helps in predicting the relative prevalence of alternative forms of the international organization of production as a function of sectoral characteristics and differences in features of the trading partners.
For simplicity, assume that the final good producer can use only one unit of this input.

In order to acquire the input, the final good producer needs to engage a supplier.

However the final good producer and the supplier cannot sign an enforceable contract that specifies the nature of the specialized intermediate input.

– The final good producer can recognize ex post, after the input is delivered, whether the input has the needed features.

For this reason the supplier can choose the characteristics of the input, and when delivering it to the final good producer he can bargain with the final good producer for payment.

At the bargaining stage, the cost of the intermediate input is sunk, and it therefore plays no role in determining the bargaining outcome.

But it does play an important role in determining whether the supplier chooses to manufacture the requisite intermediate input in the first place.
• In Grossman and Helpman (2002), potential buyers of an intermediate input find it more attractive to outsource the "thicker" the market for the input is, in the sense that there exist more sellers to serve the buyers' needs.
  – Similarly, sellers of an intermediate input find it more attractive to operate the larger the number of potential buyers is.
• An endogenous probability of successful matching between buyers and sellers is the main driving force of this process.
• In this environment, international trade affects the trade-off between outsourcing and integration.
  – When there are economies of scale to matching, trade encourages outsourcing.

• A specialized supplier of inputs can produce them with one unit of labor per unit output, which gives him a cost advantage over the integrated firm.
• In the ensuing Nash bargaining, both parties have zero outside options and the final good producer gets a fraction of the surplus.
  – The distribution of the bargaining power between the two parties affects payoffs.
• Using these payoffs it is then possible to calculate the expected profits of a final good entrant who plans to outsource and the expected profits of an intermediate good producer.
Antras & Helpman JPE 2004

  - North-South model of international trade in which differentiated products are developed in the North.
  - Final-good producers differ in productivity levels. Based on productivity and sectoral characteristics, firms decide whether to integrate into the production of intermediate inputs or outsource them.
  - Also decide from which country to source the inputs. Final-good producers and their suppliers must make relationship-specific investments.
  - In equilibrium, firms with different productivity levels choose different ownership structures and supplier locations.
  - Study how within sectoral heterogeneity and variations in industry characteristics affect the prevalence of these organizational forms.

Antras & Helpman JPE 2004

- A firm that chooses to keep the production of an intermediate input within its firm boundaries can produce it at home or in a foreign country.
  - When it keeps it at home, it engages in standard vertical integration.
  - When it makes it abroad, it engages in foreign direct investment (FDI) and intrafirm trade.
- A firm may choose to outsource an input in the home country or in a foreign country.
  - When it buys the input at home, it engages in domestic outsourcing.
  - When it buys it abroad, it engages in foreign outsourcing (offshoring), or arm’s-length trade.
Intel Corporation provides an example of the FDI strategy:
– assembles most of its microchips in wholly owned subsidiaries in China, Costa Rica, Malaysia, and the Philippines.

Nike provides an example of the arm’s-length import strategy:
– subcontracts most of its manufacturing to independent producers in Thailand, Indonesia, Cambodia, and Vietnam.

Feenstra (1998) illustrates Mattel’s global sourcing strategy in the production of its star product, the Barbie doll.
– “Of the $2 export value for the dolls when they leave Hong Kong for the United States,” he writes, “about 35 cents covers Chinese labor, 65 cents covers the cost of materials [which are imported from Taiwan, Japan, and the United States], and the remainder covers transportation and overhead, including profits earned in Hong Kong” (p. 36).
The World Trade Organization provides another example in its 1998 annual report. In the production of an “American” car, 30 percent of the car’s value originates in Korea, 17.5 percent in Japan, 7.5 percent in Germany, 4 percent in Taiwan and Singapore, 2.5 percent in the United Kingdom, and 1.5 percent in Ireland and Barbados.

– That is, “only 37 percent of the production value … is generated in the United States” (p. 36).

Feenstra and Hanson (1996) use U.S. input-output tables to infer U.S. imports of intermediate inputs. They find that the share of imported intermediates increased from 5.3 percent of total U.S. intermediate purchases in 1972 to 11.6 percent in 1990.

Campa and Goldberg (1997) find similar evidence for Canada and the United Kingdom (but not for Japan).

Hummels, Ishii, and Yi (2001) and Yeats (2001) show that international trade has grown faster in components than in final goods.
Integrate two recent strands of the literature. First is studies of the effects of within-sectoral heterogeneity on the decisions of firms to serve foreign markets.

Melitz (2003) shows that low-productivity firms serve only the domestic market, whereas high-productivity firms also serve foreign markets.

Allowing for horizontal foreign direct investment, Helpman, Melitz, and Yeaple (2004) show that, among the firms that serve foreign markets, the more productive ones engage in foreign direct investment whereas the less productive firms export, and affiliate sales relative to exports are larger in sectors with more productivity dispersion.

Emphasizes variations across firms within industries, without addressing the organizational choices of firms that need to acquire intermediate inputs.

Second is organizational choice. Grossman and Helpman (2002) address the choice between outsourcing and integration in a one-input general equilibrium framework, assuming that all firms of a given type are equally productive.

Their firms face the friction of incomplete contracts in arm’s-length relationships, which they weigh against the less efficient production of inputs in integrated companies.

As a result, some sectors have only vertically integrated firms whereas others have only disintegrated firms.

Grossman and Helpman identify sectoral characteristics that lead to one or the other equilibrium structure.
• This approach has been extended by Antras (2003) to a trading environment, by introducing two new features.
• First, the friction of incomplete contracts also exists within integrated firms.
  – Integration provides well-defined property rights, however, these property rights may or may not give integration an advantage over outsourcing.
• Second, there are two inputs, one controlled by the final-good producer and the other by another supplier, inside or outside the firm.
  – The relative intensity of these inputs turns out to be an important determinant of the choice between integration and outsourcing.

• By embodying this structure in a two-sector general equilibrium model of trading countries, Antras shows that
  – the sector that is relatively intensive in the input controlled by the final-good producer integrates,
  – whereas the sector that is relatively intensive in the other input outsources.
• As a result, in the former sector there is intrafirm trade in inputs, and in the latter sector there is arm’s length trade.
This article develops a theoretical model that combines the within-sectoral heterogeneity of Melitz (2003) with the structure of firms in Antras (2003).

The final-good producer controls the supply of headquarter services, whereas a supplier of intermediate goods controls the quality and quantity of the intermediates.

Studies the impact of variations in productivity within sectors and of differences in technological and organizational characteristics across sectors on international trade, foreign direct investment, and the organizational choices of firms, which are all interdependent in the model.

The incentives created by different organizations, differences in their fixed costs, and wage differentials across countries shape the equilibrium organizational structure.

Shows that in a world of two countries, North and South, in which final-good producers are based in the North, final-good producers that operate in the same sector but differ by productivity sort into:

- integrated companies that produce inputs in the North (do not engage in foreign trade in inputs),
- integrated companies that produce inputs in the South (engage in FDI and intrafirm trade),
- disintegrated companies that outsource in the North (do not engage in foreign trade in inputs),
- and disintegrated companies that outsource in the South (import inputs at arm’s length).
Antras & Helpman JPE 2004

• Moreover, we show that in sectors with low headquarter intensity, firms do not integrate; low-productivity firms outsource in the North whereas high-productivity firms outsource in the South.
• In sectors with high headquarter intensity, all four organizational forms may exist in equilibrium, and, as in sectors with low headquarter intensity, high-productivity firms import inputs whereas low-productivity firms acquire them in the North.
• However, among the firms that acquire inputs in the same country, the low-productivity firms outsource whereas the high-productivity firms insource (source from within the firm).
  – The least productive firms outsource in the North whereas
  – the most productive firms insource in the South via FDI.

McLaren AER 2000

  – Analyzes the effects of international openness on vertical integration.
  – Vertical integration can confer a negative externality, by thinning the market for inputs and thus worsening opportunism problems; this induces strategic complementarity and multiple equilibria in the integration decision, thus providing a theory of different "industrial systems" or "industrial cultures" in ex ante identical countries.
  – International openness thickens the market, facilitating leaner, less integrated firms, thus providing gains from international openness quite different from those that are familiar from trade theory.
  – This may be taken as one theory of "outsourcing," "downsizing," and "Japanization" as consequences of "globalization."