

Chapter 1

Introduction

1. Motivation

The flows of foreign direct investment have been increasing dramatically around the world since the 1970s. However, the level of FDI tends to fluctuate sharply over time - a phenomenon that cannot be explained satisfactorily by traditional theories. The rise in FDI is regarded by traditional theories as being motivated by the differences in the costs of domestic production versus foreign production or the internalization of transaction costs involved in exporting or licensing a product to another country.¹ While traditional theories may explain the FDI level's increase in the long run, they offer little explanation for its substantial short-run movements.

Figure 1-1 shows the FDI inflows and outflows in Japan, the United States, the United Kingdom, and Taiwan over the period between 1990 and 2003.² Panel A-D in the figure demonstrates remarkable short-run swings in the FDI flows. It raises a question whether or not these swings could be the manifestation of corresponding changes in comparative costs or transactions costs. As a matter of fact, it seems that these short-run huge fluctuations in FDI flows are hard to be reconciled with the traditional theory, since, as argued by Blonigen (1997), it is difficult for the traditional theory to explain why FDI can double in one year during a certain period.³

¹ See, for instance, Agarwal (1980) for a survey of the traditional theory.

² Japan, the United States, and the United Kingdom are the main outward FDI countries in the world, while the United States and the United Kingdom are also the main inward FDI countries.

³ See Blonigen (1997), p. 447.

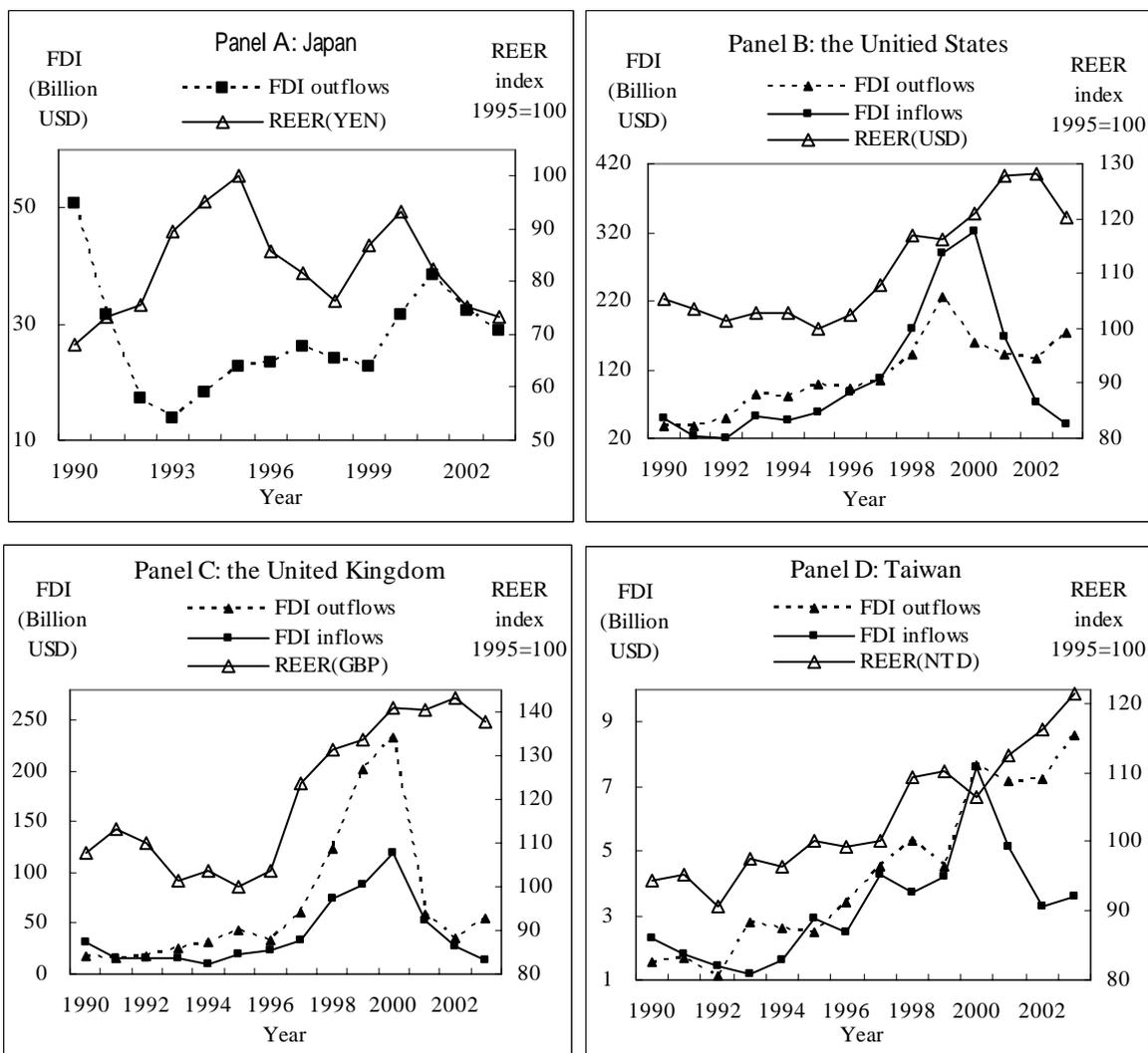


Figure 1-1. The level of real effective exchange rate and FDI: selected countries

Notes:

1. REER: real effective exchange rate; YEN: Japanese yen; USD: the US dollar; GBP: sterling; NTD: New Taiwan dollar. An increase in NTD's REER represents a depreciation of the NTD while an increase of other currencies represents appreciation of the corresponding currencies.
2. Taiwanese outward FDI does not include the post-register investments required by Taiwan's government in 1993, 1997, 1998, and 2002.
3. Source: REER: International Financial System database and Taiwan Economic Journal database; FDI outflows and inflows: OECD International Direct Investment Database (Japan, the United States, and the United Kingdom) and Investment Commission, Ministry of Economic Affairs, Taiwan (Taiwan).

Ever since the breakdown of the Bretton Woods system in 1973, the exchange rates of many countries have been fluctuating considerably over time. The pattern of exchange rate level over the same period in these four countries, shown in Figure 1-1, also exhibits similarly considerable short-run fluctuations. Given the inadequacy of the traditional theories, a lot of work recently has been done in the area of exchange rate movements and FDI. However, whereas many previous studies indicate that exchange rate level and its volatility have had a significant effect on the short-run movements of FDI, the impact is found to be heterogeneous across countries and types of investment, and varies over time. In addition, despite the popular claim that the appreciation of Taiwan's currency has been one of the most important reasons for the drastic rise of Taiwanese outward FDI, the role of the exchange rate has not been considered in recent empirical studies.⁴

Another recent important development in the literature is related to the link between exchange rate and dumping as well as the emergence of antidumping (AD) jumping FDI. Over the past three decades, AD has emerged as the most serious and widespread impediment to trade. Many previous empirical studies suggest that an appreciation of a host currency is positively correlated with AD filings.⁵ Moreover, AD laws have had a significant impact in jumping FDI.⁶ However, there are still many unresolved issues in this area. For instance, there is still no formal model to discuss how exchange rate uncertainty influences dumping occurrences, or how exchange rate volatility affects a firm's willingness of undertaking AD-jumping FDI.⁷

To fill the gap in the literature, this thesis will investigate the following issues

⁴ See, for example, Chen (1992), Chen (1996), Chen and Yang (1999), Henley et al. (1999), and Zhang (2001).

⁵ For example, Leidy (1997), Stallings (1993), Knetter and Prusa (2003), and Irwin (2004).

⁶ For example, Azrak and Wynne (1995), Belderbos (1997), Blonigen and Feenstra (1997), Barrell and Pain (1999), Girma et al. (2002), and Blonigen (2002).

⁷ See Blonigen and Prusa (2001) for a survey.

- Have exchange rates ever played an important role in determining the short-run movements in Taiwan's FDI activity?
- If exchange rates are important in determining FDI flows in Taiwan, are their effects different across various types of investment, as evidenced in many developed countries?
- How does exchange rate uncertainty influence dumping occurrence and AD-jumping FDI? What are the implications of exchange rate movements for trade policy in general and an antidumping policy in particular?

2. Literature Review

2.1 Exchange rate level and FDI

Regarding the link between the exchange rate level and FDI, there are two main streams of literature. One focuses on the impact of exchange movements on international acquisitions of assets (e.g., Froot and Stein (1991) and Blonigen (1997)), and the other focuses on the effect of exchange rate movements on the profitability of foreign production (e.g., Cushman (1985) and Campa (1993)).

In an influential paper, Froot and Stein (1991) develop a model with an imperfect capital market and show that a depreciation of the domestic currency, by systematically lowering the relative wealth of domestic agents, can lead to FDI.⁸ Blonigen (1997) argues that exchange rate movements may affect acquisition FDI because acquisitions involve firm-specific assets that can generate returns in currencies other than that used for purchases. For example, if FDI by a firm is motivated by the acquisition of assets that are transferable within a firm across many

⁸ Capital market imperfection means that MNEs attribute a lower cost to internal financing than the price of capital they would have to pay when using external financing sources. As a result, depreciation of the domestic currency against the home currency increases the relative wealth of foreigners, thus stimulating foreign acquisition.

markets without a currency transaction (e.g., technology and managerial skills), then an appreciation of the foreign currency will lower the price of the asset in terms of foreign currency, but will not necessarily lower the nominal returns. Thus, an appreciation of the home country currency tends to stimulate foreign acquisition.

Regarding the effect of exchange rate movements on the profitability of FDI, Cushman (1985) lays out a very nice model of international investment in that the effects of exchange rate movements on FDI depend on where to buy inputs and manufacture products, where to finance capital acquisitions, and where to sell output. He shows that foreign currency depreciation lowers foreign production costs and thus stimulates FDI.⁹ Empirical evidence in a number of studies reveals that the appreciation of the home currency against the host currency encourages FDI, which is consistent with the prediction of the above-mentioned theories.¹⁰

Using Dixit's (1989b) real options framework, Campa (1993) by contrast shows that if a firm sets up a foreign subsidiary in order to sell a product which is produced in the home country, then the appreciation of the host country's currency generates higher revenue, thus stimulating FDI. Empirical evidence from the wholesale industries in the United States in Campa (1993) and Tomlin (2000) is consistent with this hypothesis.

Some empirical studies find that the directions of the effects of the exchange rate on FDI are different across industries or countries, e.g., Goldberg (1993), Kosteletou and Liargovas (2000), Gorg and Wakelin (2002), Kyrkilis and Pantelidis (2003), and Pain and Van Welsum (2003). Therefore, there is still no consensus on the relationship between exchange rate level and FDI either in theory or empirical studies. For more

⁹ Kohlhagen (1977) has similar finding.

¹⁰ For example, Kohlhagen (1977), Cushman (1985), Froot and Stein (1991), Klein and Rosengren (1994), Campa (1994), Dewenter (1995), Kogut and Chang (1996), Blonigen (1997), Bell and Campa (1997), Xing (2002), Iannizzotto and Miller (2002), and Kiyota and Urata (2004).

details, see Table 1A-1 in Appendix 1-1.

2.2 Exchange rate uncertainty and FDI

Previous theoretical studies demonstrate that exchange rate volatility affects FDI activity through two main channels: firms' attitude towards risk and the option value of investment flexibility. It has been suggested that, for a risk-averse firm, higher volatility lowers the certainty equivalent value of the investing firm.¹¹ Hence, FDI decreases as exchange rate volatility increases. By contrast, Itagaki (1981) emphasizes the importance of "the exposure to exchange rate risk" in examining this issue. He indicates that the impacts of exchange rate uncertainty on volumes of both production and trade depend on whether a multinational enterprise's net exposure to exchange risk is positive or negative. Cushman (1985) and Goldberg and Kolstad (1995) also illustrate the importance of considering post-FDI changes in the exposure of a firm's profits to exchange rate risk. If the investing firm can choose to serve foreign markets via exports or FDI, then an increase in exchange rate volatility might lead the firm to substitute FDI for exports, since FDI activity reduces the exposure of its profits to exchange rate risk.

The studies mentioned above are based on the traditional investment theory which assumes that an investment decision is to be taken now or never. They ignore the option of delaying an investment. Beginning in the 1980s, a real options theory began to be developed to analyze investment behavior. Under the assumptions of uncertainty and irreversible investment, the real options theory emphasizes the option value of the flexibility that a firm may possibly delay the investment decision in order to obtain more information about the future. Dixit (1989a,b) indicates that the waiting

¹¹ See, for instance, Wihlborg (1978).

value will increase as the uncertainty rises even for a risk-neutral firm. Hence, an increase in exchange rate uncertainty deters the FDI activity of the firm. Using Dixit-Pindyck's (1994) model, Darby et al. (1999) illustrate that, for a risk-averse firm, the impact of exchange rate uncertainty on the timing of FDI is ambiguous. Therefore, there is still no consensus on the relationship between exchange rate uncertainty and FDI.

Regarding empirical studies, it is also found that the impact of exchange rate uncertainty on FDI is heterogeneous across countries and types of investment, and changes over time. For instance, Amuedo-Dorantes and Pozo (2001), Bell and Campa (1997), Campa (1993, 1994), Darby et al. (1999), Crowley and Lee (2002), and Kiyota and Urata (2004) find that exchange rate uncertainty deters FDI activity, while Cushman (1985), Goldberg and Kolstad (1995), and Pain and Van Welsum (2003) illustrate that exchange rate uncertainty stimulates FDI flows.¹²

2.3 Exchange rate movements, AD filings, AD-jumping FDI, and AD policy

Dumping is said to occur if a foreign producer sells its output in an export market either at a price below what it charges in its domestic market or in third countries, or at a price that does not permit recovery of all production cost. The former case is referred to as price dumping, while the latter one is referred to as cost dumping. Antidumping (AD) duties could be imposed if the dumping of a foreign firm is found to cause "material injury" to domestic firms.

Knetter and Prusa (2000) establish a formal model analyzing the exchange rate pass-through and AD filings. They indicate that real exchange rate fluctuations make the overall effect on filings ambiguous. For example, if an appreciation of the dollar

¹² See also Table 1A-1 in Appendix 1-1.

decreases export prices of foreign firms, then it may hurt the domestic firms' profits. Thus, the appreciation might stimulate AD filings. In contrast, if foreign firms try to reduce the probability of AD investigation by raising export prices, an appreciation of the dollar will raise the exporting price. Thus, depreciation leads to an increase in AD filings.

Most previous empirical studies suggest that an appreciation of the host currency is positively correlated with AD filings (e.g., Leidy (1997), Stallings (1993), Knetter and Prusa (2003), and Irwin (2004)). However, using the data on cases of AD/subsidy in the U.S. from 1982 to 1987, Feinberg (1989) finds that dollar appreciations lead to a decrease in AD petitions.¹³

While the immediate impact of AD laws is similar to that of a tariff (i.e., an increase in the price that consumers pay for imports of a product), the two instruments are only very imperfect substitutes. Specifically, AD duties are calculated on the basis of the dumping margin and applied only to dumping firms, but a tariff generally is imposed on all firms which sell the same or similar products. Thus, the logics of tariff-jumping FDI and AD-jumping FDI have similarities as well as differences.

Several recent studies establish formal models to investigate the relationship between AD policy and AD-jumping FDI. Haaland and Wooton (1998) show that if importing countries adopt AD policies, then the subject exporting firms have incentives to relocate their production to those countries, i.e., to undertake AD-jumping FDI. However, Belderbos et al. (2004) show that there are situations where AD-jumping FDI will happen, and situations where it will not. In contrast to ambiguous implications from theory, previous empirical studies consistently find substantial AD-jumping FDI (e.g., Azrak and Wynne (1995), Belderbos (1997),

¹³ See Table 1A-2 in Appendix 1-1.

Blonigen and Feenstra (1997), Barrell and Pain (1999), Girma et al. (2002), and Blonigen (2002).)¹⁴

Regarding the welfare effect of AD policy, Anderson et al. (1995) consider a reciprocal dumping model and indicate that unilateral AD laws benefit the local firm but hurt the consumers. However, if both governments adopt AD laws, then consumer surplus increases, but the local firms' profits decrease. Therefore, they conclude that if the objective function of governments is social welfare maximization, then the unique equilibrium is to adopt no AD laws. Furthermore, Haaland and Wooton (1998) consider AD-jumping FDI and indicate that the AD policy should depend on whether the AD policy induces AD-jumping FDI or not as well as the objectives of the government - utility-maximizing or profit-maximizing. Belderbos et al. (2004) show that if the fixed costs of FDI are high enough, then the government should adopt an AD action when its objective function is social welfare maximization; otherwise, a free trade policy is suggested. As for empirical studies, Blonigen et al. (2004) indicate that affirmative U.S. AD decisions are associated with average abnormal gains of over 3% to a firm in the petitioning industry in the absence of AD-jumping FDI, but there are much smaller and statistically insignificant abnormal gains if there is AD-jumping FDI. Specifically, AD-jumping FDI tends to seriously dampen profits of U.S. firms if FDI is in the form of new plants or plant expansion.

3. Objectives

To fill the gap in the literature, the purpose of this thesis is threefold. Firstly, to illustrate the importance in considering diversity in investing motives, this thesis develops an integrated model to reexamine the effects of exchange rate level and its

¹⁴ See Table 1A-3 in Appendix 1-1.

volatility on FDI activity. Secondly, industry-level data as well as firm-level data on the FDI activity of Taiwanese firms are employed to test the validity of the theory. Thirdly, a real options model of FDI with imperfect competition is developed to examine how exchange rate uncertainty influences a firm's pricing behavior in its domestic market as well as foreign markets. The conditions under which the firm might dump its product into foreign markets are discussed, the possibility for the firm to undertake antidumping jumping FDI is illustrated and the welfare effect of an AD policy is evaluated.

3.1 A real options model of FDI under exchange rate uncertainty

This thesis develops an integrated framework of FDI under uncertainty in which a firm's attitude towards risk and the option value of investment flexibility are incorporated simultaneously. In this regard, Dixit-Pindyck's (1994) real options model is extended to consider possible changes in the post-FDI exposure to exchange rate risk.

Three extreme cases are discussed according to the investing motives of a firm - namely, market-seeking FDI, reverse-importing FDI, and export-substituting FDI. Market-seeking FDI refers to the situation in which a domestic firm, originally without serving a foreign market via exports, chooses to set up a foreign subsidiary to produce and sell in a given foreign market. Thus, the motive of market-seeking FDI is to create a new market for a product. By contrast, reverse-importing FDI refers to the situation in which a firm sets up a foreign subsidiary to produce and exports its output back to the home country. Furthermore, export-substituting FDI refers to the situation in which an exporting firm, originally producing at its home country and serving a foreign market via exports, relocates its *whole* production abroad to serve the foreign

market. The motive of reverse-importing FDI and export-substituting FDI is to reduce the firm's production costs. It is shown that the relationship between exchange rate uncertainty and FDI varies with the extent of their exposure to exchange rate risk, which is determined by investing motives.

3.2 The impact of exchange rate movements on outward FDI: evidence from Taiwanese firms' investment into China

To test the validity of the theoretical results developed in this thesis, the data on Taiwanese outward FDI into China are used in our empirical analysis. Industry panel data on Taiwan's outward FDI in China are first employed to examine the impact of exchange rate movements on market-seeking FDI versus reverse-importing FDI. This dataset consists of 27 sectors over the period from 1991 to 2002 with a total sample size of 324 observations. Because of data limitation, the industry-level data cannot be used to test the difference between export-substituting FDI and other types of FDI, and as such firm-level data will be employed to examine the effect of exchange rate movements on export-substituting FDI versus market-seeking FDI. The data are compiled from the "*Survey on Taiwanese Firms in Mainland China*", published by Taiwan's Investment Commission, Ministry of Economic Affairs (MOEAIC) in 2003 and 2004. The sample consists of 337 listed companies which entered into China during the period from 1987 to 2002.

3.3 The impact of exchange rate movements on dumping, AD-jumping FDI, and welfare effect of AD policy

The effects of exchange rate movements on dumping and AD-jumping FDI as well as the welfare effect of AD policy are still rarely explored in previous theoretical

studies. The purpose of this chapter is to apply a real options approach to analyze these issues. This thesis focuses on the study of price dumping only.

Exchange rate movements might affect price dumping due to the partial pass-through of exchange rates on the import prices. Dornbusch (1987) is the first to develop an imperfect competition model to illustrate the relationship between exchange rate pass-through and market structure. Following this line of research, a real options model with imperfect competition is developed. In the model, it is assumed that a domestic firm originally exports its product to the foreign market. Since the exchange rate fluctuates over time, the net profit flows of this firm may become negative when the exchange rate, expressed in units of home currency per foreign currency, is low enough. Therefore, the firm has to decide whether to exit the foreign market or not in each period. The impact of exchange rate volatility on the optimal threshold of a firm's exit and occurrence of dumping will be examined

If the government of the importing country decides to adopt an AD policy, then the dumping firm could decide whether to undertake AD-jumping FDI to circumvent AD duties or not. The conditions under which AD-jumping FDI emerges will be discussed. The impact of exchange rate uncertainty on AD-jumping FDI will also be investigated. Finally, the welfare effect of an AD policy under exchange rate uncertainty will be illustrated.

4. Organization

This thesis is organized as follows. This chapter introduces the motivation, objectives, and organization of this thesis. Chapter 2 develops a real options model of FDI under exchange rate uncertainty and illustrates the effects of exchange rate volatility and its level on the FDI activity of market-seeking firms, reverse-importing

firms, and export-substituting firms. Chapter 3 employs Taiwan's industry panel data to examine the impact of exchange rate movements on the FDI activity of market-seeking firms versus reverse-importing firms. Chapter 4 investigates the FDI activity of export-substituting firms and market-seeking firms using firm-level data of listed companies on Taiwan's Stock Exchange Market. Chapter 5 develops a real options model of FDI with imperfect competition. The impact of exchange rate uncertainty on the optimal timing of exit is derived and its influence on the probability of the occurrence of dumping is discussed. The conditions under which the firm undertakes AD-jumping FDI and the welfare effect of AD policy are examined. The final chapter summarizes the major findings of this thesis and provides some concluding remarks.

Appendix 1-1. Review of Previous Empirical Studies

Table 1A-1. Review of previous empirical studies: FDI and exchange rate movements

Author	Country	Year	Data Type	No. of Obs.	Empirical Model / Dependent Variable	Exchange Rate	Host Currency Appreciate	Exchange rate Volatility
Amuedo-Dorantes and Pozo (2001)	U.S. (inflow)	1976:1-1998:3	country level	89	FDI amount/U.S. GNP (equity and inter-company accounts)	real	no effect	std: no effect GARCH: -
Bell and Campa (1997)	U.S. and EU (inflow)	1977-1989	industry-level 16 chemical products	110 (EU)	truncated regression FDI amount (capacity investment)	real	EU level: - trend: no effect	EU log_std: -
Blonigen (1997)	Japan to the U.S.	1975-1992	industry-level 3-digit SIC industries	6,498	negative binomial model no. of foreign acquisitions	real	level: -	
Campa (1993)	U.S. (inflow)	1981-1987	industry-level wholesale trade industries(4-digit SIC code)	427	Tobit model no. of entries	real	level: + trend: -	log_std: static: - forecast: -
Campa (1994)	U.S. European	1977-1988	firm-level chemical	1,824	logit model entry (1) or not (0)	real	level: - trend: no effect	log_std non-MNC: -

Author	Country	Year	Data Type	No. of Obs.	Empirical Model / Dependent Variable	Exchange Rate	Host Currency Appreciate	Exchange rate Volatility
	Community (inflow)		processing industry industry-level		(new entry or capacity increments)			MNC: no effect
Campa and Goldberg (1995)	U.S. (domestic)	1972-1986	(two-digit manufacturing industries)	280	two-stage LS domestic investment	real	level: -	std and log_std: weak and insignificant effects
Crowley and Lee (2002)	U.S. to the U.K., France, Germany, Canada, and Japan	1980:1-1998:4	country-level	inflow 49-76 out-flow 35-76	OLS, fixed effect and random effect models log (FDI)	nominal		GARCH: - (weak)
Cushman (1985)	U.S. to the U.K., France, Germany, Canada, and Japan	1963-1978	country-level	80	MLE direct investment flow	real	level: -	std: +
Darby et. al. (1999)	France, Germany, Italy, the U.K. and the U.S. (inflow)	1976:1-1996:2	country-level 5 estimations	60-82	OLS log (FDI)	real	trend: -	std: -

Author	Country	Year	Data Type	No. of Obs.	Empirical Model / Dependent Variable	Exchange Rate	Host Currency Appreciate	Exchange rate Volatility
Dewenter (1995)	U.S. (inflow)	1975:1-1989:4	country level	60 and 40	OLS and SUR FDI and FDI/DI (transaction-specific data on foreign acquisitions)	real	- or no effect (after controlling for overall investment and relative corporate wealth)	
Froot and Stein (1991)	U.S. (inflow)	1973:1-1988:4	country-level industry-level (BOP)	61 (Q) or 13 (Y)	OLS FDI amount/U.S. GNP	real	level: -	
Goldberg (1993)	U.S. (inflow)	1970:1-1989:4	26 estimations (two-digit industrial sectors)	2,080	OLS (Newey-West) investment in new plant and equipment	real	level: aggregate: no effect disaggregate: mixed effects	ARMA: mixed effects
Goldberg and Kolstad (1995)	bilateral FDI between the U.S. and the U.K., Japan and Canada	1978:1-1991:4	country-level 6 estimations	43-48	OLS (Newey-West) total investment or capacity location (BOP)	real	level: - (weak)	std: +
Gorg and Wakelin (2002)	bilateral FDI between the U.S. and 12 developed countries	1983-1995	country-level panel data	108	OLS, fixed effects and random effects models the sales by MNCs in the host country	real (log)	level: inward: - outward: + trend: no effect	std: no effect

Author	Country	Year	Data Type	No. of Obs.	Empirical Model / Dependent Variable	Exchange Rate	Host Currency Appreciate	Exchange rate Volatility
Iannizzotto and Miller (2002)	non-EU to the U.K.	1997-2000	firm-level (manufacturing and energy) industry-level (separating estimation by industries and countries)	625	zero inflated Poisson model no. of investment announcements	real	level: -	log_std: mixed effects
Kiyota and Urata (2004)	Japan and the U.S. (outward)	1990-2000	(separating estimation by industries and countries)	140-437	two-stage LS log(FDI amount/GDP)	real	level: -	std: -
Klein and Rosengren (1994)	Canada, France, Germany, Netherlands, the U.K., Switzerland, and Japan to the U.S.	1979-1991	country-level panel data	91	fixed-effects model log(FDI amount/U.S. GNP)	real	level: -	
Kogut and Chang (1996)	Japan to the U.S.	1976-1989	firm-level (95 electronics companies)	95 (no. of object)	Cox's proportional hazard model hazard rate of a firm to invest at each time period	real	level: -	
Kosteletou and Liargovas (2000)	12 EU countries (inflow)	1960-1997	country-level 12 estimations	415	two-stages LS (simultaneous equation) FDI amount	real	level: mixed effects	

Author	Country	Year	Data Type	No. of Obs.	Empirical Model / Dependent Variable	Exchange Rate	Host Currency Appreciate	Exchange rate Volatility
Kyrkilis and Pantelidis (2003)	5 EU countries and 4 non-EU countries (outward)	1977-1997	country-level 9 estimations	21	OLS FDI amount	real	level: mixed effects	
Lin, Szenberg and Webster (2001)	Taiwan (outward)	1965-1993	country-level	29	OLS FDI amount/DI	nominal	level: -	
Pain and Van Welsun (2003)	US, the UK, Canada, Germany, France, and Italy (inflow)	1971-2000	country-level panel data	180	OLS FDI amount /GDP	real	level: mixed effects	std: + France: no effect
Tomlin (2000)	U.S. (inflow)	1982-1993	industry-level wholesale trade industries (4-digit SIC code)	900	Tobit model / zero inflated Poisson model no. of entry	real	level: + or no effect trend: -	log_std: no effect
Xing (2002)	Japan to China	1989-2000	industry-level 9 manufacturing sectors	11	OLS log (FDI amount/GDP)	real	level: -	

Notes: level: exchange rate level; trend: exchange rate trend; std (log_std): exchange rate volatility measured by the standard deviation of the monthly or weekly change (in the logarithm) of the level of the exchange rate.

Table 1A-2. Review of previous empirical studies: exchange rate, pass-through, and antidumping filings

Author	Country	Year	Data Type/ Industry	No. of Obs.	Empirical Model/ Dependent Variable	Exchange Rate	Appreciation of Reporting Country's Currency (Pass-through)
Blonigen and Haynes (2002)	from Canada to U.S.	1989- 1995	iron and steel products	345	Weighted Least Squares (WLS)/ the product's U.S. price inclusive of the AD duty and the tariff	U.S.-Canadian exchange rate	- (34.9%)
Feinberg (1989)	U.S.	1982:1- 1987:4	country-level panel	92	Tobit model/ case of AD/subsidy petition	indexes of real external value of the dollar against the various currencies	-
Irwin (2004)	U.S.	1947- 2002	country-level	56	Negative Binomial regression/ annual no. of AD cases	nominal effective U.S. dollar exchange rate	+
Knetter and Prusa (2003)	Australia, Canada, U.S., and EU	1980- 1998	country-level	76	Poisson and Negative Binomial regression/ the number of filings in a year	REER index (lag one -period)	+
Leidy (1997)	U.S.	1980- 1995	country-level	17	OLS/ total AD and CVD petitions per year	REER index	+
Raafat and Salehizadeh (2002)	U.S.	1975:1- 2000:4	country-level	104	OLS/ U.S. import prices of goods	NEER index (lag six-period)	- (7.3%)

Author	Country	Year	Data Type/ Industry	No. of Obs.	Empirical Model/ Dependent Variable	Exchange Rate	Appreciation of Reporting Country's Currency (Pass-through)
Stallings (1993)	U.S.	1980:1- 1988:4	country-level	36	OLS and Poisson regression/ the total number of antidumping and countervail petitions	the real exchange rate index weighted by the total number of cases brought	+

Notes: REER: real effective exchange rate; NEER: real effective exchange rate.

Table 1A-3. Review of previous empirical studies: AD duties and AD-jumping FDI

Author	Country (Exporting Country to Reporting Country)	Year	Data Type/ Industry	No. of Obs.	Empirical Model/ Dependent Variable	AD Measure	AD Duties and Jumping FDI
Azrak and Wynne (1995)	from Japan to the U.S.	1976:1- 1992:4	country-level	58	two-step approach (logit + OLS)/ level of FDI	the predicted probabilities of an affirmative ITC decision (from logit)	+
Barrell and Pain (1999)	from Japan to the U.S., UK/Ireland, Spain/ Greece/ Portugal, Germany/ Denmark, Italy, and Benelux	1980- 1991	country-level (panel)	84	Fixed-effect model/ annual FDI flows	cumulated initiation AD cases (host market and alternative market)	+
Belderbos (1997)	from Japan to the U.S. and EU	1992	the electronics and precision machinery industries	1030	Logit model/ binary FDI decision	AD investigation in EU; U.S. AD actions (dummy variable)	+
Belderbos (2003)	from Japan to EU	1991- 1999	firm-level/ seven Japanese electronics products	209	Logit model/ binary divestment (1)	repealed AD duty (1)	+
Blonigen (2002)	U.S. (reporting country)	1980- 1990	firm-level (countries and products)	792	Probit model; Logit model/ binary FDI decision	initial AD duty	+

Author	Country (Exporting Country to Reporting Country)	Year	Data Type/ Industry	No. of Obs.	Empirical Model/ Dependent Variable	AD Measure	AD Duties and Jumping FDI
Blonigen and Feenstra (1997)	from Japan to the U.S.	1981- 1988	four-digit SIC manufacturing (panel)	2392	two-stage estimation (probit + negative binomial)/ discrete number of FDI occurrences	the predicted probabilities an affirmative decisions of AD and escape clause investigation (dummy)	+
Girma et al. (2002)	from Japan to the UK	1988- 1996	aggregating firm-level	1944	Poisson model; Tobit model/ fixed assets and employment	cumulative AD cases	+ fixed assets: 3-12% ** employment: 3-8% **

Notes:

1. AD: antidumping.
2. * An increase in the probability of FDI caused by 10% increase in the AD duty.
3. # An increase in the probability of FDI caused by affirmative AD action.
4. ** The magnitude of FDI which can be attributed to cumulative AD cases.