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# Judging Japan's FDI: The verdict from a dartboard model

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**Head, Keith, and Ries, John**—Judging Japan's FDI: The verdict from a dartboard model

We evaluate Japan's inward and outward FDI performance using theoretical benchmarks based on the premise that management teams headquartered around the world bid for the production facilities located in each country. Our model incorporates the assumption that bids are inversely proportionate to distance. It accurately predicts the multilateral shares of FDI stocks for most important countries. The theory predicts lower shares of FDI for Japan than its share of the world economy. Japan's actual share of outward FDI exceeds its inward share—as the model predicts—but both currently lie below the benchmark predictions. *J. Japanese Int. Economies* **19** (2) (2005) 215–232. Sauder School of Business, University of British Columbia.

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## 1. Introduction

During the 1980s, Japanese multinationals became some of the world's most prominent outward investors. However, Japan—the world's second largest economy—continued to

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host only meagre amounts of foreign direct investment (FDI). Was Japan an overachiever for outward FDI and an underachiever for inward FDI?

With regard to FDI, Japan is recognized as a large source country but has been under pressure to increase its inward FDI based on the premise that it is too low. The Japanese government has responded to this pressure and expended considerable resources to increase FDI into Japan. Two examples of such efforts are the Japanese External Trade Organization (<http://www.investjapan.org>) that provides information on opportunities to potential investors and new legislation facilitating the acquisition of Japanese firms.

An assessment of whether a country makes “too many” or “too few” international transactions requires a benchmark of cross-border activity derived from sound theory. This paper uses a simple model of FDI to generate predictions of a country’s share of world FDI based on the size of its economy and its size-weighted proximity to potential host and source countries. We use the analogy of darts as management teams targeting production units, whose international distribution corresponds to areas on a dartboard. After compiling a data set covering 181 countries from 1980–2002, we use the dartboard model to construct benchmark predictions for FDI. This allows us to assess how well actual FDI patterns conform to the model and examine how Japan’s FDI performance relative to the benchmark has evolved over time.

Studies of Japan’s trade pattern illustrate the value of judging performance through the lens of a theoretical benchmark. For Japanese imports, some have argued that the Japanese market is effectively closed because its ratio of manufacturing imports to GDP is lower than other industrialized countries. However, this conclusion has not held up once theory is applied. [Saxonhouse \(1993\)](#) estimates a theoretical model that refutes this contention by showing that Japan’s distinctive trade structure can be explained by its pattern of factor endowments. More recently, [Harrigan and Vanjani \(2003\)](#) uses a gravity model to show that Japan’s “normalized” (for market size) imports from the United States are higher than US imports from Japan. [Head et al. \(2004\)](#) apply a model incorporating the relationship-specific investment of input suppliers to US auto parts trade and find Japan imports about what the model predicts.

Critics point to Japan’s low level of inward FDI relative to GDP as evidence of too little investment in Japan (see [Fukao and Amano, 2003](#)). Other’s have used a gravity model of FDI to establish this position. [Eaton and Tamura \(1994\)](#) find that Japan is more open to US exports, but less open to FDI than most countries in Western Europe. [Eaton and Tamura \(1996\)](#) confirm this finding using a gravity-type specification generated from a model of technological adoption via either exports or FDI.

This paper contributes to the literature by employing a theoretical benchmark for multi-lateral FDI levels to evaluate Japan’s FDI performance. The next section discusses existing models of FDI and identifies their limitations for assessing FDI performance in an international perspective. Section 3 describes our model that posits FDI as an outcome of management teams making bids on production units. Section 4 details the data we use and explains why a model of acquisitions is appropriate for modelling FDI. Section 5 evaluates Japan’s inward and outward FDI position relative to the theoretical predictions at different points in time. The final section summarizes the results and addresses policy implications.

## 2. Existing models of FDI

Until 1984, the academic study of FDI consisted mainly of verbal frameworks constructed by management professors. Helpman (1984) and Markusen (1984) launched the modern formal economics literature on FDI. Helpman (1984) viewed FDI through the lens of factor proportions theory and emphasized the separation of the firm into two activities, one appropriate for skill-abundant countries and the other best carried out in skill-scarce countries. Markusen (1984) modelled FDI as a way that firms could achieve multi-plant economies while avoiding trade costs. In the literature that followed, the Helpman (1984) and Markusen (1984) approaches came to be known as *vertical* and *horizontal* FDI. In his monograph summarizing the FDI literature of the last decade, Markusen (2002, p. 5) defines vertical FDI as investments that “geographically fragment the production process by stages of production” and horizontal FDI as “foreign production of products and services roughly similar to those that the firm produces for its own market.”

Markusen (2002) also develops and promotes his “knowledge–capital” model that integrates both vertical and horizontal motives for FDI. Since there is abundant anecdotal evidence of both motives in practice, the knowledge–capital model seems eminently sensible. But the realism associated with considering both motives in a general equilibrium setting with oligopoly and free entry comes at a considerable cost. The knowledge–capital model comprises over 40 equations in which there are inequalities with associated non-negative variables (chiefly, the numbers of various types of firms). It can only be solved numerically using Rutherford’s mixed complementarity problem solving program, GAMS. Eaton and Tamura (1996) also must use simulations to generate predictions about the level of FDI in their two-country, general equilibrium model of FDI.

Both the knowledge–capital model and the Eaton–Tamura model consider only two countries. The world has 100 times as many. This leads to two problems. First, do the two-country predictions extend to the  $N$  country case? Second, even if they do extend, while they could be useful for predicting patterns for a particular source country relative to different host countries, can they be used, for example, to determine what Japan’s overall FDI levels should be relative to the United States? To identify a concrete issue regarding extension to higher dimensions, the knowledge–capital model predicts that horizontal FDI will be high when the two countries have similar factor endowments. This makes sense in the case of, say, Canada and the United States. However, one presumably does not see high horizontal FDI in the case of less developed countries with similar factor endowments.

Markusen’s theory focuses on a firm that deploys the same “blueprints” (designs for products and processes) at multiple production sites. The approach does not explicitly consider multinationals that expand by acquiring existing firms with their own established blueprints. The data (described in Section 4) suggest that the majority of FDI in the world takes the form of acquisitions.

## 3. The dartboard model of FDI

Here we provide an abbreviated and simplified description of a model that is fully developed in Head and Ries (2004). It generates predictions for each country’s share of world

FDI based on its economic size and location. The model explicitly considers the acquisition decision, and we also allow for an arbitrary number of different sized countries.

The model takes its inspiration from the notion in corporate finance of the *market for corporate control*, described by Jensen and Ruback (1983) as an “arena in which managerial teams compete for the rights to manage corporate resources.” The name “dartboard” derives from the Ellison and Glaeser (1997) approach to quantifying geographic concentration of industries. In our case, darts correspond to investors whereas areas on the dartboard correspond to the assets available in each country.

The basic idea of our model is as follows. Management teams search for acquisition opportunities throughout the world (at home and abroad). The amount of outward FDI for a country depends on the number of foreign acquisitions done by home management teams. FDI will be a function of the number of management teams, the amount of potential foreign acquisitions, and the likelihood that home management teams bid successfully on a foreign acquisition target. The model specifies each of these three elements for each country.

The intuition underlying the model is conveyed by Fig. 1. Management teams are represented as darts whereas the number of acquisition targets by areas on a map. Larger countries have more management teams (darts) and larger countries have more potential acquisitions (area on the map). The figure depicts both the number of darts and the areas on the dartboard as proportional to the sizes of these economies in 2002. The probability of acquiring an asset in a given country is reflected by the likelihood that a dart thrown at the map will land within that country. Two basic ideas are demonstrated here. First, large countries will do more FDI because they have more management teams. Second, large countries will have more inward FDI because they host more acquisition targets. A more

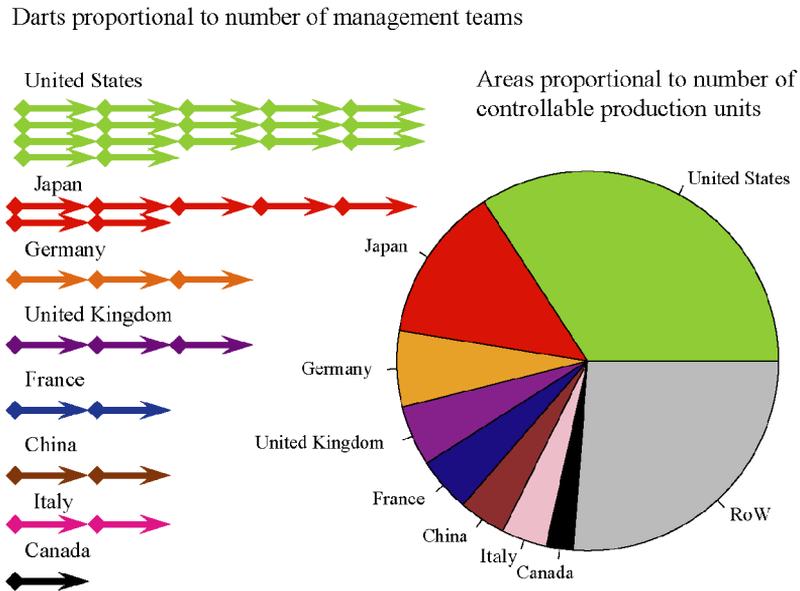


Fig. 1. The dartboard metaphor.

subtle idea is also portrayed in the figure—large countries will have a high proportion of their darts land within their country owing to their large size. These domestic acquisitions will not be counted as FDI. As we will see formally later, the implication is that small economies have FDI levels that are large relative to the size of their economies.

Each country  $i$  has  $M_i$  management teams that bid to control production units. There are  $M_w = \sum_i M_i$  management teams worldwide. Management teams from a given source country  $i$  have a collective probability that they will gain control of a given production unit in  $j$  denoted as  $\pi_{ij}$ . Defining  $K_j$  as the value of production units in country  $j$ , we can express source country  $i$ 's FDI stock in host country  $j$ ,  $F_{ij}$ , as

$$F_{ij} = \pi_{ij} K_j. \quad (1)$$

In the following subsections, we show two different ways of specifying  $\pi_{ij}$ .

### 3.1. The neutral dartboard

In the simplest version of the model, each bidding management team is symmetric and has an equal probability of winning equal to  $1/M_w$ . Summing across teams, the collective probability of any team from country  $i$  winning a particular unit in country  $j$  is  $\pi_{ij} = M_i/M_w$ . Substitution yields a simple equation for bilateral FDI:

$$F_{ij} = \frac{M_i K_j}{M_w}. \quad (2)$$

Summing over all *foreign* destination countries  $j$  we obtain an equation for outward investment of country  $i$ :

$$F_{iw} = \sum_{j \neq i} F_{ij} = \frac{M_i}{M_w} \sum_{j \neq i} K_j = \frac{M_i}{M_w} (K_w - K_i) = \frac{M_i}{M_w} K_w \left(1 - \frac{K_i}{K_w}\right). \quad (3)$$

A destination country's aggregate inward FDI can be obtained by summing over all *foreign* ( $i \neq j$ ) source countries:

$$F_{wj} = \sum_{i \neq j} F_{ij} = \frac{K_j}{M_w} \sum_{i \neq j} M_i = \frac{K_j}{M_w} (M_w - M_j) = K_j \left(1 - \frac{M_j}{M_w}\right). \quad (4)$$

Worldwide direct investment stocks equal the sum of either inward or outward stocks.

$$F_{ww} = \sum_i F_{iw} = \sum_j F_{wj} = K_w \left(1 - \sum_j \frac{M_j K_j}{M_w K_w}\right). \quad (5)$$

We now introduce lower case notation to denote country-level variables expressed as shares of their worldwide values. Thus, let country  $i$ 's share of management teams be  $m_i = M_i/M_w$  and country  $j$ 's share of available production units be  $k_j = K_j/K_w$ . FDI shares are denoted  $f_j^I = F_{wj}/F_{ww}$  for inward stocks and  $f_i^O = F_{iw}/F_{ww}$  for outward stocks. Using this notation we show the two equations of the dartboard model of FDI:

$$f_i^O = m_i \frac{1 - k_i}{1 - \sum_j m_j k_j}, \quad (6)$$

$$f_j^I = k_j \frac{1 - m_j}{1 - \sum_i m_i k_i}. \quad (7)$$

These equations offer predictions for a country's inward and outward FDI as a function of production units and management teams.

A key question for the empirical estimation is how to obtain measures of these two determinants. In Head and Ries (2004), we experimented with using estimates of national capital stocks as  $K_i$ . However, many countries do not have capital stock data and it is not available in the Penn World Tables after 1992. We extended existing series using World Development Indicators data on capital formation and an assumed depreciation rate. However, we found that shares of capital obtained in this manner were very highly correlated with other measures of economic size that were available for large sets of countries.

In Head and Ries (2004), we considered measuring management teams,  $M_i$ , as proportional to workers with post-secondary degrees and a human capital measure constructed from Mincer regression returns to education. As with estimated capital stocks, these measures suffer from coverage issues—the data are not available for all countries over a long time horizon. Moreover, they generate problematic results. China and India have very large levels of workers with post-secondary degrees relative to their economic size. In the context of our model, this implies that they have a large number of management teams and would do a large amount of outward FDI, an outcome that is inconsistent with the data.

Lacking attractive measures of  $M_i$  and  $K_i$  for the whole sample we wish to examine, we consider instead a simplifying assumption that both management teams and production units are distributed internationally in proportion to the overall size of the economy, denoted  $S_i$ . This symmetry assumption greatly simplifies the algebra. After substituting economy size shares, denoted  $s_i = S_i/S_w$ , for  $m_i$  and  $k_i$ , the benchmark for both inward and outward FDI stocks becomes

$$f_i^O = f_j^I = s_i \frac{1 - s_i}{1 - H}, \quad (8)$$

where  $H = \sum_j s_j^2$  is the Herfindahl concentration index for the worldwide distribution of economic activity.

The formula reveals that a country's share of world FDI is not simply equal to its share of the world economy,  $s_i$ . When other studies compare FDI performance across countries based on FDI to GDP ratios, they implicitly are assuming that FDI should be proportional to economy size, implying FDI shares equal to GDP shares. Our derivation shows that there needs to an adjustment for country size. Because it is available for almost all countries through 2002 and probably among the most consistently measured aggregates, we use Gross National Income (GNI) as our measure of economy size,  $S_i$ , in the empirical implementation. We find that  $H$  is 0.10 in 1980 and gradually rises to 0.14 by 2002.<sup>1</sup> Thus, for countries such as the United States with  $s = 0.33 > H = 0.14$ , FDI shares are predicted to be less than income shares. Indeed, in 2002 the US benchmark is  $0.26 < 0.33$ . Its actual shares of inward and outward FDI stocks are even lower: 0.19 and 0.22, respectively. Since

<sup>1</sup> Note that the corresponding number of equal-sized countries,  $1/H$ , therefore declines from 10 to 7 over this period.

all countries except the US have  $s < H$  in 2002, they should have higher FDI shares than GNI shares.

Coincidentally in 2002 Japan's GNI share of 0.13 lies just under  $H$ . Thus, our neutral benchmark predicts that for Japan only the FDI share should be roughly equal to the income share. As we will show, Japan's outward and especially its inward FDI shares (0.048 and 0.008 respectively) are considerably lower than its GNI shares. There are many possible explanations. Our paper focuses on an explanation based on Japan's geography. As noted by Deardorff (2005), "Japan is farther from its nearest developed-country trading partner than any other developed country." Furthermore, Japan has a small area relative to the size of its economy. In the next section we show that the dartboard model can be modified to take into account the influence of geography.

### 3.2. The gravitational dartboard

The model has so far deliberately excluded all sorts of frictions that influence the pattern of FDI. This simplification yields a remarkably compact expression for FDI stocks. However there are good reasons to believe that teams will be more likely to obtain control of production units if they are relatively nearby. This is because the prospective bidder recognizes the high costs of monitoring production units that are long distances away from the management team's head office. Without adequate monitoring, there would be high agency costs. Management teams should anticipate these costs and reduce their bids for faraway units accordingly. Referring back to Fig. 1, the intuition is that darts of a given color are attracted to areas of the same color. Thus, most darts will land in or near to the source country.

Head and Ries (2004) show that if bids are inversely proportionate to distance, then discrete choice theory can be used to predict

$$\pi_{ij} = \frac{s_i/d_{ij}}{\sum_{\ell} s_{\ell}/d_{\ell j}}, \quad (9)$$

where  $\ell$  indexes the countries (including  $j$ ) from which  $j$  consumers purchase goods.<sup>2</sup> The specification shows that the probability that management teams in country  $i$ 's will make an acquisition in country  $j$  depends on its size (number of management teams) discounted by the distance between  $i$  and  $j$  relative to the distance adjusted size of all other potential suitors. Thus, not only does size play a role, but so does a country's geographic location relative to all other countries.

Now we can express bilateral FDI from source country  $j$  to host country  $i$  as

$$F_{ij} = \pi_{ij} S_j = \pi_{ij} s_j S_w = \frac{s_i s_j S_w}{d_{ij} B_j},$$

where  $B_j \equiv \sum_{\ell} s_{\ell}/d_{\ell j}$ .

<sup>2</sup> Head and Ries (2004) derive a more general specification where distance is raised to the power  $\theta$ . Searching across all  $\theta$ s between  $-1$  and  $2$ , we found that  $\theta \approx 1$  fits the data best. Here we simplify the notation by assuming  $\theta = 1$ .

Algebraic manipulation yields cost  $i$ 's share of world inward FDI stock is

$$f_i^I = \frac{F_{wi}}{F_{ww}} = \frac{s_i(1 - \pi_{ii})}{1 - \tilde{H}},$$

where  $\tilde{H} \equiv \sum_j s_j \pi_{jj}$ . Note that if distance effects were very small, then  $\pi_{jj} \approx s_j$  and  $\tilde{H} \approx H \equiv \sum_j s_j^2$ . Home  $i$ 's share of world outward FDI stock

$$f_i^O = \frac{F_{iw}}{F_{ww}} = \frac{s_i(A_i - \pi_{ii})}{1 - \tilde{H}},$$

where  $A_i \equiv \sum_j s_j / (B_j d_{ij})$ .

Note that the expressions for shares of inward and outward investment cease to be symmetric unless  $A_i$  happens to be one. Outward shares exceed inward shares when  $A_i > 1$  and vice versa for  $A_i < 1$ . We can think of  $A_i$  as country  $i$ 's "geographic advantage" as a source for outward investment.  $A_i$  tends towards one when distance costs are very small. We will observe later that  $A$  is considerably larger than one for Japan and thus it is predicted to have larger outward FDI shares than inward shares.

#### 4. Data

The model requires data on foreign direct investment, economy size, and distance between and within countries. As described below, we collect data for various sources to obtain a panel data set for 181 countries from 1980–2002. Missing data and changes in the number of countries cause the actual sample size to vary across years.

##### 4.1. FDI data

FDI occurs when investors in one country establish or acquire a significant portion of the assets in an enterprise in another country. In principle "significant" means enough to gain an active voice in the management of the enterprise. In practice, the IMF defines "significant" as more than 10%. Thus, FDI involves cross-border ownership and some degree of control.

We obtain data on FDI flows and stocks from United Nations Conference on Trade and Development (UNCTAD). Aggregate inward and outward FDI data are available at <http://www.unctad.org/fdistatistics>. The site does not provide bilateral FDI data.

Flows of FDI are defined as capital provided by a foreign direct investor to an enterprise resident in another economy. It comprises three components: equity, retained earnings, and loans. Equity and retained earnings depend on the equity stake of the foreign parent whereas loans measure the indebtedness of affiliates to the parent. The flows of these components are reported in *Balance of Payments* compiled by the IMF. Since by definition FDI is capital provided by foreign direct investors, it excludes changes in the equity position of a parent in its foreign affiliates that are not financed by the parent. However, the accounts do record changes in retained earnings. Although, no cross-border capital flow actually occurs, the accounts assume that earnings are repatriated (a payment for financial services) and then sent back to the affiliate (an increase in direct investment).

FDI stocks reported by UNCTAD originate from a variety of sources. If possible, the data come from national sources. In the case of Canada and Japan, the stocks reflect cumulative balance of payments transactions adjusted for exchange rate changes and re-classification as reported in the International Monetary Fund's *International Investment Position*. When data cannot be obtained from national sources, UNCTAD uses data in *Balance of Payments* or *International Investment Position*. The time series on outward stock is influenced by changes in the source of the data. For example, Japan's outward FDI stock reported in the 2003 *World Investment Report* is based on IMF data for 1980–1996 and national sources from 1996–2002. Inconsistencies in the time series data can also arise when the IMF revises how it defines and reports information on direct investment.

UNCTAD also supplies data on cross-border acquisitions of equity stakes that exceed 10% where the value corresponds to total transaction amount at the time of closure of the deal. These numbers are based on original data supplied by Thompson Financial Securities Data Company. [United Nations Conference on Trade and Development \(2000, p. 104\)](#) discusses four reasons why this merger and acquisition (M&A) transaction data is not a subset of bilateral FDI flows.<sup>3</sup> First, they include funds raised domestically and internationally (FDI includes only the amounts provided by the foreign investor). Second, the M&A data reflect gross investment and do not deduct any disinvestment. Third, the UNCTAD data record M&A capital as being paid out in a single year even though this is not necessarily the case. Fourth, M&A includes any acquisitions involving firms whose owners' nationalities differ regardless of the residence of the target and acquiring firm (whereas FDI requires that a direct investor provide capital to an enterprise resident in another economy).

[Figure 2](#) is a Venn diagram portraying the sources of overlap and differences between FDI and M&A data.<sup>4</sup> Both include equity purchases of foreign-resident entities financed by the parent company. Investment activities subsequent to the initial purchase as well as greenfield investments are reflected in FDI data but not M&A data. On the other hand, M&A data include any third-party financing of the acquisition and acquisitions of domestic-resident, foreign-owned entities.

For our present analysis, we focus on FDI stocks rather than M&As for two reasons. First, M&A and FDI flow data are highly correlated, but FDI data are available for a longer period (starting in 1980 as opposed to 1988 for M&As) and larger set of countries. Second, as mentioned before, M&A data record aggregate purchases and do not track divestitures or other equity changes. We focus on stocks because our model makes predictions on the aggregate amount of foreign assets controlled by firms. We note that a more general interpretation of our model could apply to greenfield (new plant) investment. Instead of thinking about the acquisition of companies, consider investors to be bidding for plots of land to build greenfield investments. As long as there are assets that are not supplied with a perfectly elastic supply curve, the FDI decision may be modelled as a bidding competition between different investors and thereby would be consistent with our model.

[Figures 3–6](#) display M&A and FDI flows from 1988–2002 for four regions: EU, US, Canada, and Japan. Each figure contains four lines that should be compared as pairs: out-

<sup>3</sup> [International Monetary Fund \(2003, p. 32\)](#) also discusses the significant differences between the two data sets.

<sup>4</sup> Venn diagrams portray the common and distinct elements between two sets of information.

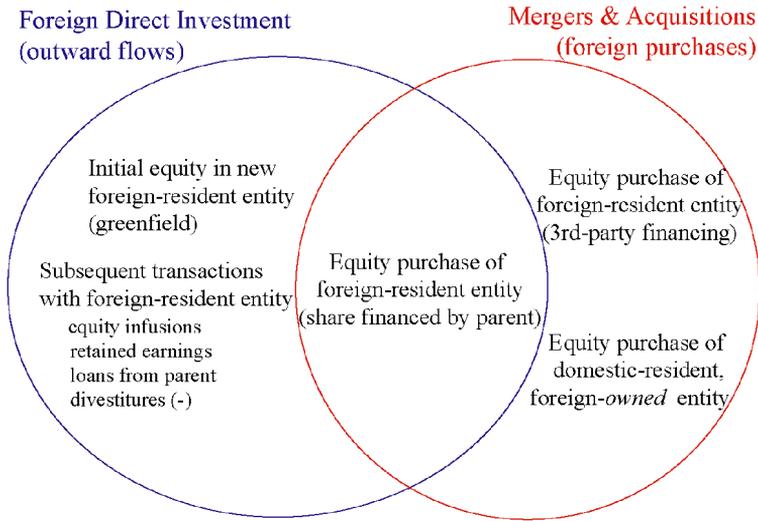


Fig. 2. Overlapping definitions of FDI and cross-border M&A.

ward FDI flow with foreign M&A purchases and inward FDI flow with foreign M&A sales. Clearly FDI and M&A are closely related. For the EU, US, and Canada, not only are M&A and FDI close in levels, they “bounce around” in a similar pattern. The relationship is poorer in the case of Japan. Japan’s outward investment is much lower than its inward investment (note the data are plotted on a log scale) and M&As appear to be less closely correlated with FDI. In two years, 1989 and 1990, inward investment into Japan is negative and cannot be plotted on a log scale.

The relationship between the data is summarized in Table 1. The first two columns pertain to inward FDI and M&A sales (sales of domestic firms to foreigners) and the last two to outward FDI and M&A purchases (by domestic firms). The correlations are based on the 1988–2002 period whereas the ratios are the ratio of aggregate 1988–2002 M&A transactions to aggregate 1988–2002 FDI flows. The table reveals that M&As appear to account for most of the FDI activity in the EU, US and Canada—the correlations and ratios are high. For Japan, M&A accounts for much of inward FDI but has a less tight relationship to outward FDI, suggesting greenfield (new plant) investment plays an important role in outward FDI for Japan in the 1988–2002 period.

Table 1  
M&A transactions and FDI flows: Correlations and ratios for 1988–2002

	M&A sales: Inward FDI		M&A purchases: Outward FDI	
	correlation	ratio	correlation	ratio
EU	0.97	0.70	0.98	0.69
US	0.97	1.02	0.84	0.75
Canada	0.97	1.04	0.92	0.90
Japan	0.85	1.34	0.66	0.29

Note: Ratios sum 15 years of transactions in numerator (M&A) and denominator (FDI).

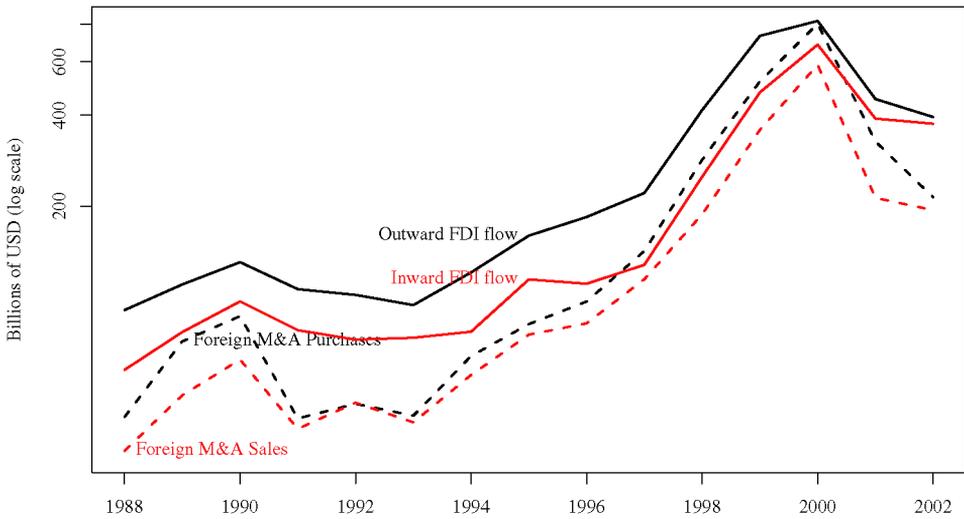


Fig. 3. FDI and M&A, European Union.

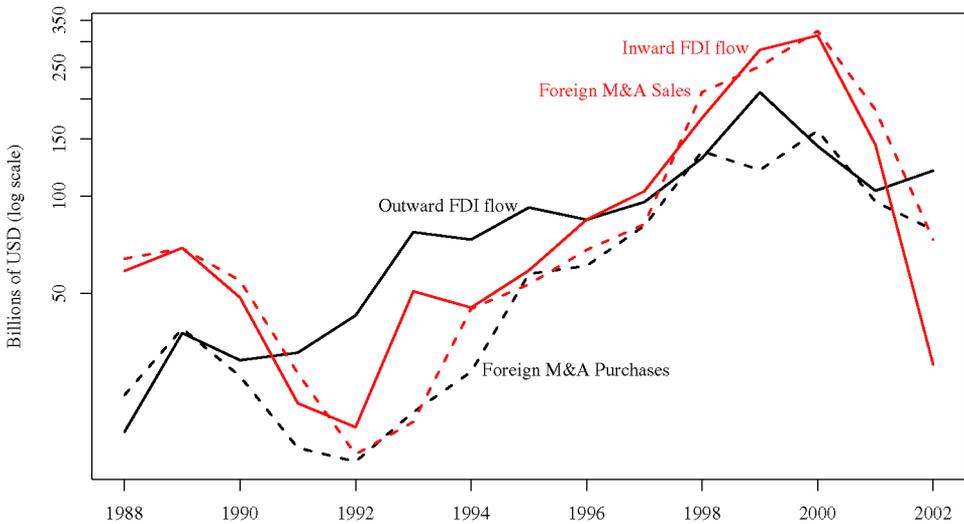


Fig. 4. FDI and M&A, United States.

Japan has been viewed as country being hostile to corporate takeovers. Two impediments to FDI underlie low foreign acquisitions in Japan. First, there is substantial cross-shareholding in Japan that prevents firms from acquiring majority stakes in Japanese enterprises. A famous case in point is T. Boone Pickens' attempt to have a management voice in Koito Manufacturing in 1989. Despite having a 20% stake in the Japanese company, he was thwarted in his attempt to gain a seat on the Board of Directors by large Japanese corporate shareholders. [Morck and Nakamura \(2003\)](#) describe the history of corporate control

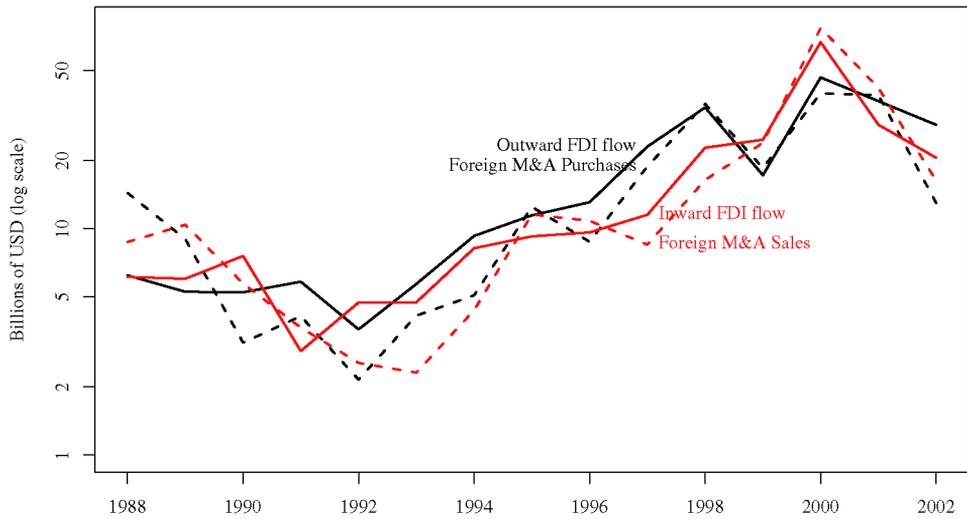


Fig. 5. FDI and M&A, Canada.

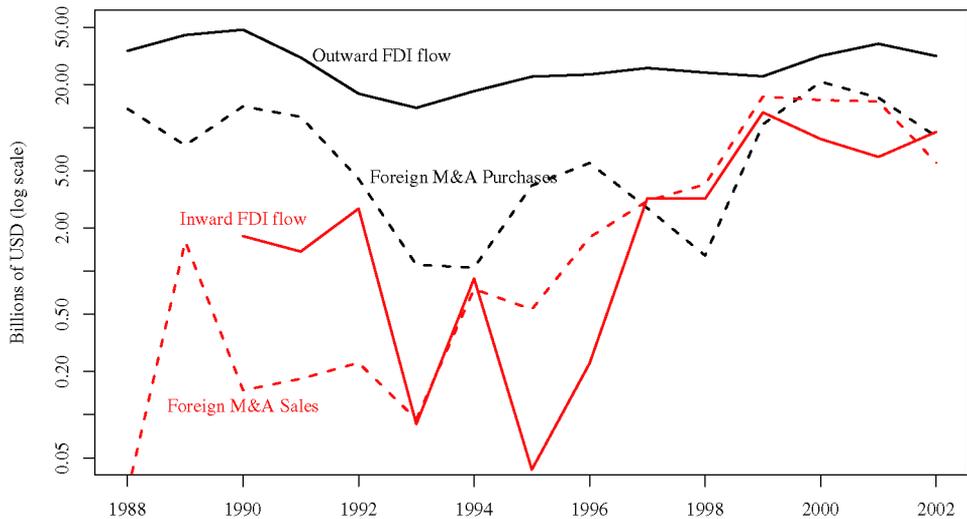


Fig. 6. FDI and M&A, Japan.

in Japan and explain how small blocks of shares held by *keiretsu* firms summed to majority stakes that effectively blocked hostile takeovers in Japan. In addition to cross-shareholding, a second impediment to acquisitions is a difficult administrative and legal environment for acquiring firms in Japan.

However, Fig. 6 reveals that M&A sales increased rapidly in Japan in the latter half of the 1990s. This may be attributed to efforts by the Japanese government to ease obstacles to acquisitions and other efforts to promote inward FDI. The Japanese Investment Council

was created in 1994 and is chaired by the Prime Minister and membership includes the Ministers of all the important ministries. A Council initiative to improve the M&A environment has led to changes in administrative and legal procedures aimed at providing additional means through which to acquire Japanese companies. Examples include the introduction of share-for-share exchanges (*kabushiki kokan*) and share switches (*kabushiki iten*) in 1999. Large foreign takeovers include Ripplewood Holdings purchase of the failed Long Term Credit Bank of Japan, Wal-Mart's stake in Seiyu Ltd. that now stands at 38%, and Roche's acquisition of Chugai Pharmaceuticals.

Figure 7 shows country shares of world outward FDI relative to shares of world inward FDI on a log scale using 2002 stocks. The 45-degree line represents the two shares being equal. The figure reveals that many countries have low levels of outward FDI relative to their levels of inward FDI. This is not a ringing endorsement for our symmetric model which predicts the two should be equal (and thus line up along the 45 degree line). It is small, developing countries that tend to have low levels of outward FDI relative to inward FDI. Presumably, they do not possess management teams capable of acquiring foreign production units. Countries with large outward shares *do*, however, tend to have large inward shares. An exception is Japan which has a much higher outward share than inward share. The gravitational benchmark breaks the symmetry between outward and inward FDI and as we will see later, predicts larger outward shares than inward shares for Japan.

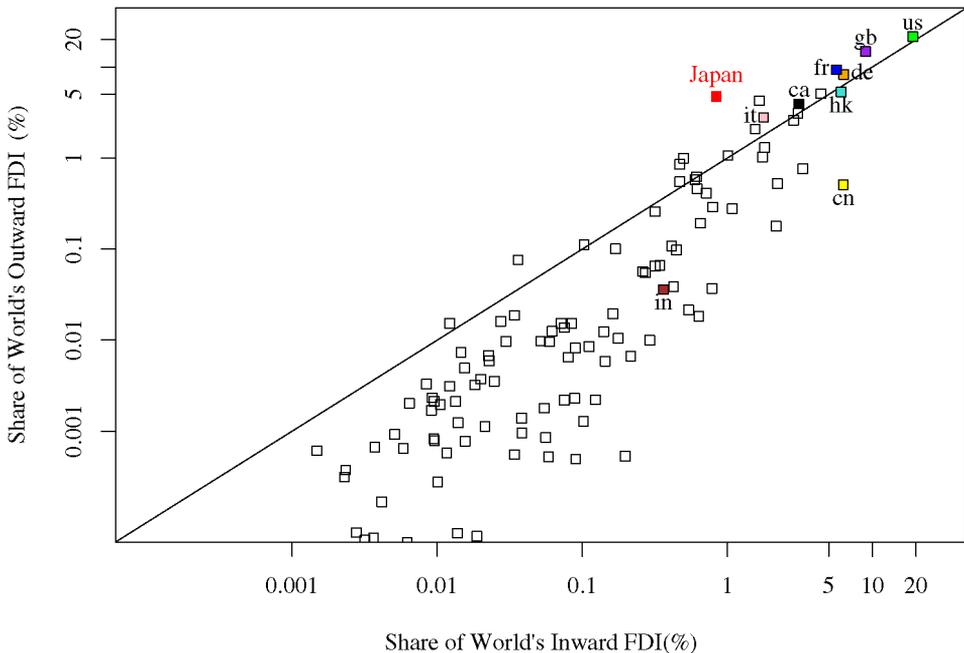


Fig. 7. The relationship between inward and outward FDI in 2002.

4.2. National incomes and distances

We use gross national income (GNI) from the World Bank’s *World Development Indicators* expressed in current US dollars as our measure of economy size  $S_i$  to construct country shares  $s_i$ .

Following standard practice for gravity equations for bilateral trade, we measure distance using the great circle formula applied to the major city (usually the capital) of each country. The measurement of distance within nations poses both conceptual and practical problems. Nevertheless some measure must be employed since it is unreasonable in this context to think of nations as points where each bidder would have zero distance from each target. We use an approximation based on a highly artificial geography: countries are shaped like disks with targets uniformly distributed across the plane. Bidders’ headquarters are assumed to be concentrated in the center. Integration reveals that the average distance from bidder to target equals  $(2/3)\sqrt{A/\pi}$ , where  $A$  represents the area of the country. The international and intranational distances calculated in this manner are all available in an Excel spreadsheet on the CEPII web site <http://www.cepii.fr/anglaisgraph/bdd/distances.htm>.

5. Japan’s FDI stocks in international perspective

The dartboard model makes predictions for each country’s share of world inward and outward FDI. Figures 8 and 9 show the relationship of this benchmark to inward and out-

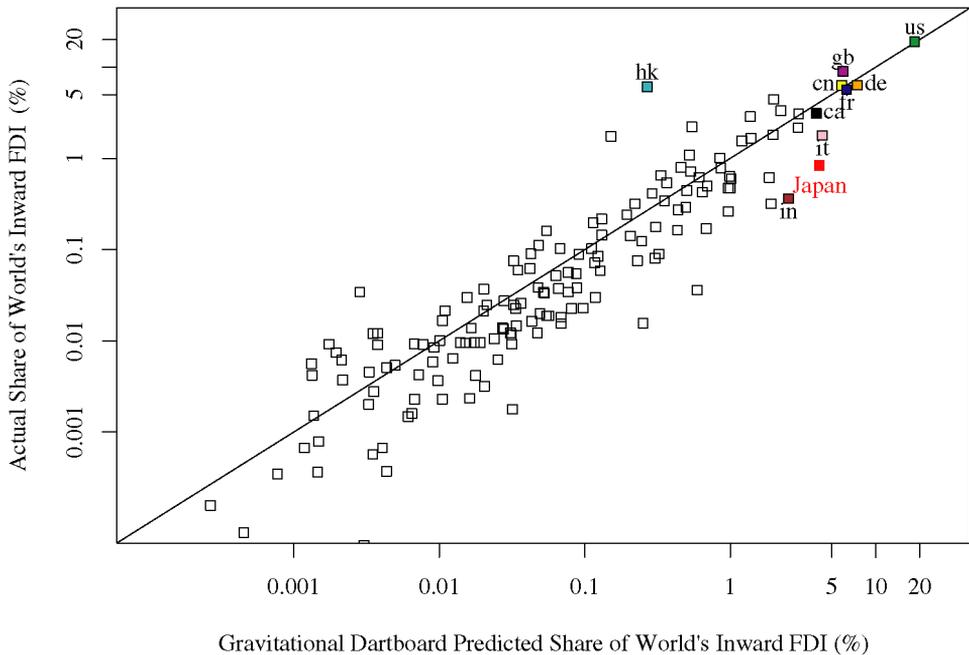


Fig. 8. Inward FDI stocks relative to the benchmark, 2002.

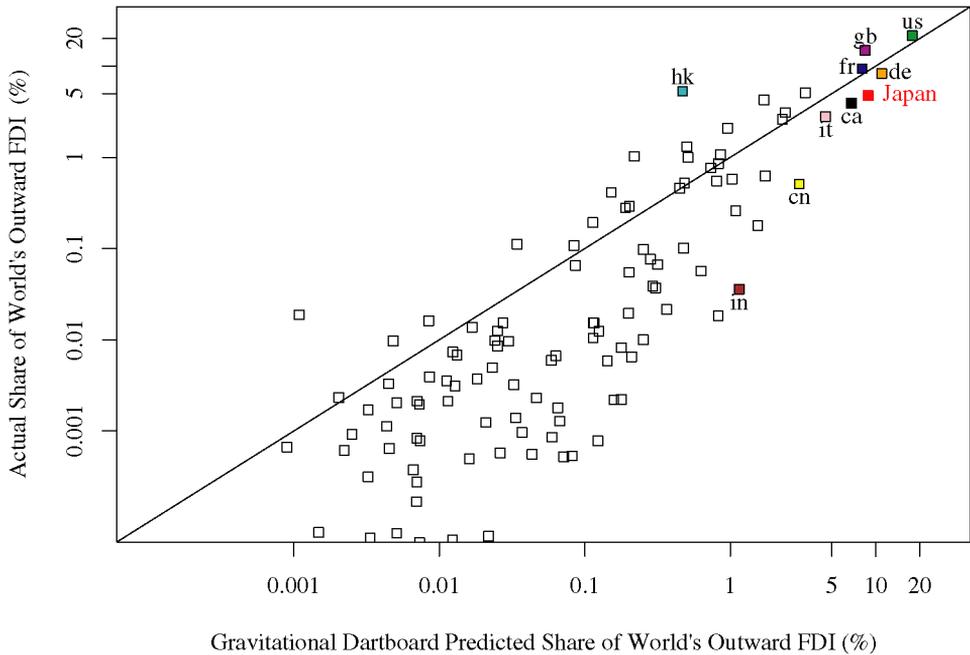


Fig. 9. Outward FDI stocks relative to the benchmark, 2002.

ward FDI shares for the year 2002 based on the gravitational dartboard model predictions. The vertical axis reflects actual FDI shares and the horizontal axis the benchmark with the points corresponding to individual countries. The data are plotted on a log scale. We identify Japan in the figure and a few other countries (using their two-letter ISO abbreviations). If the benchmark predicted actual FDI perfectly, all points would lie on the 45-degree line. Figure 8 contains 153 countries compared to 126 in Fig. 9 because many more countries host FDI than invest abroad.<sup>5</sup>

We observe that the model predicts inward shares much better than outward shares. The problem with the outward share predictions is that poor countries do very little outward FDI, suggesting that using GNI shares as the proxy for shares of management teams might not be a good approximation for these countries. Alternatively, it might be that management teams from poor countries systematically underbid teams from richer countries.

Researchers conventionally compare countries' direct investment performance based on the ratio of FDI to the size of the economy. Using that approach, Japan's outward FDI stock is 8% of its national income. The median (in 2002, for 126 countries with positive outward stocks) is 3%. From that perspective, Japan looks like a good performer. However, its share of world outward FDI is less than 5%, when its neutral benchmark share is 13%. Thus the question to be answered is why Japan does so little outward FDI, rather than why it does

<sup>5</sup> The log scale used in these figures makes it impossible to show countries with zeros.

so much. Part of the answer is its geography. As a densely packed and remote country, our gravitational benchmark leads us to expect a lower share than the neutral benchmark. However, the adjustment for distance only lowers the outward benchmark to 9%. Thus, Japan's low outward FDI is a puzzle, though the gap relative to the benchmark is not as severe as it is for inward FDI.

The benchmark is a good predictor of US (us) and Canadian (ca) FDI stocks and also does well for many European nations. Hong Kong (hk) has more inward and outward FDI than predicted, whereas India (in) under-performs in both cases.

Figure 10 portrays Japan's FDI performance from 1980 to 2002. It shows Japan's actual inward and outward FDI shares as well and the neutral and gravitational dashboard predictions. We see that the outward gravitational benchmark for Japan is considerably higher than the inward gravitational benchmark. Until the late 1990s, Japan's outward FDI share tracks pretty closely to the gravitational benchmark but has fallen short in recent years. Its inward share is below its gravitational benchmark and the two are converging. Thus, while Japan has increased its inward stock of FDI in levels in recent years (see Fig. 6), its share of world inward FDI remains constant and low. We also plot the prediction of the neutral benchmark in the figure and this line (applying to both inward and outward FDI) is above the other benchmarks. It is clear that the gravitational benchmark provides a much better fit to the Japanese actual FDI than does the neutral benchmark.<sup>6</sup> This is because the gravitational model recognizes Japan's remoteness to other economies.

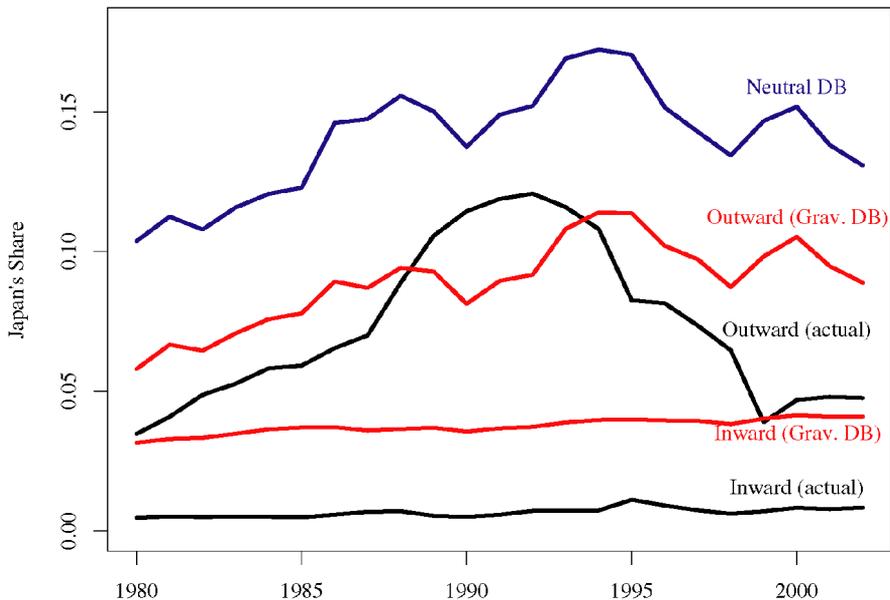


Fig. 10. Japan's inward and outward FDI performance, 2002.

<sup>6</sup> Head and Ries (2004) report evidence establishing that the gravitational benchmark provides a superior fit than the neutral benchmark for the sample of countries as a whole.

## 6. Conclusion

In this paper, we assess Japan's FDI in the context of a model of FDI as an outcome of the market for corporate control. Management teams bid on controllable production units located both at home and abroad and the bid amounts decline with the distance between management and production units. Japan, due to its remote location, has lower shares of world FDI than what would be expected based on its share of world income.

While the model we apply explicitly considers acquisitions, we use it to predict a country's share of FDI. Our investigation of FDI and merger and acquisition data reveals that M&A data accounts for much of FDI over the last 15 years and the two series are very highly correlated. However, FDI's similarity with M&A activity is lower for Japan than the EU, US, and Canada. Even in cases where M&As do not account for a large share of a country's FDI, as is the case for Japan, our model is still appropriate if greenfield investment involves bidding for an asset in fixed supply. This would be the case if management teams bid on highly prized greenfield locations.

A country's FDI performance needs to be evaluated relative to a norm derived from economic theory. Our comparison of multilateral FDI shares to our benchmark for a large number of countries reveals that the gravitation dartboard model fits the data surprisingly well given that it relies solely on data on economy size and geography. The dartboard benchmark corroborates the conventional wisdom that Japan's inward FDI is very low. This is the case even when one takes into account the size and location of Japan's economy. Although Japan's stock of inward FDI has doubled since 1997, its share of world FDI remains under 1%. Recent Japanese efforts to facilitate M&As are probably integral for elevating its inward FDI towards the benchmark value of around 4%. Our findings for Japanese outward investment performance are somewhat surprising, given the many famous multinationals headquartered in Japan. While outward shares surpassed the benchmark from 1989 to 1993, Japan has remained below the benchmark since 1994. Japan's substantial under-performance as a source of outward FDI is a phenomenon that calls out for an explanation.

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