

location theory

Location theory addresses the important questions of who produces what goods or services in which locations, and why. As many government policies involve attempts to shift production, one must first examine the basis for the initial location decisions in order to understand the impact of altering incentives.

Nearly 200 years ago, the primary concern of early location theorists, most notably Johann-Heinrich von Thünen (1783-1850), was the optimal location of cities and farms, balancing both land costs and transport costs. In von Thünen's model, concentric rings of agricultural activity develop around a city. The production of perishable goods and/or goods needing to get to market quickly locate in the rings closer to the city, and other activities such as ranching locate in outer rings. Since von Thünen, many other scholars have proposed more complex location models, incorporating the production of industrial and agricultural goods and services.

Many of the questions addressed in location theory are highly relevant to international economics. For example, trade theory explains patterns of international production and trade. Similarly, much of the research on foreign direct investment (FDI) looks at where multinational firms locate various activities. Policy applications of location theory have examined ways in which different countries, states and regions can actively compete to be production locations for both trade and FDI. Before turning to the applications of location theory in international economics, it is important to review the basic elements of location theory.

Standard Assumptions

Most theories of economic location start with these main assumptions:

1. The production process for particular goods is uniform, independent of locations.
Producing corn requires a certain amount of a particular quality of land, farm machinery, chemicals, climate, etc. Therefore, some locations are more suitable for producing corn than others. Factors of production cannot be substituted for each other. For example, superior farm machines cannot substitute for scarce land to grow corn in a big city.
2. The demand for products is separated from the production, or supply, of the products.
Corn producers want to put the money they earn from farming into banks in cities. Bankers in cities want to consume agricultural goods. Therefore, transportation costs affect where goods are produced. If both Iowa and Nebraska have the same amount of corn-producing factors of production, but most of the demand for corn is in New York City, other things equal, Iowa's shorter distance to New York makes Iowa the better location for producing corn.
3. Factors of production are immobile. Inhabitants of New York City cannot import Iowa's cheap land to grow corn locally, and Iowans cannot import New York's bankers. While some factors (capital, migrant workers) are in fact mobile, land and most natural resources are not.

Theories based on the above assumptions generate the clear prediction that to minimize production and transportation costs, certain locations will specialize in the production of particular goods and services and "export" these goods to other locations.

Trade Theory

There is considerable overlap between location theory and trade theory. Krugman (1993) compares and contrasts location theory and trade theory. Differences aside, the theories are

ultimately quite similar in the questions they address and the assumptions they make. Neither trade theory nor location theory is inherently international. Optimal production locations could be within one country, such as Iowa and New York City in the example above.

Neither location theory nor trade theory identifies the specific countries or regions in which production of particular goods will be located. Trade theory speaks to characteristics of production locations, such as relative endowments of factors of production required to produce particular goods, or comparative advantage in producing one good relative to another. Location theory speaks to the optimal location of production given the cost of factors of production and transport costs to consumers. In order to determine specifically which countries or regions will specialize in producing which goods, researchers have tested these theories using data on the production characteristics of particular goods, the factor endowments of countries, and transportation costs. In Sources of International Comparative Advantage, Edward Leamer (1984) tests the precise relationships specified in neoclassical trade theory and predicts the specific countries in which production for export should be located. The evidence is, at best, an imperfect fit with the predictions of both location theory and neoclassical trade theory.

Location of FDI

Location theory is frequently applied by researchers wanting to understand factors that influence where multinational firms (MNCs) choose to locate their foreign operations. Typically lacking data on the production costs of individual MNCs or data on an MNC's costs in countries where the firm does not operate, researchers tend to study features of the different locations that should make them more or less attractive, such as a country's corporate tax rate. These features include factors related to a country's policy, economy and technology environments, and strategic considerations for individual MNCs. These are discussed in detail below.

Host Country Policies

The policy environment of a country has an important impact on its attractiveness. Policies such as corporate tax rates affect the costs of an MNC. Hence disproportionate amounts of FDI (relative to GDP) occurs in low-tax countries such as Ireland and tax havens such as the Cayman Islands. Conversely, some countries put restrictions on FDI such as not allowing wholly-owned subsidiaries, requiring technology transfer, limiting the repatriation of profits, and mandating a certain proportion of value-added be produced in the local market. Other things equal, countries with more restrictive policies toward FDI tend to be less attractive FDI locations. Despite a global trend toward liberalization of policies toward FDI (OECD 2006), restrictions continue to exist in some form in almost every country.

Other features of a country's policy environment also affect its attractiveness. Labor market institutions such as the degree of unionization affect FDI flows. Similarly, the protection of property rights and intellectual property, strong institutions for contract enforcement and capital market governance, environmental regulation and trade policy may also affect MNCs' FDI location choices (Javorcik and Spatareanu, 2005).

Recently, researchers have studied various types of political risk as influences on MNCs' FDI location decisions. MNCs make location decisions based upon expected future profits, and greater risk creates greater uncertainty with regard to future income streams. Thus, other things equal, risk reduces FDI inflows. Countries that are politically risky in the sense of having a history of expropriating FDI, weak institutions, endemic corruption, autocratic governments, periodic coups d'état, or ethnic tension tend to receive negligible FDI flows (or far less than would otherwise be expected). Many of the poorest countries in the world, e.g., Haiti, Honduras

and much of sub-Saharan Africa, are beset with political risk, and receive very little FDI. To a greater or lesser extent, some of the aforementioned risks are present in many countries, some of which, e.g., China and Nigeria, are recipients of large FDI inflows, as other things are not equal. Nigeria is one of the most oil-rich countries in the world, and China has the largest population in the world and a rapidly growing economy. These factors offset some of the risk MNCs encounter in China and Nigeria. However, if these countries were less risky, they likely would enjoy larger inflows of FDI.

Economic Environment

Features of a country's economic environment are also important determinants of FDI location. Capital, human and natural resource endowments such as labor in China and oil in Nigeria continue to be significant influences on FDI location choices. The importance of neoclassical factors of production (e.g., land, labor, capital, raw materials) to MNCs' FDI location choices is consistent with the predictions of location theory.

Factors of production can be intrinsic or created. The Silicon Valley area receives large inflows of FDI due in part to the quality of its human capital. The geographically concentrated pool of specialized human capital arose, in part, from the presence of leading edge domestic companies and the entry of foreign companies. Hence, specialized labor in Silicon Valley can be viewed as a created and dynamic factor of production: Created in the sense that high-tech workers developed their knowledge through their experience working at different Silicon Valley firms, dynamic in the sense that the entry of more firms into the area expanded the skill set and enlarged the pool of specialized labor.

The size of a country's economy is another important economic influence on FDI location decisions. Market size can be viewed as an indirect measure of transportation costs, since it reflects the ability of a firm to reach many consumers at a relatively low cost. The attractiveness of large countries is particularly true when an economy is both large in terms of absolute size (GDP), and wealthy in terms of GDP per-capita. Brainard (1997) finds that proximity to customers is an important factor in an MNC's FDI location choices.

Finally, like political risk discussed above, economic risk is also an important influence on FDI location decisions. Countries that have experienced very high rates of inflation or exchange rate shocks may have difficulty attracting FDI. Similarly, other things equal, highly indebted countries and countries with periodic fiscal crises are typically not recipients of large FDI inflows.

Technology and Agglomeration Economies

Studies of the effects of spillovers, external economies or agglomeration economies on FDI location choices date back to Alfred Marshall (1920). Agglomeration economies are benefits that accrue to firms that locate in geographically concentrated areas or "clusters" such as Silicon Valley.

Several types of benefits can arise when firms collocate. First, a geographically concentrated cluster of activity in a particular sector creates a specialized pool of skilled labor which can lower a firm's search and training costs. Second, due to labor mobility and social networks, firms can potentially gain some knowledge about the proprietary technology and processes of their competitors. At the same time, of course, firms also risk losing some of their own proprietary knowledge in this context. Third, specialized suppliers often locate near

clusters, again, lowering firms' costs and giving firms more choice in make-or-buy decisions.

Fourth, when clusters exist, firms and states often make significant investments in infrastructure development such as building roads, upgrading airports and improving local universities. These features of industrial clusters create an environment where firms can potentially reap benefits larger than their direct costs.

The existence of spillovers and their influence on the location decisions of MNCs has been a controversial topic that has received considerable attention from academic researchers. Since spillovers are nearly impossible to measure, their very existence is controversial. Firms in the same sectors often do tend to locate in clusters. Some researchers take this empirical fact as *prima facie* evidence for the existence of agglomeration economies. However, Head et al (1996) point out that clusters could exist for many reasons that have nothing to do with spillovers. Firms might collocate for economic reasons such as the local presence of factors of production or strategic reasons such as the ability to better monitor competitors. Local governments wanting to attract quality jobs might offer subsidies to firms in particular industries. Thus, the fact that firms do cluster, is not, in itself, evidence of spillovers.

Another controversy in the literature on agglomeration economies is the question of what, if any, effect they have on the production cost of firms, and hence, firms' decisions to collocate. If knowledge spillovers exist, why would a leading-edge firm risk locating close to competitors that could free-ride on its investments in proprietary technology? Similarly, clusters often do eventually result in crowding. After experiencing rapid growth, the Silicon Valley area became such a high-cost location for land and labor that many firms wanting to move there were ultimately priced out of the market. Crowding should eventually increase the production costs of all firms, including early entrants into the cluster.

Spillovers of knowledge have a less straightforward effect on firms' costs in the sense that some firms might gain, and others might lose. By focusing on micro mechanisms such as buyer-supplier relationships between firms, recent research allows us to better understand which firms would benefit from knowledge spillovers. Since firms do tend to collocate, and since proprietary technology is so important to firms, further research in this area will help us better understand the complex links between spillovers, production costs, and FDI location decisions.

Firm Strategy

Strategic factors that influence the location choices of MNCs include the need to locate near important clients or customers, to locate close to key rivals in order to monitor their actions, or to deter the entry of key rivals. For example, service firms such as advertising agencies often locate their foreign operations near important clients.

This literature uncovers some fundamental motives underlying firms' FDI location decisions. First, and perhaps most important, although FDI flows are often discussed in the aggregate by economists and policy makers, it is important to remember that these aggregate flows represent the sum of a great many decisions made by individual MNCs. Since firms are so different from each other, clearly, their own state variables will be very important in determining where they choose to locate. Second, the heterogeneity of firms implies that all the aforementioned characteristics of locations will not be equally attractive to all firms. Advertising agencies probably will not care about the presence of natural resources such as coal, and even manufacturing firms might not care about labor or natural resources if they are trying to decide where to locate an R&D laboratory.

Thus, in focusing on micro mechanisms underlying FDI location choices, recent research on firm strategy has considerable potential to shed light on which location characteristics will be valued by what type of MNC. Moreover, by looking at different kinds of location decisions such as the location of manufacturing plants and the location of R&D, this research should contribute valuable insight into the conditions under which some location characteristics may be more or less important. The recent availability of large new datasets on multinational firms such as the data from the US Department of Commerce, Bureau of Economic Analysis should help advance research in this area.

Empirical Research on FDI Location

Empirical studies of FDI location have typically used one of two general research designs. First, using aggregate data on FDI flows into different countries, researchers have studied the correlation between aggregate FDI flows and many of the location characteristics discussed above. The problem with this type of research design is that FDI locations are chosen by individual firms, and aggregate data do not give us much insight into the micro mechanisms underlying firms' choices.

The second type of research design uses micro data on multinational firms to examine decisions to enter particular markets. Entries are generally observed as discreet data points. For example, an MNC that has operations in Canada and the United Kingdom in 1989, then has operations in Canada, the United Kingdom and France in 1990 has "entered" France. Although entry data give us much more insight into decisions at the firm level, there are two problems with using this type of research design in studies of FDI location. First, with only a few exceptions, publicly available data on MNCs that contain reliable information on entries often do not contain

information on the size of the entry or the purpose of the entry (e.g., production facility, R&D lab, distribution operation, etc.). Second, and perhaps more importantly, most location decisions made by MNCs are incremental. MNCs might choose, for example, to reduce the scope of their existing operations in Canada and double the scale of their existing facilities in India. If the researcher only observes countries in which the MNC has operations, no location change would be noted. However, in this example, there has been a fundamental shift in the locations in which the MNC operates. In the day to day operations of MNCs, the decision to enter a new market is made relatively infrequently. In contrast, MNCs with established subsidiaries in many different markets frequently make decisions about how much to reinvest into their existing foreign operations.

A consequence of the widespread use of entry studies in research on FDI location is that we know very little about how the location characteristics which are correlated with MNCs' entry decisions affect decisions about growing or shrinking existing operations at the margin (see Feinberg and Keane, 2001). From a policy standpoint, most countries are at least as concerned about retaining, growing and upgrading existing FDI as they are concerned about luring new FDI. Therefore, additional research on MNCs' incremental FDI location choices could contribute significantly to FDI policy.

New Location Theory: Random Chance and Time

Recently, researchers applying location theory to international trade and FDI have begun to incorporate important new theoretical developments such as the role of chance and dynamics. Random chance plays a critical role in determining real world patterns of production. For example, Krugman (1991) traces the location of the carpet industry in Dalton, Georgia to

Catherine Evans, who in 1895, by chance, made a tufted bedspread as a wedding gift. The bedspread was regarded as so beautiful that neighbors began demanding tufted items. From that beginning, with the addition of modern technology, the carpet industry grew and became concentrated in Dalton. A general theory of location or trade could not account for the chance events that give rise to global production locations such as carpets in Dalton. Rational planning, rather than historical accident, would be more consistent with the predictions of location or trade theory. The Dalton, Georgia carpet industry example shows how chance events combine with dynamic factors such as new or increased demand, technological and infrastructure development and the entry of new firms to create permanent global production locations. Chance and dynamics are both present in the Dalton example because the bedspread maker could have been born anywhere.

In contrast, agglomeration economies often do not arise by chance, but they do have a dynamic component. For example, the San Francisco Bay Area location of the Silicon Valley tech cluster is much less surprising and random than the Dalton, Georgia carpet location. The Bay Area is home to several of the top research universities in the world and numerous government research laboratories. The state of California has a large and thriving defense industry. Thus, both demand and supply conditions favored the creation of the Silicon Valley technology cluster.

A final new contribution to the literature on location theory, FDI and trade is the literature on hysteresis, or path dependence. Hysteresis occurs when temporary economic shocks such as exchange rate volatility result in permanent transformations in global patterns of production and trade. For example, many Japanese auto and auto parts manufacturers that exported cars to the U.S. endured considerable economic hardship in the 1980s when the U.S.

dollar began to decline. Since there was no certainty as to when the dollar would stop falling, many firms eventually decided to relocate production from Japan to North America. Thus, the global pattern of production and trade was permanently changed as a result of transitory exchange rate shocks (see Baldwin and Krugman, 1989).

The idea that temporary changes in the economic environment can cause permanent changes in global production patterns potentially gives significant discretion to policy makers to use short term policies such as subsidies and tax breaks to attract global production. However, as we discuss below, when the use of such policies is widespread both within countries and internationally, bargaining power tends to shift from states to firms, and billions of dollars in dead-weight economic loss arise every year from competition to redistribute global production.

Policy Applications

In a policy context, researchers have studied the following question: What can policymakers do to enhance the attractiveness of their locations and thus, increase the likelihood multinational firms will decide to choose the particular location? Much of the work in this area evolved from two important areas of research.

First, new trade theory (see Krugman, 1994) introduced economies of scale into theories of international trade. In the extreme, some industries such as airplane manufacture and semiconductor fabrication are so costly to set up that the world might only support a very small number of firms. In such a case, a country could “win” a two-country game in which each country decides whether to subsidize its own firm so that firm is able to lower its cost and take the entire world market for producing a particular good (see Brander and Spencer, 1985). This type of policy is often referred to as “strategic trade policy”. Despite there being no empirical

evidence for the existence of industries with such extreme production structures that only support a single global firm (suitable subsidy targets), many billions of dollars are wasted every year by countries and states in subsidy games designed to “win” a larger share of global production. Knowing countries and states are willing to offer payments to lure and keep production gives firms an incentive to threaten to move. In many cases, these threats lead to bidding wars that reduce firms’ costs at the expense of countries and states.

Second, the publication of Michael Porter’s Competitive Advantage of Nations (1998) also directly considered a positive role for governments in making locations more attractive. Unlike proponents of strategic trade policy, Porter advocated broader types of policy actions to enhance the attractiveness of a location. These actions include increased spending on education and R&D, government spending on infrastructure, institutional development, etc. This goal of these policies would be to create Silicon-Valley-like clusters by improving the quality of domestic factors of production such as labor and capital. Since high quality factors of production can be deployed across many different sectors, there is much less waste involved in policies that improve factor quality than in policies that merely seek to redistribute the location of existing economic activity.

Location theory addresses the important questions who produces what goods or services in which locations, and why. Ideas from location theory have been widely used in international economics, in particular, to predict which countries will specialize in the production of certain goods for export, and which countries MNCs will choose as production locations. In early location models, factors of production were given rather than created, and technologies for producing particular goods were unalterable. Clearly, modern applications of location theory to trade, FDI and international economic policy have considerably expanded the scope of these

location models. However, fundamental insights from the earliest theories of location such as the importance of factors of production, trade and transport costs remain powerful explanations for the location of global production today.

Further Reading

Baldwin, Richard, and Paul Krugman. 1989. "Persistent Trade Effects of Large Exchange Rate Shocks." *Quarterly Journal of Economics* 104(4): 635-54. Examines the issue of hysteresis and trade: The notion that permanent changes in the location of production and trade can result from transitory economic shocks.

Brainard, S. Lael. 1997. "An Empirical Assessment of the Proximity-Concentration Trade-off between Multinational Sales and Trade." *American Economic Review* 87(4): 520-44. Finds evidence that proximity to consumers is an important consideration for the location decisions of multinational firms.

Brander, James A., and Barbara J. Spencer. 1985. "Export Subsidies and International Market Share Rivalry." *Journal of International Economics* 18(1-2): 83-100. One of many fundamental papers that Brander and Spencer have done relating to strategic trade theory; Provides a theoretical background for policy-related papers on strategic trade theory.

Feinberg, Susan and Michael Keane. 2001. "U.S.-Canada Trade Liberalization and MNC Production Location." *The Review of Economics and Statistics* 83(1): 118-32. In this and several other papers, Feinberg and Keane examine incremental location decisions of multinational firms, as opposed to entry decisions.

Head, Keith, John Ries, and Deborah Swenson. 1995. "Agglomeration Benefits and Location Choice: Evidence from Japanese Manufacturing Investments in the United States." *Journal of International Economics* 38(3-4): 223-47. Examines whether clustering is

caused by spillovers or other unobservable country and industry characteristics such as factor endowments.

Isard, Walter, and Merton J. Peck. 1954. "Location Theory and International and Interregional Trade Theory." *Quarterly Journal of Economics* 68(1): 97–114. A fundamental paper on location theory.

Krugman, Paul R. 1994. Rethinking International Trade. Cambridge, MA: MIT Press.

An introduction to New Trade Theory, the intersection of Industrial Organization economics and Neo-classical trade.

Krugman, Paul R. 1993. "On the Relationship between Trade Theory and Location Theory." *Review of International Economics* 1(2): 110-22. Compares and contrasts location theory and trade theory, finding that despite some differences, the theories ask similar questions and make similar assumptions.

Krugman, Paul R. 1991. *Geography and Trade*. Cambridge, MA: MIT Press. Provides examples of random chance impacting location decisions.

Leamer, Edward E. 1984. *Sources of International Comparative Advantage: Theory and Evidence*. Cambridge, MA: MIT Press. An in-depth and extensive examination of how to test the predictions of neoclassical trade theory. Uses a structural estimation to test the predictions of trade theory using an extensive cross-country data set containing detailed information on factor endowments, production and trade.

OECD. 2006. *International Investment Perspectives*. OECD: Paris. Source of information on the world-wide trend toward liberalization of FDI policies.

Porter, Michael E. 1998. *The Competitive Advantage of Nations*. New York: Free Press. Combines industrial organization, international trade and economic geography to

investigate why some countries are systematically more competitive at producing particular goods and services.

Smarzynska Javorcik, Beata, and Mariana Spatareanu. 2005. "Do Foreign Investors Care About Labour Market Regulations?" CEPR Discussion Papers 4839, Centre for Economic Policy Research. This article, and other research by Javorcik, examines many different features of countries' economic and policy environments and their relation to the location of FDI.

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