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Export Versus FDI and the Communication of Complex Information ☆

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ABSTRACT

Traditional proximity-concentration models of the decision to serve foreign markets through exports or FDI sales tend to overemphasize physical transport costs and market size while underemphasizing the cost of transmitting information. I augment those models with the importance of interacting with customers and communicating complex information within firms and use these characteristics to predict the location of production. Goods and services requiring direct communication with consumers are more likely to be produced in the destination market. Activities requiring complex within firm communication are more likely to occur at the multinational's headquarters for export, especially when the destination market has weak institutions. These predictions are tested using firm-level data from the Bureau of Economic Analysis US Direct Investment Abroad Benchmark Survey of Multinationals combined with task-level data from the Department of Labor's Occupational Information Network. The approach developed in this paper performs well for both manufacturing and service industries and is robust to a variety of specifications.

1. Introduction

The export versus FDI literature is dominated by models of the proximity-concentration tradeoff. In these models, the decision to produce in the firm's home country for export or in the destination market through a foreign affiliate is based on a tradeoff between the gains to scale achieved by concentrating production at the firm's headquarters and the benefits of producing near the final consumers to avoid transport costs. This framework, while theoretically appealing, has lead to an empirical focus on physical transport costs rather than the costs associated with communicating complex information across borders. While physical transport costs and distance still matter, increases in the trade of knowledge-based services highlight the need to pay greater attention to the transmission of information when studying firm production location decisions.

Firm communication can be divided into two categories: the communication of information within the firm (during production) and the communication of information from the firm to the outside customer (during delivery or sales). Consider the path that a product follows from idea to production to consumption in a foreign market. During this process, a design originates at the firm's headquarters, output is produced either at the headquarters or at a foreign affiliate, and the final product is then transferred to the customer, either by the headquarters or by the foreign affiliate. When a firm chooses to locate production at its headquarters for export, it is simplifying the within firm transmission of information between the design and production stages, however, it is complicating transmission to the final customer, which must happen across borders. When the firm chooses to produce at a foreign affiliate in the destination market it is complicating the within firm transmission of information which happens between the headquarters and its affiliate, but simplifying communication with the customer, which occurs between the affiliate and a customer residing in the same location. The relative importance of these two types of communication (within firm and between the firm and its customer) determines whether the firm will serve a given market through exports or affiliate sales.

Looking at the difference between manufacturing and services provides a clear way to illustrate this concept. US exports of services

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[1] Examples include Krugman (1983), Horstmann and Markusen (1992), Brainard (1993, 1997) and Helpman et al. (2004).

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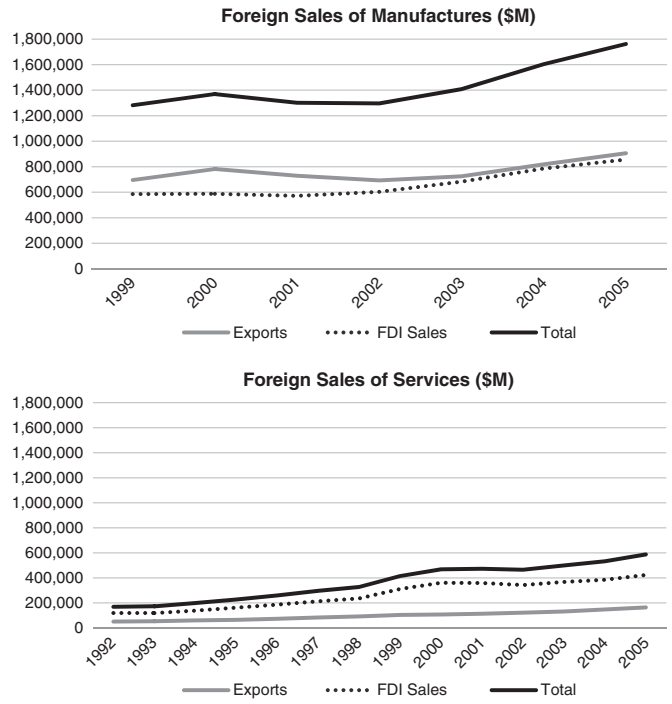

Fig. 1. Share of export and FDI sales in manufacturing and service industries.

have been increasing rapidly in the last decade (see Fig. 1). Much of this trade has been in complex, information-intensive services such as business and finance (see Table 1). These services differ from traditional manufacturing exports in meaningful ways. Communicating with customers is about twice as important for services as for manufacturing (See Table 2. Details about how these importance scores were constructed will follow in Section 4). Service producers also rely on FDI sales relative to exports to a much greater extent than manufacturing firms (see Fig. 1). I show that because services require much more interaction with consumers than manufactures, the difference in the importance of this type of communication can explain much of the difference in export to FDI ratios across the two sectors. This relationship between the need for consumer interaction and higher relative affiliate sales is highly intuitive but has never been shown in the economic literature on the export versus FDI decision. Note that although this approach was motivated by observations about trade in services, it does a good job of explaining trade and affiliate sales in both manufactures and services.

If communicating with consumers were the only factor that mattered for the export versus FDI decision, we would expect to see nearly all services provided through investment. Fig. 1 shows that about 30 percent of of sales of services to foreign markets are through exports. Controlling for standard determinants of trade and investment, I show that the level of complexity of production has an effect that is opposite to that of communication with customers, offsetting some of the impact of the need for consumer interaction. More nonroutine activities are noncodifiable, and thus it is difficult to successfully transfer these processes to teams in another country and to specify clear quality standards for these more abstract tasks than for more routine activities. Thus their production is less likely to be offshored to foreign affiliates. This is true for both manufacturing and service industries. When a headquarters firm tasks an affiliate with a complex and potentially problematic assembly procedure, the parent must communicate more complex information to the affiliate. This is in contrast to a more routine good or service (such as data entry or the assembly of simple and easily inspectable goods like plain tee shirts or reams of paper), for which clear quality standards can be fully specified in advance.[2] This is consistent with recent work by Keller and Yeaple (2009) who show that headquarters services cannot always be transferred costlessly from parents to affiliates, especially in knowledge-intensive industries. I introduce this possibility into a Helpman et al. (2004) framework to explain how the level of routineness of tasks determines how easily they can be offshored.

I operationalize these two types of information transmission using data on the specific work activities or tasks required for production in each industry. The data on these tasks are collected by the Department of Labor and allow for empirical identification of the role that work activities play in determining patterns of trade and investment. When each industry is defined by the importance of communication and complexity in its production, the differences between manufactures and services become clear. On average, the importance of communicating with customers is twice as high for services as for manufactures. Scores for complex activities, such as creative thinking, are 44 percent higher. In general, manufacturing industries are comprised of relatively more manual and routine tasks, while service production requires relatively more nonroutine, cognitive, and communication tasks. Table 2 summarizes the key task dimensions that I will use in this paper. Table 3 lists the service industries used in this study. Business, professional and technical services make up most of the sample.

The results show that the two forms of information transmission that I focus on are important for both manufacturing and services and their effects are larger in magnitude than those of distance, industry concentration, tax rates, wages, education levels, and standard measures of endowment-based comparative advantage. The intensity with which an industry uses communication with customers and nonroutine production tasks is a significant determinant of the location of multinational production. The relationship between communication and complexity and the export to FDI ratio is similar for manufacturing

Table 1
US Exports of "Other Private Services".

Service Category	US Exports ($M)	Share of US Service Exports
Financial services	36,389	24%
Education and Training	13,634	9%
Insurance	7,314	5%
Telecommunications	4,651	3%
Business/professional		
Computer and information	8,693	6%
Research and development	9,563	6%
Management and consulting	16,372	11%
Other business/professional	26,304	18%
Other services	26,349	18%
Total	149,269	100%

Constructed using publicly available data from www.bea.gov.

Table 2
Mean Task Intensities for Manufacturing and Service Industries.

Task	Goods		Services		Difference	
	raw	scaled	raw	scaled	raw	scaled
1. Communicating with customers	21.3	1.34	50.3	2.56	29.0	1.22
2. Creative thinking	35.7	2.19	49.3	2.63	13.6	0.44
3. Problem solving/ decisions	54.4	3.30	66.5	3.51	12.1	0.21
4. Handling objects	62.5	3.67	35.0	1.76	-27.5	-1.91
5. Operating machines	61.0	3.59	31.7	1.65	-29.3	-1.94

Raw scores are unadjusted importance levels of each task reported by O*NET.
Scaled scores are the percentage shares of each task in the total task input requirements of a given industry.

[2] Intellectual property concerns may also factor into this decision, as nonroutine goods likely have a higher innovational content than routine goods, and thus are more vulnerable to intellectual property rights violations or information leakage when they are produced abroad, especially if the foreign affiliate is in a country with weak institutions.