This PDF is a selection from an out-of-print volume from the National Bureau of Economic Research

Volume Title: Topics in Empirical International Economics: A Festschrift in Honor of Robert E. Lipsey

Volume Author/Editor: Magnus Blomstrom and Linda S. Goldberg, editors

Volume Publisher: University of Chicago Press

Volume ISBN: 0-226-06083-7

Volume URL: http://www.nber.org/books/blom01-1

Conference Date: December 3-4, 1998

Publication Date: January 2001

Chapter Title: Multinational Firms: Reconciling Theory and Evidence

Chapter Author: James R. Markusen, Keith E. Maskus

Chapter URL: http://www.nber.org/chapters/c10579

Chapter pages in book: (p. 71 - 98)

3

Multinational Firms
Reconciling Theory and Evidence

James R. Markusen and Keith E. Maskus

3.1 Introduction

An important component of Robert Lipsey's research has involved the study of direct foreign investment and often the relationship between investment and trade. From our point of view, this research is of major importance, and our first task in this paper is to explain why.

The field of international trade developed in the modern era, largely as a study of trade in goods. Mundell (1957) wrote an important article in which he noted that trade in goods and trade in factors were substitutes, perhaps suggesting that there is little point in expanding our theory to include trade in factors: The same equilibrium in terms of commodity prices, factor prices, and welfare can be achieved by trading either goods or factors. Only much later was it noted that Mundell had shown this in the context of an extremely special case, namely a 2×2 Heckscher-Ohlin model with zero trade costs in both goods and factors. Positive analyses showed a wide variety of circumstances in which trade in goods and factors are complements (Markusen 1983; Wong 1986; Markusen and Svensson 1985; Ethier and Svensson 1986; Neary 1995). Normative analyses showed that the effects of policy often depend crucially on what is traded (Brecher and Diaz-Alejandro 1977; Bhagwati and Brecher 1980; Dick 1993).

Although it had many antecedents (e.g., Kemp 1969; Melvin 1969; Linder 1961), an industrial-organization (IO) approach to trade was developed in the 1980s. This approach incorporated elements of imperfect competition, increasing returns to scale, and product differentiation into general equilibrium trade models. Yet this new theory, however welcome, was largely disjoint from the study of multinational enterprises. Firms in the trade-IO literature are typically single-plant production units with all firm activities in a single location. This is rather odd insofar as most of the firms that fit the general facts and paradigms of the IO approach to trade are indeed multinationals with production plants in several countries. Research on multinationals was certainly produced, but it was often (at best) partial equilibrium in nature and focused on individual firms rather than on explaining the pattern of direct investment in relation to country and industry characteristics.

Robert Lipsey is a distinctive individual in that he apparently ignored this allocation of trade, national firms, and general equilibrium to trade theory, and of multinational firms to the international business studies. Lipsey wrote a number of important articles in which he related the pattern of direct investment by multinational firms to national characteristics and to trade flows. This work presented researchers with a comprehensive and challenging set of stylized facts to explain. His research helped make it clear that multinationals had to be integrated into both trade theory and the empirical analysis of trade and investment flows.

The work by Lipsey that most clearly relates to this paper includes the following. Two early papers with Merle Yahr Weiss examined determinants of foreign production and exports (Lipsey and Weiss 1981, 1984). During the same period Lipsey developed a long coauthorship with Irving Kravis, looking at the determinants of the competitiveness of multinational firms and how these firms affect other variables of interest, such as domestic employment (Kravis and Lipsey 1982, 1988, 1992; Lipsey and Kravis 1987). Single-authored papers on determinants of inward and outward investment and the internationalization of production include Lipsey (1988, 1989, 1993, 1995). A series of other papers was the result of collaboration with Magnus Blomström (Blomström and Lipsey 1989, 1993), in some cases with other coauthors (Blomström, Kravis, and Lipsey 1988; Blomström, Lipsey, and Kulchycky 1988; Blomström, Lipsey, and Ohlsson 1990; Lipsey, Blomström, and Ramstetter 1998). This body of work provides a tremendous volume of empirical evidence on direct investment and trade, which needs to be reconciled with formal theory.

A few attempts to develop a formal general-equilibrium theory of multinational firms developed during the early 1980s. Helpman (1984) had a model in which production involved two activities—one capital intensive and one labor intensive—that could be geographically separated. Markusen (1984) took a rather different approach, assuming the existence of firm-level (as opposed to plant-level) scale economies arising from the

joint-input nature of knowledge capital across geographically separated production facilities. Helpman's model captured the notion of vertically integrated firms, but allowed no investments to take place between very similar countries, which is clearly counter to empirical fact. Markusen's model captured the notion of horizontally integrated firms that undertake the same activity in multiple countries, but excluded any motive for vertical specialization. Theoretical refinements of these ideas can be found in Helpman (1985), Horstmann and Markusen (1987, 1992), Brainard (1993a), Markusen (1997), and Markusen and Venables (1998); a survey is found in Markusen (1995).

During the same period in which some of this formal theory was developing, a large body of empirical work developed relating direct investment to country and industry characteristics, much of this by Robert Lipsey alone or with various coauthors as just noted. It quickly became clear that the overwhelming proportion of direct investment occurs among the similar, high-income developed countries, not among dissimilar countries. "North-north" investment dominates "north-south" investment even after correcting for income levels and other determinants. At a superficial level, horizontal, multiplant models fit the data better than do vertical specialization models, which do not predict direct investment among similar countries.

Formal econometric reconciliation or testing of the theories with the evidence was slow in coming. Two important papers by Brainard (1993b, 1997) confirmed the casual observation that similarities rather than differences between countries in terms of size and relative endowments are closely related to the level of direct investment relative to trade. These papers provide additional support to the horizontal view that firm-level scale economies rather than factor intensity differences between activities provide the more important explanation of direct investment. Yet subsequent to 1987, the year of Brainard's data sample, a boom in direct investment to developing countries emerged. This suggested that perhaps it was unmeasured investment barriers that accounted for the low levels of direct investment to these countries. Carr, Markusen, and Maskus (forthcoming) estimate a model that integrates both horizontal and vertical motives for direct investment on 1986–94 panel data and find support for that integrated approach. Complementary work by Ekholm (1995, 1997, 1998a, 1998b) supports the findings of Brainard and of Carr, Markusen, and Maskus, and adds convincing evidence about the importance of intrafirm trade in knowledge-intensive headquarters services. Of relevance to the present study, recent empirical work that focuses on the relationships between direct investment and trade flows (particularly intrafirm), such as whether trade and investment are in some sense complements or substitutes, includes papers by Blonigen (1997, 1998), Swenson (1998), and Smith (1998).

The objective of this paper is to extend this inquiry by decomposing

foreign affiliate production data into sales to the host-country market and export sales. We first develop and extend existing theory from Markusen (1997) and Carr, Markusen, and Maskus (forthcoming) to generate separate predictions of how local sales versus export sales should be related to parent-country and host-country characteristics. This approach will attempt to get at the horizontal versus vertical distinction that is not explicitly considered in Carr et al. (forthcoming). These theoretical predictions are then taken to the data.

Results fit well with the theoretical hypotheses. Local sales of foreign affiliates are strongly dependent on market size and trade costs into the host country. The difference in skilled labor abundance between the parent and host country is only weakly related to local affiliate sales in both economic and statistical terms. Export sales are weakly related to market size and to host-country trade costs. They are strongly related to the skilled labor endowment differences of the parent and host countries, and strongly related to an interaction term between skill differences and country size: Exports by affiliates are particularly important when the parent is both small and skilled-labor-abundant (e.g., Sweden, the Netherlands, Switzerland). Both local sales and export sales are strongly negatively related to a host-country investment barrier (cost) index.

The ratio of exports to local sales is positively related to the relative skilled labor abundance of the parent, and negatively related to market size, the host-country investment cost index, and the host-country trade cost index. The findings on trade and investment costs may be due to a substitution phenomenon. If the investment is undertaken to serve the local market, firms will bear the trade and investment costs. If the investment is made to serve the market in the parent or third countries, high local trade and investment costs will induce the firm to look elsewhere.

3.2   The Knowledge-Capital Model

In this section, we outline what we refer to as the *knowledge-capital model* of the multinational enterprise. A formal algebraic development is presented in Markusen (1997), and many of its testable implications are analyzed in Carr et al. (forthcoming).

Assume a two-good, two-factor, two-country world. Refer to the factors as skilled (S) and unskilled (L) labor. Good Y is produced with constant returns to scale by a competitive industry and is unskilled labor intensive. The countries are referred to as h (home) and f (foreign).

Good X is produced with increasing returns by imperfectly competitive, Cournot firms. Production of X requires a firm-level fixed cost—headquarters services such as R&D, management, finance, accounting, marketing and so forth. An X firm may then have one or two plants, and a plant and headquarters may be geographically separated. Headquarters services

are a joint input across plants, creating firm-level scale economies, also referred to in the literature as multiplant economies of scale. The idea is that headquarters services (e.g., blueprints) are often knowledge based and can be provided to additional production facilities at low or zero marginal cost. We also assume plant-level fixed costs (scale economies).

Assumptions about the factor intensities of fixed costs are crucial to the story. We assume that headquarters services use skilled labor exclusively. Plant-level fixed costs are a combination of skilled and unskilled labor. Final production occurs with constant costs and requires only unskilled labor. Transport costs between markets use unskilled labor. Finally, we assume that plant production, including both fixed costs and marginal costs, is more skilled labor intensive than Y production, the composite of the rest of the economy. This is not particularly important to any of the results in this paper, but is important in generating certain results concerning the factor price effects of investment liberalization (Markusen 1997). In summary, then, the ranking of activities from most skilled labor intensive to least skilled labor intensive is as follows:

[headquarters only] > [integrated X] > [plant only] > [Y].

This completes the description of the model, and allows us to specify more precisely what is meant by the knowledge-capital approach. There are three defining assumptions:

1. *Transportability or fragmentation.* The services of knowledge-based assets may be fragmented from production and are easily supplied to geographically separate production facilities.
2. *Skilled labor intensity.* Knowledge-based assets are skilled labor intensive relative to final production.
3. *Jointness.* The services of knowledge-based assets are (at least partially) joint (public) inputs into geographically separate production facilities.

The first two properties give rise to vertical multinationals that locate their single plant and headquarters in different countries depending on factor prices and market sizes. The third property gives rise to horizontal multinationals that have plants producing the final goods in multiple countries.

More formally, several types of firms may be active in equilibrium in a free-entry Cournot equilibrium for the model we have just outlined. The term *national firms* refers to single-plant firms with their headquarters and plant in the same country; the term *horizontal multinationals* refers to two-plant firms with their headquarters in one country or the other. *Vertical multinationals* refers to single-plant firms with their headquarters and plant in different countries.

Here we simply outline the results that emerge from this model with respect to what types of firms are active in equilibrium as a function of country characteristics, such as differences in size, relative endowments, and the level of trade costs and total world demand. The interested reader is referred to Markusen (1997) for a fuller development.

Horizontal multinationals tend to arise when the two countries are similar in size and relative endowments, total demand is high, and trade costs are moderate to high. In order to understand the importance of similarity in size, it is perhaps easiest to note that single-plant firms (national or vertical) have an inherent advantage when the countries are of very different size: Put a single plant in the large country, avoiding costly capacity in the small market. Growth in total demand will induce shifts (in some regions of parameter space) from single-plant production, serving the other market by high marginal-cost exports, to high fixed-cost branch plant production.

Vertical multinationals are favored over national firms and horizontal multinationals when the countries have very different relative endowments, especially when the skilled-labor-abundant country is also small. Differences in factor prices encourage fragmentation of activities, such that the headquarters in the skilled-labor-abundant country and differences in size encourage placing the plant in the large country. These two motives reinforce one another when the skilled-labor-abundant country is also small.

These results are interesting, but not very useful to take to the data. We do not have good data on the types of firms existing, and in reality, these pure types are greatly blurred in any case. However, the model can be used to generate results on the sales of affiliates of country i firms in country j. This reduced form gives us direct predictions on observable data, fully endogenizing the trade flows, types of firms that are active, and so forth, without requiring us to identify those items in the data.

Figures 3.1–3.4 present results from simulations using the model from Markusen (1997) and Carr et al. (forthcoming). These diagrams are world Edgeworth boxes, with unskilled labor on the x axis and skilled labor on the y axis. The origin for country i is at the southwest (SW) corner and the origin for country j is at the northeast (NE) corner. For points on the SW-NE diagonal, the countries have the same relative endowments but differ in size. Note for later reference that movements within these Edgeworth boxes are compensated experiments, in that total world factor endowments are constant (and, therefore, world GDP is approximately constant). These diagrams are most useful for developing intuition about two-way data in which we observe production and sales by affiliates of country i firms in country j and vice versa. Thus in any pair (i-to-j and j-to-i) of observations, total GDP and factor endowments are held constant.

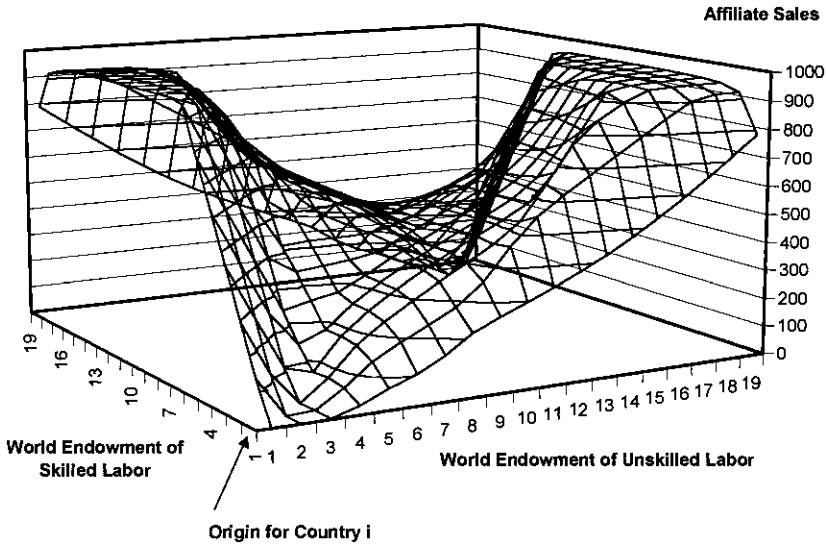Affiliate sales are graphed on the vertical axis of figure 3.1. Affiliate sales

Fig. 3.1   World affiliate sales

appear as a saddle, with an inverted U-shaped curve along the SW-NE diagonal. As noted earlier, horizontal multinationals dominate production when the countries are identical, whereas national firms located in the larger country dominate when the countries are very different in size. In the center of the box, exactly half of world production is affiliate sales, while the other half is the output of the horizontal multinationals' domestic plants.

The highest level of affiliate sales occurs in the NW and SE areas of the Edgeworth box in figure 3.1, where one country is both small and skilled labor abundant.[1] In this case, most firms are vertical multinationals head-quartered in the small, skilled-labor-abundant country, so most plants are located in the larger, skilled-labor-scarce country. Output of these plants is classified as "affiliate production," of course, so most (in the limit, all) world X production is affiliate sales.

Figures 3.2, 3.3, and 3.4 show simulation results for affiliate sales in just one direction: affiliates of country *i* firms producing in country *j*. Figure 3.2 shows the local sales in country *j* of affiliates of country *i* firms. There is again an inverted U-shaped relationship along the SW-NE diagonal. But

---

1. The locus of points in which countries *i* and *j* have equal incomes is much steeper than the NW-SE diagonal of the Edgeworth boxes in figures 3.1–3.4. It runs between columns 8 (north edge) and 12 (south edge). So, for example, country *i* is smaller than *j* to the left of this locus.
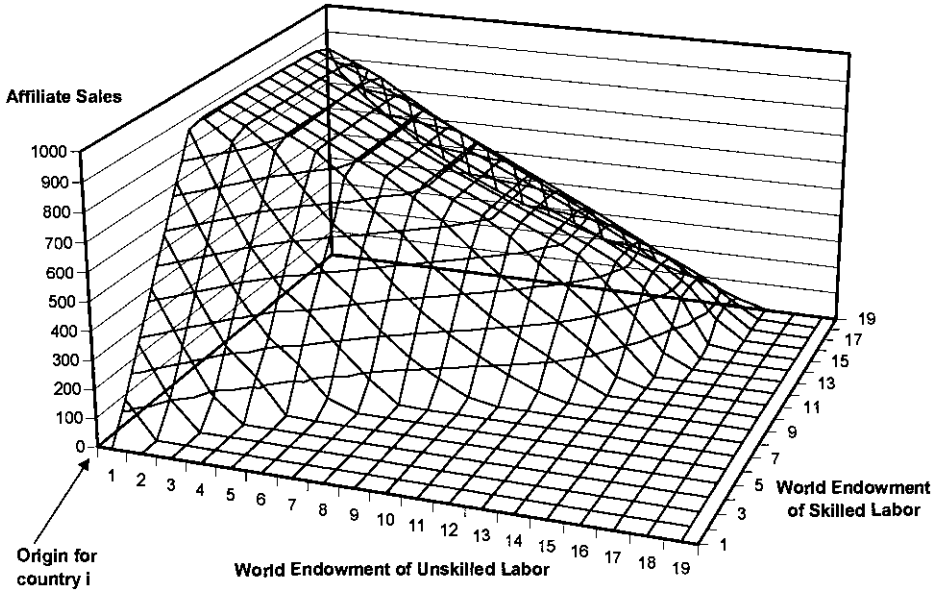
Fig. 3.2   Local sales of affiliates of country *i* firms in country *j*

the highest levels occur when country *i* is both small and skilled labor abundant for the reasons just noted.

Figure 3.3 shows the export sales of affiliates back to the parent country *i*. This diagram is a "mountain," reaching a maximum when country *i* is small and skilled labor abundant, but not too small and not too skilled labor scarce. The not-too-small requirement is obvious, because little output is exported back to a very small country. The not-too-skilled-labor-abundant requirement is less obvious, and it has to do with the assumption that some host-country skilled labor is required in plant-level fixed costs. As country *j* becomes too skilled labor scarce, production there becomes very expensive and national firms in country *j* substitute for vertical firms headquartered in *i* and producing in *j*.

There are clear differences between figures 3.2 and 3.3. Most notably, only local sales occur if the countries are very similar, or if country *i* is very small and very skilled labor abundant. Yet there are some similarities that make it difficult to propose sharply different hypotheses regarding how these two classes of affiliate sales should be related to country characteristics.

Figure 3.4 clarifies this ambiguity a bit by displaying the ratio of affiliate exports back to the parent to local affiliate sales in the host country. This graph suggest that this ratio is most closely related to the skilled labor abundance of the parent in relation to the host country. Relative size
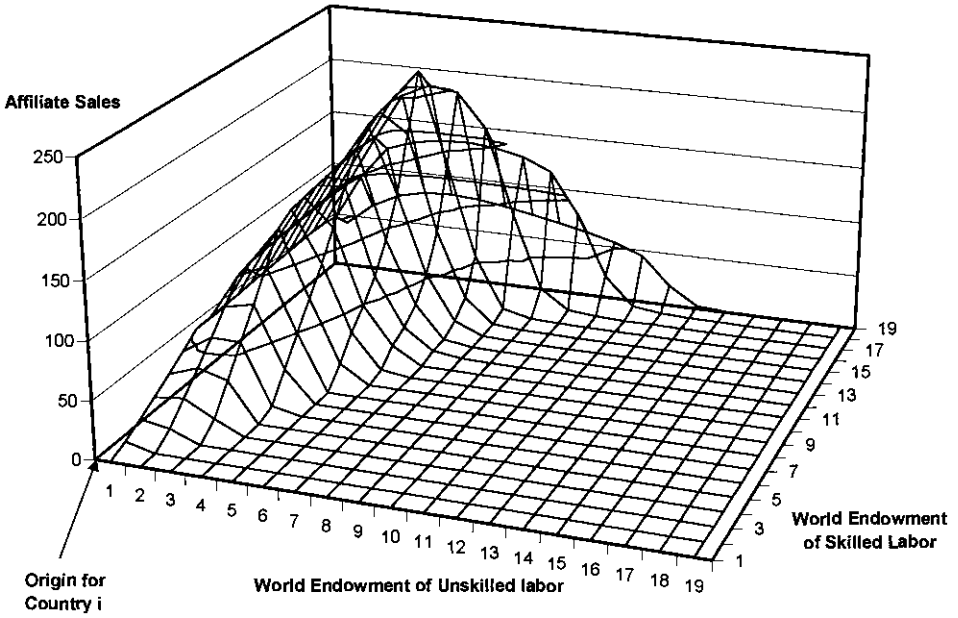
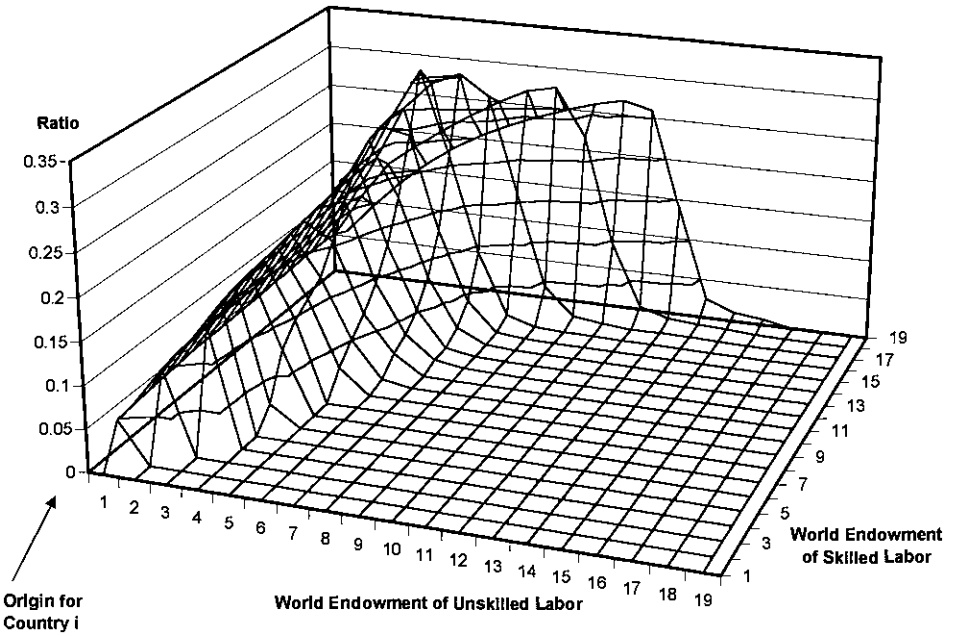**Fig. 3.3   Export sales of affiliates of country *i* firms in country *j***

Fig. 3.4   Ratio of export sales to local sales, affiliates of country *i* firms in country *j*

differences play some role, but the ratio clearly is not higher when the parent country i is both small and skilled labor abundant.[2]

These simulation results suggest a number of independent variables that should be used to explain the three dependent variables: local sales by affiliates of country i firms in country j (fig. 3.2), export sales by the same affiliates (fig. 3.3), and the ratio of these two variables (fig. 3.4). Refer to these variables as RSALESL, RSALESE, and RATIOEL (R for *real* in the first two). We now list the right-hand-side variables, adding a discussion of the hypothesized signs and magnitudes using figures 3.1–3.4 and other more obvious intuition. Again, note that these hypotheses are most appropriate to two-way compensated observations as noted earlier. We shall return to this point shortly.

SUMGDP denotes the sum of two countries' real GDPs. This should have a positive coefficient in explaining RSALESL and RSALESE. However, the effect should be stronger on RSALESL; the reason is that growth will, at various points in parameter space, lead to a switch from high marginal-cost single-plant firms to high fixed-cost multiplant firms, increasing local sales more than in proportion to growth in incomes. Accordingly, we hypothesize that RATIOEL should be negatively related to SUMGDP.

GDPDIFF is the difference between the two countries' real GDP levels, and GDPDIFSQ is the squared difference. GDPDIFSQ should be negatively related to all three dependent variables, as suggested by figures 3.2–3.4. Moving along various loci parallel to the SW-NE diagonal, all three dependent variables are higher near the center than at the extremes, although the maximum point generally is not exactly where the two countries are the same size.

SKDIFF denotes the relative skilled labor abundance of the *parent* country relative to that of the host; formally, it is the share of the labor force that is skilled in country i (parent or source) minus the same share in country j (host). SKDIFF should be positively related to both RSALESL and RSALESE. However, it is likely to have a stronger impact on RSALESE than on RSALESL from examination of figures 3.2 and 3.3. Relative endowments and factor price differences are the primary determinants of export sales, whereas local sales are influenced heavily by country sizes as well. Accordingly, we hypothesize that SKDIFF will have a positive sign in the RATIOEL regression, as suggested by figure 3.4.

INVJ denotes an index of investment barriers (costs) into country j, the host country. Higher numbers indicate higher investment costs. This is hypothesized to be negatively related to both RSALESL and RSALESE. However, investments to serve the local market may be less sensitive to

---

2. Recall that country i is smaller than country j at all points left of a line running from approximately column 8 on the north side of the box to column 12 on the south side.

these costs than are investments to serve export markets, because alternative locations may be selected for the latter; thus we hypothesize that the magnitude of the coefficient in the RSALESL equation should be less than that in the RSALESE equation, and therefore that the sign on INVJ should be negative in the RATIOEL equation as well.

TCJ denotes an index of trade barriers (costs, not including distance or freight) into country j. Higher numbers indicate higher barriers or costs. Such barriers should encourage investments to serve the local market, so the hypothesized sign is positive in the RSALESL equation. The effect should be noticeably less in the RSALESE equation and may be negative, insofar as trade costs raise the costs of imported intermediate inputs. The sign of the coefficient in the RATIOEL equation should thus be negative.

TCI is a similar measure of trade barriers back into the parent country. This has little effect on production for local sales in country j, but is expected to have a negative effect on production for export, insofar as much of that may be going back to the home country. This variable should thus have a negative sign in the RATIOEL equation.

SKDIFF*GDPDIFF is an interactive term. Referring to figures 3.2–3.3, the effect of an increase in SKDIFF should be larger when the parent is smaller (GDPDIFF < 0), and the effect of an increase in GDPI (parent GDP) should be smaller when the parent country i is skilled labor abundant (SKDIFF > 0). Both effects imply that the sign of the coefficient on the interactive term should be negative in the RSALESL and RSALESE regressions. Figure 3.4, however, does not suggest a very sharp hypothesis as to whether it should be positive or negative in the RATIOEL equation. Therefore, we are agnostic about the sign in the RATIOEL equation.

DIST will denote a distance measure between pairs of countries. Theory does not offer us much of a prediction about distance. It may lead to a substitution: producing abroad instead of exporting to a distant country. However, distance raises the transaction costs of investments as well as those of exports. It is possible that distance might affect production for export more negatively than it would production for local sale (which might actually be encouraged), but we are generally agnostic insofar as we do not understand the transactions costs of investing at a long distance.

In addition to examining these hypotheses on two-way data (inward and outward affiliate sales data for the United States), we examine them on U.S. outward data only. The advantage of the latter is that it breaks down affiliate export sales into sales back to the parent country and sales to third countries. Sales back to the U.S. parent may be closely identified with vertical investments such as foreign assembly plants. We should note, however, that the intuition generated by figures 3.1–3.4 may not always be appropriate, insofar as these diagrams are compensated experiments holding the two-country total factor endowment constant. Thus an increase in SKDIFF is an increase in the U.S. skilled labor abundance and a fall in

the host-country skilled labor abundance in the simulations. For the U.S. outward data, an increase in SKDIFF is a fall in the host-country skilled labor abundance holding the U.S. endowment constant. Similar comments apply to GDPDIFF, and in the outward regressions we will use GDPJ since it is only the latter variable that changes.

A problematic issue with the outward-only data arises from the fact that the United States (the parent) is always far bigger than the host, although not always skilled labor abundant relative to the host. This restricts observations to an area in the NE section of the Edgeworth boxes in figures 3.2–3.4, which is a considerable difficulty given the nonlinearity and non-monotonicity of the theoretical predictions over the parameter space of the Edgeworth box. For example, note that increases in SKDIFF could lead to a fall in outward U.S. investment in this region (foreign plants are replaced by U.S. national firms serving the host by exports). Thus we should expect some differences in the U.S. outward-only results versus the two-way results due to the fact that they are somewhat different experiments and because we are constrained to a subregion of parameter space in the outward-only data. Further comment is postponed until we view the results.

3.3   Data Sources and Variable Construction

The data form a panel of cross-country observations over the period 1986–94. We take real sales volume of nonbank manufacturing affiliates in each country to indicate production activity. The U.S. Department of Commerce provides annual data on sales of foreign affiliates of American parent firms and on sales of U.S. affiliates of foreign parent firms. Thus, for each year, the United States serves as both the headquarters country for its firms producing abroad and the affiliate country for foreign firms producing there. There are thirty-six countries in addition to the United States for which we have at least one year of complete data. Annual sales values abroad are converted into millions of 1990 U.S. dollars using an exchange rate adjusted local wholesale price index, with exchange rates and price indexes taken from the *International Financial Statistics* (*IFS*) of the International Monetary Fund.

As just noted, the inward data (U.S. affiliates of foreign parents) list only total exports of the affiliates to all countries. The outward data (foreign affiliates of U.S. parents) break down exports of those affiliates into exports back to the United States and exports to third countries. The latter series is particularly valuable, but constrains the analysis to a subarea of the Edgeworth box in which the parent country (United States) is always very large relative to the host, as has been noted. The inward-outward (two-way) data are thus in some ways much better for examining the theory, but suffer from a clear third-country problem, whereas the theory is developed

in a two-country context. Thus, we examine two cases, each of which has a drawback: the inward-outward data using total affiliate export sales to all countries, and outward-only data in which exports can be distinguished between exports back to the parent and exports to third countries.

Real GDP is measured in billions of 1990 U.S. dollars for each country. For this purpose, annual real GDP figures in local currencies were converted into dollars using the market exchange rate. These data are also from the *IFS*.

Skilled labor abundance is defined as the sum of occupational categories 0/1 (professional, technical, and kindred workers) and 2 (administrative workers) in employment in each country, divided by total employment. These figures are compiled from annual surveys reported in the *Yearbook of Labour Statistics* published by the International Labour Organization. In cases in which some annual figures were missing, the skilled labor ratios were taken to equal the period averages for each country. The variable SKDIFF is then simply the difference between the relative skill endowment of the parent country and that of the affiliate country.

The cost of investing in the affiliate country is a simple average of several indexes of impediments to investment throughout the period, reported in the *World Competitiveness Report* of the World Economic Forum. The indexes include restrictions on ability to acquire control in a domestic company, limitations on the ability to employ foreign skilled labor, restraints on negotiating joint ventures, strict controls on hiring and firing practices, market dominance by a small number of enterprises, an absence of fair administration of justice, difficulties in acquiring local bank credit, restrictions on access to local and foreign capital markets, and inadequate protection of intellectual property. These indexes are computed on a scale from 0 to 100, with a higher number indicating higher investment costs.

A trade cost index is taken from the same source and is defined as a measure of national protectionism, or efforts to prevent importation of competitive products. It also runs from 0 to 100, with 100 representing the highest trade costs. All of these indexes are based on extensive surveys of multinational enterprises.

We also incorporate a measure of distance, which is simply the number of kilometers of each country's capital city from Washington, D.C. It is unclear whether this variable captures trade costs or investment costs, since both should rise with distance.

3.4 Results

Tables 3.1–3.3 show results for regression equations on the full inward-outward data set. Table 3.1 gives results for dependent variable RSALESL (local sales in country j of affiliates of country i firms). Signs are as predicted for *direct* effects, although the two variables involving SKDIFF are

Table 3.1   **Results for Panel Estimation, Inward and Outward Data**

	Dependent variable:	RSALESL (weighted least squares)
	Total observations:	381
	R^2:	0.728
	Adjusted R^2:	0.722

Variable	Parameter Estimate	Sign as Predicted?	T for HO: Parm = 0	Prob > |T|
SUMGDP	10.2937	Yes	9.108	0.0001
GDPDIFSQ	−0.0009	Yes	−7.163	0.0001
SKDIFF	10,531	Yes	0.877	0.3813
GDPDIFF*SKDIFF	−2.6932	Yes	−1.114	0.2658
INVCJ	−633.3970	Yes	−7.119	0.0001
TCJ	366.5574	Yes	6.142	0.0001
TCI	−22.0996	?	−0.195	0.8451
DIST	−1.5326	?	−9.293	0.0001
INTERCEPT	469.22		0.046	0.9631

Table 3.2   **Results for Panel Estimation, Inward and Outward Data**

	Dependent variable:	RSALESE (weighted least squares)
	Total observations:	381
	R^2:	0.486
	Adjusted R^2:	0.473

Variable	Parameter Estimate	Sign as Predicted?	T for HO: Parm = 0	Prob > |T|
SUMGDP	2.9274	Yes	3.971	0.0001
GDPDIFSQ	−0.0003	Yes	−3.504	0.0005
SKDIFF	42,961	Yes	5.523	0.0001
GDPDIFF*SKDIFF	−6.9520	Yes	−4.434	0.0001
INVCJ	−277.2284	Yes	−4.758	0.0001
TCJ	52.1164	?	1.332	0.1836
TCI	65.6274	No	0.892	0.3729
DIST	−0.6398	?	−5.927	0.0001
INTERCEPT	7,501.94		1.127	0.2604

not statistically significant. Country size, investment costs, and trade costs into the host-country market have strong explanatory power. Trade costs back into the parent country (TCI) have little explanatory power, and theory does not hypothesize that it should.

Table 3.2 gives results for dependent variable RSALESE (export sales to all countries by affiliates of country *i* firms in country *j*). Signs are as hypothesized except for TCI, which should be negative, at least for exports going back to the home countries (these cannot be broken out in the data, as previously noted). The two terms involving SKDIFF are both larger

in magnitude (economic significance) than in the RSALESL regression, and highly statistically significant. The magnitude of the SUMGDP coefficient, on the other hand, is much smaller in the RSALESE regression. These results suggest that market size is a more important determinant of production for local sales while differences in relative endowments are a more important determinant of production for export.

These comparisons can be misleading, however, due to differences in the size of the dependent variables (local sales are larger than export sales in most observations). Table 3.3 therefore uses the ratio of export sales to local sales. Results confirm that market size is more important for local sales (coefficient on SUMGDP is negative) and that skill differences are more important for export sales (coefficient on SKDIFF is positive); thus, the proportion of export sales increases as host country j becomes more unskilled labor abundant (skilled labor scarce).

The coefficients on the INVCJ and TCJ variables in the ratio equation of table 3.3 are negative. This conforms to our intuition about substitutability. Production for local sale, by definition, cannot move to a third country, and thus local sales may be relatively insensitive to these costs. Production for export sale may be more sensitive to investment and trade costs because the firm can choose an alternative location to serve a broader market, as suggested by the negative signs in the ratio equation. TCI is positive in this regression, which is consistent with results in tables 3.1 and 3.2. This outcome is not consistent with our intuition, but note that the significance level is low. Higher parent-country trade costs should discourage foreign production for export back to the parent, but should not affect production for local sale.

Tables 3.4–3.8 present results on the U.S. outward-only sample, allowing

Table 3.3   **Results for Panel Estimation, Inward and Outward Data**

Dependent variable:	RATIOEL (weighted least squares)			
Total observations:	371			
R^2:	0.335			
Adjusted R^2:	0.319			

Variable	Parameter Estimate	Sign as Predicted?	T for HO: Parm = 0	Prob > |T|
SUMGDP	−0.000671	Yes	−4.327	0.0001
GDPDIFSQ	−1.92E-08	Yes	−1.209	0.2273
SKDIFF	3.175373	Yes	3.121	0.0019
GDPDIFF*SKDIFF	−0.000043	?	−0.173	0.8630
INVCJ	−0.043374	Yes	−3.491	0.0005
TCJ	−0.010975	Yes	−1.261	0.2082
TCI	0.014789	No	1.094	0.2749
DIST	0.000055	?	2.446	0.0149
INTERCEPT	6.100586		4.222	0.0001

Table 3.4   **Results for Panel Estimation, U.S. Outward Only**

Dependent variable:		RSALESL (weighted least squares)		
Total observations:		274		
R^2:		0.773		
Adjusted R^2:		0.766		

Variable	Parameter Estimate	Sign as Predicted?	T for HO: Parm = 0	Prob > |T|
GDPJ	20.8423	Yes	10.362	0.0001
GDPDIFSQ	−0.0018	Yes	−8.120	0.0001
SKDIFF	−948,636	?	−11.980	0.0001
GDPDIFF*SKDIFF	174.5818	?	11.905	0.0001
INVCJ	−517.8056	Yes	−6.546	0.0001
TCJ	314.8092	Yes	5.943	0.0001
DIST	−1.2044	?	−7.810	0.0001
INTERCEPT	73,798.00		9.863	0.0001

a breakdown of production for export sale into sales back to the United States (RSALESUS in table 3.5) and sales to third countries (RSALESF in table 3.6). The most dramatic change in these results relative to tables 3.1–3.3 is the reversal in the signs of SKDIFF and GDPDIFF*SKDIFF. This suggests that U.S. outward investment is attracted to more-skilled-labor-abundant countries, for both local production and production for export, with strong statistical significance. The latter result is particularly at odds with the two-way results.

There are two possible explanations, other than simply concluding that inward and outward investments follow different models. First, there is the compensated versus uncompensated issue that we mentioned earlier. In the U.S. outward-only data, an increase in SKDIFF holds U.S. skilled labor abundance constant, effectively lowering world skilled labor abundance. This is a somewhat different experiment than that in the two-way data, which includes not only such uncompensated observations across different countries, but also a great many compensated observation pairs comparing i-to-j and j-to-i affiliate production. The response of affiliate production to an increase in host-country skilled labor abundance (decrease in SKDIFF) should be more positive or less negative than if this change is accompanied by a fall in the parent-country skilled labor abundance, and that is what the results are telling us.

The second possible explanation relates to the fact that the parent country (the United States) is always much larger than the host in the U.S. outward data. How this might affect the results is shown most clearly in figure 3.2. When country i is quite large relative to country j, a (compensated) increase in SKDIFF may produce a fall in RSALESL: Heading toward the north edge of the box, we go over the "hump" and RSALESL

Table 3.5   **Results for Panel Estimation, U.S. Outward Only**

Dependent variable:	RSALESUS (weighted least squares)
Total observations:	244
R^2:	0.358
Adjusted R^2:	0.336

Variable	Parameter Estimate	Sign as Predicted?	T for HO: Parm = 0	Prob > |T|
GDPJ	2.1956	Yes	1.445	0.1499
GDPDIFSQ	−0.0002	Yes	−1.332	0.1843
SKDIFF	−177,143	No	−3.049	0.0026
GDPDIFF*SKDIFF	33.4368	?	3.088	0.0023
INVCJ	−346.6351	Yes	−5.722	0.0001
TCJ	207.5793	No	5.141	0.0001
DIST	−0.7968	?	−6.635	0.0001
INTERCEPT	20,469		3.616	0.0004

Table 3.6   **Results for Panel Estimation, U.S. Outward Only**

Dependent variable:	RSALESF (weighted least squares)
Total observations:	259
R^2:	0.598
Adjusted R^2:	0.585

Variable	Parameter Estimate	Sign as Predicted?	T for HO: Parm = 0	Prob > |T|
GDPJ	6.8947	Yes	5.690	0.0001
GDPDIFSQ	−0.0006	Yes	−4.615	0.0001
SKDIFF	−237,383	No	−4.803	0.0001
GDPDIFF*SKDIFF	44.7907	?	4.860	0.0001
INVCJ	−211.3208	Yes	−4.541	0.0001
TCJ	−8.6449	Yes	−0.279	0.7805
DIST	−8.6449	?	−3.001	0.0030
INTERCEPT	29,941.00		6.715	0.0001

start to fall. What is happening in the theory model is that host country *j* is becoming sufficiently skilled labor scarce that branch plants there are closed and production is concentrated in national firms headquartered in country *i*. This implies a negative sign on SKDIFF, which is the result we are getting in tables 3.4–3.6. This finding is in fact consistent with results in Zhang and Markusen (1999), which show that the smallest, poorest (skilled-labor-scarce) countries receive a far smaller share of world direct investment than their share of income. The result and associated theory also points out the importance of knowing which part of the box is being

examined and of adding more investing countries, as is done in the two-way sample.

Table 3.7 shows results for the ratio of affiliate export sales back to the United States to affiliate sales to the local market, and table 3.8 shows results for the ratio of affiliate sales to third markets to affiliate sales to the local market. Results on market size confirm those in table 3.3, that a larger market shifts a proportion of sales from exports to local sales. The findings also confirm the results on INVCJ and TCJ (TCI was dropped because country i is always the United States). The results on SKDIFF and GDPDIFF*SKDIFF are not consistent with tables 3.4–3.6; however,

Table 3.7 **Results for Panel Estimation, U.S. Outward Only**

Dependent variable:	RATIOUSL (weighted least squares)		
Total observations:	231		
R^2:	0.413		
Adjusted R^2:	0.392		

Variable	Parameter Estimate	Sign as Predicted?	T for HO: Parm = 0	Prob > |T|
GDPJ	−0.000693	Yes	−3.708	0.0003
GDPDIFSQ	−4.12E-08	Yes	−2.134	0.0340
SKDIFF	2.364984	Yes	0.391	0.6963
GDPDIFF*SKDIFF	−0.000186	?	−0.165	0.8689
INVCJ	−0.019319	Yes	−2.831	0.0051
TCJ	−0.004806	Yes	−0.959	0.3387
DIST	0.000087	?	6.225	0.0001
INTERCEPT	1.947083		2.925	0.0038

Table 3.8 **Results for Panel Estimation, U.S. Outward Only**

Dependent variable:	RATIOFL (weighted least squares)		
Total observations:	236		
R^2:	0.343		
Adjusted R^2:	0.320		

Variable	Parameter Estimate	Sign as Predicted?	T for HO: Parm = 0	Prob > |T|
GDPJ	−0.001291	Yes	−3.881	0.0001
GDPDIFSQ	−2.36E-08	Yes	−0.683	0.4953
SKDIFF	29.904477	Yes	2.630	0.0091
GDPDIFF*SKDIFF	−0.005218	?	−2.467	0.0144
INVCJ	−0.045391	Yes	−3.517	0.0005
TCJ	−0.003751	Yes	−0.403	0.6876
DIST	−0.000026	?	−0.841	0.4014
INTERCEPT	3.913419		3.330	0.0010

these point estimates have extremely low statistical significance in table 3.7, while the positive sign on SKDIFF in table 3.3 is highly significant. Both coefficients are statistically significant in table 3.8. Thus, the results suggest that U.S. outward investment is not attracted to low-skilled countries, even investment for production for export back to the United States (table 3.5).

Results on market size and relative endowments must be interpreted carefully, however, since GDP appears in three terms and relative endowments in two terms. Let us write the first four terms of the regression equations as

(1) $\beta_1 \text{SUMGPD} + \beta_2 \text{GDPDIFSQ} + \beta_3 \text{SKDIFF}$

$$+ \beta_4 \text{GDPDIFF} * \text{SKDIFF}.$$

The derivatives of this equation with respect to host-country variables GDPJ and SKLJ are then as follows (an increase in GDPJ is a negative change in GDPDIFF, and an increase in SKLJ is a negative change in SKDIFF):

(2) $\dfrac{\partial \text{RSALES}}{\partial \text{GDPJ}} = \beta_1 - 2\beta_2 \text{GDPDIFF} - \beta_4 \text{SKDIFF},$

(3) $\dfrac{\partial \text{RSALES}}{\partial \text{SKLJ}} = -\beta_3 - \beta_4 \text{GDPDIFF}.$

Table 3.9 computes values of these derivatives at the mean values of SKDIFF and GDPDIFF for the two samples. Table 3.9 gives the absolute change in sales by country i affiliates in j in response to a growth in country j's income and to an increase in country j's skilled labor abundance (decrease in its unskilled labor abundance). Effects of increases in country j's investment and trade cost indexes are also listed. The top panel gives results for the inward-outward estimation, while the lower panel gives estimates for the U.S. outward estimation only. Below the level estimates, an elasticity figure is computed. We do not compute elasticities with respect to INVCJ and TCJ, since these are qualitative indexes.

According to results in the top panel of table 3.9, local sales are elastic with respect to host-country income, with an elasticity of $\varepsilon = 1.6$. Export sales are less elastic, at $\varepsilon = 1.1$. Local sales are very insensitive to the skilled labor ratio in the host country, while export sales have an elasticity with respect to the skilled labor ratio of $\varepsilon = -0.7$. Production for export sales is attracted to less-skilled-labor-abundant (more-skilled-labor-scarce) countries. Comparing local sales to export sales, the former respond more to income, whereas the latter respond more to skilled labor scarcity as suggested by the regression results discussed earlier.

The pattern for the U.S. outward-only data (lower panel of table 3.9) is qualitatively similar to the top panel but quantitatively different. Production

Table 3.9   **Effects of Host-Country Size and Skilled Labor Abundance on Foreign Affiliate Production for Local Sale and Export (derivatives evaluated at the mean of independent variables) ($ millions)**

Effect on:	$1 Billion Increase in Country J's GDP	One Percentage Point Increase in SKLJ[a]	One Point Increase in INVCJ	One Point Increase in TCJ
Local sales of country i affiliates in country j (inward and outward data)	16.7 (1.558)	−12.1 (−0.017)	−633.4	366.6
Export sales of country i affiliates in j to all countries (inward and outward data)	4.7 (1.118)	−189.0 (−0.681)	−277.2	52.1
Local sales of U.S. affiliates in country j (U.S. outward data only)	22.7 (1.044)	280.5 (0.599)	−517.8	314.8
Export sales of U.S. affiliates in country j to United States (U.S. outward data only)	1.3 (0.213) } $\varepsilon_W = 0.681$	8.3 (0.064) } $\varepsilon_W = 0.062$	−346.6	207.6
Export sales of U.S. affiliates in country j to other countries (U.S. outward data only)	9.0 (0.989)	12.0 (0.061)	−211.3	−8.6

Note: Numbers in parentheses are elasticity values.

[a] By "One Percentage Point Increase in SKLJ" we mean, for example, an increase from 15 percent to 16 percent, not an increase from 15 percent to 15.15 percent.

for local sale has an elasticity with respect to local market size of about 1.0, while the elasticities of exports back to the United States and to third countries are 0.2 and 1.0, respectively. A weighted average of these two elasticities (εw) yields a figure of 0.68. Thus the elasticity of exports with respect to host-country size is less than that for local sales by an amount similar to the two-way estimates. The elasticity of local sales with respect to the host-country skilled labor ratio is about 0.6, while the average of the two export elasticities is 0.06. Production for export back to the United States or to third countries is insensitive to the host-country skilled labor ratio, at least at the mean of GDPDIFF. Again, the pattern is qualitatively similar to that for the two-way estimate in that the export elasticity with respect to local skilled labor is smaller than that for local sales (i.e., less positive or more negative).

Overall, the results in table 3.9, taking into account interactive effects, clearly confirm that production for local sales is more sensitive to local market size than is production for export. Production for local sales has an elasticity with respect to the host-country skilled labor ratio that is larger than the elasticity for production for export. Production shifts relatively in favor of local sales when the host is more skilled labor abundant and relatively in favor of exports when the host is skilled labor scarce.

There is an interesting quantitative difference between the two-way and U.S. outward estimates of the elasticities with respect to the host-country skilled labor ratio (subject again to the caveats that these are point estimates, evaluated at the mean of GDPDIFF in each sample, and that the means differ in the two samples). While production for export is attracted by host-country unskilled labor abundance in the two-way sample, there is virtually no effect in the U.S. outward sample. We might infer from this that production by U.S. affiliates for export, including that back to the United States, is not primarily attracted to low-skilled countries, contrary to a popular impression of multinationals exporting jobs to low-wage countries. While this may occur in arm's-length outsourcing (e.g., subcontracting), our results suggest that it is not primarily multinationals that are responsible for such a phenomenon. As we have noted, this is consistent with the theoretical assumption that branch-plant production is skilled labor intensive relative to the rest of the host economy. Past a certain level of skilled labor scarcity in the host economy, inward direct investment begins to fall as that country becomes increasingly skilled labor scarce (Zhang and Markusen 1999).

3.5   Summary and Conclusions

Robert Lipsey's work over many years has given us a rich empirical literature that relates the behavior of multinational firms to industry and country characteristics. Theoretical work that endogenizes multinational

firms into general equilibrium trade models has developed somewhat more recently, and offers predictions about the relationship between affiliate production and parent-country and host-country characteristics. In particular, the knowledge-capital approach to the multinational enterprise identifies motives for both horizontal and vertical multinational activity and predicts how affiliate activity should be related to variables such as country sizes and relative endowment differences.

This paper draws implications from the theory as to how production for local sales versus production for export sales relates to country characteristics, and then subjects these hypotheses to empirical estimation. Results fit well with the theory in terms of economic and statistical significance. Local (host-country) market size is more important for production for local sales than for production for export sales. Host-country skilled labor scarcity is important for export production relative to production for local sales. Investment and trade-cost barriers in the host country affect production for export more negatively than they do production for local sales.

Some quantitative difference was found in the two-way (inward and outward) sample versus the U.S. outward-only sample with respect to host-country skilled labor scarcity. In the U.S. outward-only sample, host-country skilled labor scarcity (unskilled labor abundance) had little effect on U.S. affiliate production for export sale, whether back to the United States or to third countries. This suggests that U.S. outward investment is not drawn primarily to unskilled-labor-abundant countries, contrary to a common fear that outsourcing by multinationals is resulting in a loss of U.S. unskilled jobs. (Firms could, of course, be outsourcing to unaffiliated subcontractors). In the two-way sample, production for exports is drawn to unskilled-labor-abundant countries. However, the results are qualitatively similar in the two samples insofar as unskilled labor abundance in the host is *relatively* more important for export sales.

References

Bhagwati, Jagdish N., and Richard A. Brecher. 1980. National welfare in an open economy in the presence of foreign-owned factors of production. *Journal of International Economics* 10 (1): 103–15.

Blomström, Magnus, Irving B. Kravis, and Robert E. Lipsey. 1988. Multinational firms and manufacturing exports from developing countries. NBER Working Paper no. 2493. Cambridge, Mass.: National Bureau of Economic Research, January.

Blomström, Magnus, and Robert E. Lipsey. 1989. The export performance of US and Swedish multinationals. *Review of Income and Wealth,* ser. 35, no. 3: 245–64.

———. 1993. The competitiveness of countries and their multinational firms. In *Multinationals in the global political economy,* ed. Lorraine Eden and Evan H. Potter, 129–41. New York: St. Martin's Press.

Blomström, Magnus, Robert E. Lipsey, and Ksenia Kulchycky. 1988. US and Swedish direct investment and exports. In *Trade policy issues and empirical analysis,* ed. Robert E. Baldwin, 259–97. Chicago: University of Chicago Press.

Blomström, Magnus, Robert E. Lipsey, and Lennart Ohlsson. 1990. What do rich countries trade with one another? R&D and the composition of US and Swedish trade. *Banca Nazionale del Lavoro Quarterly Review* 173 (June): 215–35.

Blonigen, Bruce. 1997. Firm-specific assets and the link between exchange rates and foreign direct investment. *American Economic Review* 87 (3): 447–66.

———. 1998. In search of substitution between foreign production and exports. University of Oregon, Department of Economics, Working Paper.

Brainard, S. Lael. 1993a. A simple theory of multinational corporations and trade with a trade-off between proximity and concentration. NBER Working Paper no. 4269. Cambridge, Mass.: National Bureau of Economic Research, February.

———. 1993b. An empirical assessment of the factor proportions explanation of multinationals sales. NBER Working Paper no. 4580. Cambridge, Mass.: National Bureau of Economic Research, December.

———. 1997. An empirical assessment of the proximity-concentration tradeoff between multinational sales and trade. *American Economic Review* 87 (4): 520–44.

Brecher, Richard A., and Carlos F. Diaz-Alejandro. 1977. Tariffs, foreign capital and immiserizing growth. *Journal of International Economics* 7 (4): 317–22.

Carr, David, James R. Markusen, and Keith E. Maskus. Forthcoming. Estimating the knowledge-capital model of the multinational enterprise. *American Economic Review.*

Dick, Andrew R. 1993. Strategic trade policy and welfare: The empirical consequences of foreign ownership. *Journal of International Economics* 35 (3/4): 227–49.

Ekholm, Karolina. 1995. *Multinational production and trade in technological knowledge.* Lund Economic Studies no. 58. University of Lund, Lund, Sweden.

———. 1997. Factor endowments and the pattern of affiliate production by multinational enterprises. CREDIT Working Paper no. 97/19. University of Nottingham, Nottingham, UK.

———. 1998a. Headquarter services and revealed factor abundance. *Review of International Economics* 6 (4): 545–53.

———. 1998b. Proximity advantages, scale economies, and the location of production. In *The geography of multinational firms,* ed. Pontus Braunerhjelm and Karolina Ekholm, 59–76. Boston: Kluwer Academic Publishers.

Ethier, Wilfred, and Lars E. O. Svensson. 1986. Theorems of international trade with factor mobility. *Journal of International Economics* 20 (1/2): 21–42.

Helpman, Elhanan. 1984. A simple theory of trade with multinational corporations. *Journal of Political Economy* 92 (3): 451–71.

———. 1985. Multinational corporations and trade structure. *Review of Economic Studies* 52 (3): 443–58.

Horstmann, Ignatius J., and James R. Markusen. 1987. Strategic investments and the development of multinationals. *International Economic Review* 28 (1): 109–21.

———. 1992. Endogenous market structures in international trade. *Journal of International Economics* 32 (1/2): 109–29.

Kemp, Murray C. 1969. *The pure theory of international trade and investment.* New York: Prentice Hall.

Kravis, Irving B., and Robert E. Lipsey. 1982. The location of overseas production and production for export by US multinational firms. *Journal of International Economics* 12 (3/4): 210–23.

———. 1988. The effect of multinational firms' foreign operations on their domestic employment. NBER Working Paper no. 2760. Cambridge, Mass.: National Bureau of Economic Research, December.

———. 1992. Sources of competitiveness of the United States and of its multinational firms. *Review of Economics and Statistics* 74 (2): 193–201.

Linder, Staffan B. 1961. *An essay on trade and transformation.* Uppsala, Sweden: Almqvist and Wiksells.

Lipsey, Robert E. 1988. Changing patterns of international investment in and by the United States. In *The United States and the world economy,* ed. Martin Feldstein, 475–545. Chicago: University of Chicago Press.

———. 1989. The internationalization of production. NBER Working Paper no. 2923. Cambridge, Mass.: National Bureau of Economic Research, April.

———. 1993. Foreign direct investment in the United States: Changes over three decades. In *Foreign direct investment,* ed. Kenneth A. Froot, 113–70. Chicago: University of Chicago Press.

———. 1995. Outward direct investment and the U.S. economy. In *The effects of taxation on multinational corporations,* ed. M. Feldstein, J. R. Hines, Jr., and R. Glenn Hubbard, 7–33. Chicago: University of Chicago Press.

Lipsey, Robert E., Magnus Blomström, and Eric Ramstetter. 1998. Internationalized production in world output. In *Geography and ownership as bases for economic accounting,* ed. Robert E. Baldwin, Robert E. Lipsey, and J. David Richardson, 83–135. Chicago: University of Chicago Press.

Lipsey, Robert E., and Irving B. Kravis. 1987. The competitiveness and comparative advantage of U.S. multinationals 1957–1984. *Banca Nazionale del Lavoro Quarterly Review* 161 (June): 147–65.

Lipsey, Robert E., and Merle Yahr Weiss. 1981. Foreign production and exports in manufacturing industries. *Review of Economics and Statistics* 63 (4): 488–94.

———. 1984. Foreign production and exports of individual firms. *Review of Economics and Statistics* 66 (2): 304–8.

Markusen, James R. 1983. Factor movements and commodity trade as complements. *Journal of International Economics* 13 (3/4): 341–56.

———. 1984. Multinationals, multi-plant economies, and the gains from trade. *Journal of International Economics* 16 (3/4): 205–26.

———. 1995. The boundaries of multinational firms and the theory of international trade. *Journal of Economic Perspectives* 9 (2): 169–89.

———. 1997. Trade versus investment liberalization. NBER Working Paper no. 6231. Cambridge, Mass.: National Bureau of Economic Research, October.

Markusen, James R., and Lars E. O. Svensson. 1985. Trade in goods and factors with international differences in technology. *International Economic Review* 26 (1): 175–92.

Markusen, James R., and Anthony J. Venables. 1998. Multinational firms and the new trade theory. *Journal of International Economics* 46 (2): 183–203.

Melvin, James R. 1969. Increasing returns to scale as a determinant of trade. *Canadian Journal of Economics* 3 (3): 389–402.

Mundell, Robert. 1957. International trade and factor mobility. *American Economic Review* 47 (3): 321–35.

Neary, J. Peter. 1995. Factor mobility and international trade. *Canadian Journal of Economics* 28 (November, special iss.): S4–S23.

Smith, Pamela J. 1998. Patent rights and bilateral exchange: A cross-country analysis of US exports, FDI, and licensing. University of Minnesota Working Paper.

Swenson, Debra. 1998. The tradeoff between trade and foreign investment. University of California, Davis, Working Paper.

Wong, Kar-Yui. 1986. Are international trade and factor mobility substitutes? *Journal of International Economics* 21 (1/2): 25–44.

Zhang, Kevin H., and James R. Markusen. 1999. Vertical multinationals and host-country characteristics. *Journal of Development Economics* 59 (2): 233–52.

Comment   Ann E. Harrison

I'd like to begin by saying how much I welcome the opportunity to contribute to this conference in honor of Robert Lipsey. One of my greatest joys in being affiliated with the NBER (and there have been many) has been the opportunity to get to know him. One outcome has been a recent paper that we coauthored on the impact of multinational activity on host-country wages, where we found that multinational corporations (MNCs) pay a wage premium vis-à-vis domestic enterprises equal to around 10 percent (Aitken, Harrison, and Lipsey 1997).

It is also a great pleasure to be able to discuss Jim Markusen and Keith Maskus's paper. This paper is very appropriate for the conference: The authors are applying some very interesting ideas to real data.

Let me begin by highlighting two reasons this is timely: (1) It provides a concise but illuminating review of the previous literature on direct investment and multinational activity, focusing in particular on Bob Lipsey's voluminous contributions to that literature. (2) It provides a nice review of some of Jim Markusen's research, focusing on some of his key ideas and presenting graphical representations of his theoretical results.

This paper measures the importance of two different motives for multinational activity: exploiting differences in endowments (which leads to vertical MNC activity, with skill-intensive activities such as R&D done at home, and labor-intensive activities such as assembly done abroad) versus exploiting certain firm-specific assets or ideas that can be shared across units. The latter motive for MNCs is likely to lead firms to establish similar units across countries, leading to horizontal FDI. The question is, How can we distinguish between these two motives in the data?

The authors are able to identify empirically the importance of these two motives through clever use of U.S. data on inward and outward MNC activity: MNCs that locate facilities abroad for reexport are likely to be doing so in order to take advantage of differences in factor endowments. Take, for example, *maquiladoras* in northern Mexico who exploit cheap labor and reexport all their final production back to the United States. MNCs who expand horizontally and set up similar facilities at home and

Ann E. Harrison is professor at Columbia Business School and a faculty research fellow of the National Bureau of Economic Research.

abroad do so to exploit their knowledge (which can be shared across multiple facilities) and are less sensitive to differences in endowments.

Another attractive feature of this paper is that it is the only research of which I am aware that directly tests the implications of general equilibrium models of FDI on actual data. Clearly, this research agenda could provide much scope for future papers. I have several suggestions for future research.

First, it is easy to understand the motive for a vertical MNC and how to identify the motive empirically: MNC activity should be correlated with differences in endowments. I have a difficult time, however, trying to understand how we test for the alternative hypothesis: How do we capture the horizontal motive empirically? Based on the theory, the authors argue that horizontal MNC activity is more likely between countries of similar size with similar endowments. It is difficult for me to understand why there should be any MNC activity at all in this case—why don't countries just trade? The answer must be that high tariffs or transport costs make it difficult to trade and therefore lead to horizontal MNC. So I find the authors' results on protection a better measure of the importance of horizontal MNC activity than the variable that they use (GDP size) to provide support for horizontal MNC activity. I suspect that GDP size is important because it reflects opportunities to take advantage of protected domestic markets, rather than scale-induced horizontal expansion. One nice empirical result in the paper is that tariff-jumping is clearly a motive for horizontal MNC activity but not for vertical MNC activity.

Another reason for horizontal MNC activity could be market imperfections that make it difficult to exploit intangible assets through arm's-length licensing, such as poor contract enforcement. This is the so-called internalization hypothesis, which can be captured through variables such as R&D-to-sales ratios. The authors do include measures of protection and transport costs, but not measures of R&D intensity.

This brings me to my next point: In future research, it would be interesting to compare the results in the current paper with results using disaggregated manufacturing data. The authors have made excellent use of country-level data on MNC activity both into and out of the United States, but my intuition tells me that the motive for MNC activity within a country will vary quite a bit by subsector. Let's take, for example, the sales of U.S. affiliates in Mexico:

At the border, U.S. *maquiladoras* are assembling garments for reexport to the United States. This is clearly based on differences in endowments and is of the vertical MNC type.

The big three U.S. auto makers, at least before NAFTA, were completely driven to produce in Mexico because of prohibitive tariffs and quotas.

So FDI in autos was of the horizontal type, becoming more vertical only at the end of the sample period.

Colgate Palmolive has a huge operation in Mexico. This seems to be based on the desire to exploit firm-specific assets by relocating there. This is horizontal MNC activity based on intangible assets and correlated with home R&D intensity.

If we add all three types of affiliate sales together for the empirical work, my fear is that these different effects become muddled and it becomes very difficult to distinguish between the different motives for foreign direct investment. The aggregation problem could explain why it is difficult to get consistent results across different specifications. The variable SKLDIF in some cases captures endowment differences, and in other cases captures the fact that there is less direct investment between less similar countries (i.e., we get horizontal FDI).

I have some other, minor, comments. In the real world, there are more than two factors. How do the authors account for natural-resource intensive reasons for moving? Why do the authors use weighted least squares? It would also be useful to know the weights used in the estimation. Since the authors have a panel over time and across countries, they could also try using a fixed-effects approach. I wonder how the importance of exchange rate fluctuations are taken into account. A large share of Japanese MNC activity into the United States was driven by the desire to hedge against a strong yen and a fluctuating exchange rate. Do the authors include time dummies to account for this?

The authors use a cost-of-investing index, which measures the barriers to FDI and is consistently negatively correlated with affiliate activity. This index includes a lot of independent factors such as restrictions on majority controls, labor market restrictions on hiring and firing, entry barriers through existing oligopolies, and inadequate protection of intellectual property. It would be very interesting to be able to measure the independent effects of these separate policies. This again would be easier to do with more disaggregate data, which would increase sample size and allow the authors to add more right-hand-size variables.

Let me conclude by saying how much I have enjoyed reading and thinking about the results in this paper.

Reference

Aitken, B., A. Harrison and R. Lipsey. 1997. Spillovers, foreign investment, and export behavior. *Journal of International Economics* 43 (1/2): 103–32.