

Antidumping and Foreign Divestment*

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ABSTRACT

This paper explores the relationship between the closure of 'antidumping jumping' manufacturing plants and the repeal of antidumping measures. An examination of Japanese 'antidumping jumping' manufacturing activities in the consumer electronics and office equipment industries in the EU in operation by 1990 learns that only 45 percent of the production lines were still in operation in 1999. Logit analysis of Japanese plants' probability of divestment in this period for a sample of 207 plants in the broadly defined electronics industry shows that Japanese plants producing products for which antidumping duties had been repealed are significantly and substantially more likely to be divested. The results suggest that the potential positive effects of antidumping duties on host economies by inducing inward investment are in many cases short lived and easily overestimated.

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Antidumping and Foreign Divestments

1. Introduction

An extensive amount of evidence has appeared in recent years suggesting that antidumping measures frequently induce foreign exporters to invest in local manufacturing operations in order to avoid payment of antidumping duties. Such 'antidumping jumping' Foreign Direct Investment (FDI) has been observed to be a common response by Japanese firms targeted by antidumping actions in the EU and the US. Belderbos (1997a) showed a pattern of 'bunched' investments in European manufacturing plants by Japanese exporters just after the initiation of EU antidumping investigations against a variety of electronics products in the 1980s. Belderbos (1997b) found that antidumping duties have a large impact on the probability that Japanese manufacturers invest in EU and US plants, after controlling for firm and product market characteristics.¹ Barrell and Pain (1999) found evidence that an overall increase in the number of antidumping actions in the US and the EU in the 1980s increased the level of FDI inflows from Japan. Girma et al. (1999) confirmed a positive impact of antidumping actions on Japanese investments in the UK. Blonigen and Feenstra (1997) and Azrak and Wynne (1995) found that the *threat* of antidumping actions, as measured by industry conditions determining the propensity to petition for antidumping action, led to increased Japanese FDI in the US, in anticipation of antidumping measures. While most evidence pertains to Japanese firms, two recent studies have found similar results for exporters from other countries targeted by antidumping actions. Perrin (1991) found that South Korean firms were more likely to invest in the US or the EU if their export products were affected by antidumping measures. Blonigen (2000) extended the analysis of FDI responses to US antidumping to exporters from all named countries in US antidumping cases. His results showed that the FDI response is not limited to Japan but that it is an important phenomenon for affected exporters based in developed economies in general.

The implications of FDI for the impact of antidumping measures are substantial. Antidumping duties or price undertakings (agreements between the administration and

¹ The impact was about twice as large for investments in the EU, which is ascribed to the nature of the EU antidumping system in which duties are fixed for a period of five years. In the US exporters have the possibility of obtaining lower duties through an administrative review, if they are found to have increased the price level of exports.

foreign exporters to maintain import prices at a certain level) can be imposed on imports if these are found to be sold at prices below price levels in the foreign exporters' home country or below cost, and if the 'dumped' imports are causing material injury to the local industry. Antidumping law restricts foreign exporters' pricing behaviour on the local market protected by an antidumping statute, but it can only act against imports. Once foreign firms are supplying the local market from their own local manufacturing base, the antidumping instrument can no longer discriminate between foreign and local firms and foreign firms can set their prices without the restrictions of antidumping law. Hence, FDI-inducing antidumping measures are unlikely to be effective in protecting local firms from aggressive price competition by foreign firms. On the other hand, the administration may see the FDI response as a positive effect of antidumping, to the extent that it creates employment in the industry and may potentially improve productivity through the introduction and spillovers of superior manufacturing technologies.

These implications have been examined in recent additions to the theoretical literature of the effects of antidumping laws allowing for 'antidumping dumping' FDI. Haaland and Wooton (1998) in a symmetric two-country model showed that reciprocal antidumping inducing 'antidumping jumping' FDI reduces profits of domestic firms. In their model, the induced FDI, by allowing investors to avoid paying transport costs, reduces the marginal cost of the investor and increases competition. Firms in both countries would benefit from the abolition of antidumping law. Vandebussche et al. (1999) examined the welfare effects of EU antidumping actions in a model encompassing specific features of EU antidumping practice. They found that FDI is not likely to be observed if foreign firms' competitiveness is based on home country factor endowments (e.g. low foreign labour costs or low material input costs), or if the EU administration imposes price undertakings instead of duties. In the latter case, antidumping measures can benefit both domestic and foreign producers and the expectation of undertaking can discourage FDI rather than induce it. 'Antidumping jumping' FDI does occur if the foreign firm has a firm-specific competitive advantage that it is able to transfer to its EU plant, and if the EU administration imposes antidumping duties with the objective to increase social welfare.

The frequent occurrence of FDI in EU antidumping cases, in particular those targeting Japanese firms, suggests that the EU administration has had broader objectives than protecting EU firms' profitability, and has taken into consideration the potential positive impact of FDI on EU employment and productivity and its related stimulus for upstream industries. This is perhaps illustrated most clearly by the EU Commission's decision to extend

duties on imports of Japanese photocopiers in 1995 for another two years. The Commission conceded that earlier antidumping duties imposed in 1987 had probably had a major impact on Japanese firms' investments in EU manufacturing plants.² Interestingly, maintaining these manufacturing investments was an important reason to extend the duration of antidumping measures. The Commission feared that repeal of the antidumping measure would induce Japanese firms to divest in the EU and shift production back to Japan or to South East Asian countries, since cost considerations alone would probably warrant the latter transfer:³

"As a result, the economic advantages of producing small and relatively simple PPCs (plain paper copiers) in third countries with low labour costs, rather than in the Community where most Japanese companies produce them now, would become more alluring".

The above example illustrates an important implication of FDI induced by the imposition of antidumping duties: that it is by nature a second-best manufacturing configuration for the foreign firms, which would have preferred to continue to serve the local market through exports in the absence of antidumping actions. Some evidence is provided in Belderbos et al (2001) where it is found that Japanese electronics manufacturing affiliates established with the motivation to avoid trade barriers such as antidumping, are systematically less vertically integrated and procure fewer components in the host country. Firms appear to limit their 'antidumping jumping' investments to avoid creating a higher cost structure. The question rises than to what extent 'antidumping jumping' FDI is sustainable once antidumping measures are repealed. Given that antidumping measures have a fixed duration of five years, the benefits of FDI to the local economy may be short-lived, reducing the positive impact of antidumping actions.

This paper is the first to explore the longevity of 'antidumping-jumping' FDI. It examines the relationship between the elimination in the 1990s of antidumping duties on seven consumer electronics and office machinery products exported by Japanese firms and the occurrence of divestment from EU manufacturing by these firms in this period. The seven products (CD players, typewriters, computer printers, video recorders, halogen lamps, audiocassettes, and copiers) are all products for which a pattern of 'bunched' FDI by Japanese firms in EU manufacturing capacity has been observed after the start of the antidumping

² "Although the anti-dumping duties may not have been the only reason for this strongly increased Japanese production in the Community, it can hardly be doubted that they did significantly influenced this development". *Official Journal of the European Communities*, 7 July 1995, page 26.

³ *Official Journal of the European Communities*, 7 July 1995, page 26. See Belderbos (1997a: 55) for a further analysis of this antidumping case.

investigation [Belderbos (1997a); Belderbos and Sleuwaegen (1998)], suggesting at least a partial 'antidumping jumping' motivation. The degree of survival or cessation of these manufacturing activities by 1999 provides some prima facie evidence of the longer-term effects of antidumping actions on FDI. The paper then compares the divestment ratio for the affected products with divestment patterns for Japanese plants in the wider electronics industry. It develops an empirical model of divestment decisions based on the existing literature on foreign divestment and manufacturing relocation decisions by multinational firms [e.g. Hennart et al (1998), Pennings and Sleuwaegen (2000)]. It seeks to establish to what extent plants manufacturing products for which antidumping measures have expired have a higher probability of being divested, after controlling for other factors affecting divestment decisions.

The remainder of this paper is organized as follows. The next section provides detailed information on the cessation or continuation of manufacturing activities for the seven products by investing firm and location of the plant. Section 3 develops an empirical model of foreign plant divestments and Section 4 discusses the results. Section 5 concludes and offers suggestions for further research.

2. The Repeal of Antidumping Measures and Manufacturing Divestments by Japanese Electronics Firms in the EU, 1991-1999

Repeal of Antidumping Measures

The 1980s witnessed a strong increase in EU antidumping investigations targeting imports by Japanese firms, in particular in the electronics industry. The major EU electronics and office machinery manufacturers, such as Philips, Olivetti, Siemens, Rank Xerox, and Thomson, were actively involved in petitioning for antidumping protection with the Commission of the European Communities. In the majority of cases, the Commission judged that 'dumped' imports were hurting market share and profitability of EU producers and levied antidumping duties. In accordance with international antidumping rules of the WTO, these antidumping measures expire after a period of five years. The complainant firms can however request that the Commission conducts a 'sunset review', to determine if dumping and 'injury' are still occurring or whether they are likely to recur in the near future. If the answer to one of

these questions is affirmative, antidumping measures can be renewed or extended for a period of five more years. During the investigation period of this review, antidumping measures remain in force. Among the twelve different electronics products imported from Japan and investigated by the EU Commission in the 1980s, on ten products antidumping duties or price undertakings were subsequently imposed [Belderbos (1997a, p. 34).⁴ During the 1990s, nine of these antidumping measures have been repealed due to withdrawal of the complaint, uncontested expiry of measures, or after a non-affirmative sunset review investigation. The only product for which antidumping measures imposed in the 1980s, were still in place (after extension of measures) in the year 2000 was electronic weighing scales.

In this section, I examine more in detail the evolution of Japanese manufacturing activities in the EU for seven products in the consumer electronics and office machinery sector: CD players, typewriters, computer printers, video recorders, halogen lamps, audiocassettes, and copiers.⁵ For all of these products, multiple establishments of Japanese manufacturing plants in the EU have been observed just after the antidumping investigation or the imposition of duties [Belderbos (1997a, pp. 31-40). Table 1 lists the antidumping measures, the date of their repeal and the reason for the repeal. The first antidumping measures to be repealed were those against imports of Japanese CD players. In this case, the Commission repealed measures after the complainant, Dutch consumer electronics manufacturer Philips, withdrew its support for the measures. The reason was that Philips had transferred its EU CD player manufacturing operations from Belgium to Singapore, where it could produce at lower cost. With this relocation, there no longer was a EU industry to protect against Japanese imports. A similar pattern occurred in the case of electronic typewriters. Here two EU producers, among which Olivetti, had transferred a large part of their manufacturing operations to Asia and were making healthy business unit profits by importing typewriters from its Asian plant into the EU. The Commission judged in its sunset review that it could no longer be sustained that Japanese imports were causing 'injury' to EU

⁴ Video recorders were targeted twice (in 1982 and 1987), of which the first investigation led to a voluntary export restraint. For convenience the parallel cases of dot and SIFF printers are counted as one.

⁵ I exclude the antidumping measures against Japanese DRAM and EPROM semiconductors, which were repealed in 1997. These cases are exceptional because measures were limited to price undertakings, whereas in all other cases duties were levied. In addition, the measures in the DRAM case were allowed to lapse because the EU industry dropped its support of antidumping measures after concluding a comprehensive industry-to-industry agreement with Japanese producers to ensure price stability in the EU market. Hence, antidumping measures were replaced by a private arrangement restraining price setting in the EU market. The empirical model in Section 3 will take the possible influence of these and other antidumping measures on divestment into account.

industry and decided not to extend the measures [Belderbos (1997a, 49-51)].⁶ In four other cases (printers, video recorders, halogen lamps, and audiocassettes) the measures expired without a petition for a sunset review. The antidumping duties on Japanese copier imports were extended in 1995 after a long sunset review investigation, and were finally repealed when the extended period of duties lapsed in 1997.

INSERT TABLE 1

'Antidumping Jumping' Investments and Divestments

In order to determine the responses of Japanese firms to the repeal of antidumping duties, a number of data sources on Japanese firms' manufacturing activities were examined. Starting point was the list of Japanese producers in Europe in 1990 by product compiled in Belderbos (1997a). The main source on the evolution of Japanese manufacturing activities throughout the 1990s was JETRO's annual report on Japanese manufacturing affiliates in Europe [JETRO (1989-1999)]. An additional source of information was Toyo Keizai's directory of Japanese affiliates [Toyo Keizai Inc (1990-2000)]. The difficulty in using these data sources is that precise line of business information and yearly updates of affiliate information are not always available. In the latter cases, information dating from a previous year in which the affiliate did respond to the survey is reported. Hence, changes in products manufactured or plant closures are not always recorded, or are only recorded with a lag of one or more years. This makes it very difficult to determine the exact timing of divestments of manufacturing activities. For these reasons, the analysis focuses on the state of Japanese manufacturing activities in one specific year, 1999. Information from Toyo Keizai and JETRO could be amended with line of business information from the Amadeus company report database [Bureau Van Dijk (2000)], information from newspaper reports, press release compilations [Denshi Keizai Kenkyujo (1994-1998)], and telephone interviews with a number of affiliates to confirm production information.

Detailed results of the investigation are included in Appendix A, which lists the subsidiaries producing the 7 products in 1990 and whether these subsidiaries were operating a production line for the product in 1999. A summary of the data is presented in Table 2. Three

⁶ Since the Commission took almost three years to conclude the sunset investigation, duties have been imposed

types of divestments are distinguished: *subsidiary closure* implies that the Japanese firm dissolved the entire affiliate,⁷ *plant closure* implies that the subsidiary stopped all manufacturing activities but remained active in import, wholesaling and marketing activities, *production line closure* implies that the subsidiary stopped manufacturing the product, but that it remained active as a manufacturer of other, existing or new, products.

INSERT TABLE 2

Table 2 shows that during the years 1991-1999, 31 of the 67 production lines for the seven products were divested, a divestment ratio of 55 percent. Of these divestments, there were eleven cases of subsidiary closure and nine more cases of subsidiaries that ceased all manufacturing activities but remained trading. The majority of divestment cases (18) were production line closures, in which case the subsidiaries continued to manufacture other products. Since a number of subsidiaries were manufacturing more than one of the seven products in 1990, the number of unique plant and subsidiary closures was 17, implying a subsidiary and plant divestment ratio of 31 percent. Table 2 also reveals substantial differences in divestment behaviour across products. Only one of the five typewriter production lines remained operational in 1999, a divestment ratio of 80 percent. On the other hand, only 2 of the 9 copier production lines were divested. Sharp stopped assembling copiers in the UK but continued production in France, and Minolta closed its German manufacturing operations acquired through the takeover of German firm Develop.⁸ The continuation of copier manufacturing activities is perhaps surprising in light of the prediction by the EU Commission that repeal of measures would induce a relocation of Japanese manufacturing to Asia. One of the highest divestment ratios (75 percent) is recorded for the 12 CD player production lines. The number of computer printer plants halved to seven in 1999. A number of these seven remaining plants 'converted' to the production of laser printers or inkjet jet printers, after starting out in the 1980s as dot matrix printer manufacturers.⁹ Twelve out of the

for a period of almost eight years.

⁷ Among the subsidiaries in Appendix A, all divestments were closures and no case was reported of divestment by means of subsidiary acquisition by another firm.

⁸ It reportedly started small-scale assembly of copiers in its French (Lorraine) components plant.

⁹ In the analysis, no distinction is made between dot matrix printers and inkjet or laser printers. Although the original antidumping measure of 1985 was directed at imports of dot matrix printers, the dominant technology at the time, antidumping rules would have allowed a relatively easy extension of measures to other technologies as they have similar functionality (they can be considered 'like products' in the antidumping methodology). In case the analysis were to be limited to dot matrix technology printers, the number of production lines in 1999 would be substantially smaller and the divestment ratio higher.

17 production lines of video recorders were divested, which implies a divestment ratio of 71 percent.¹⁰ The two halogen lamp manufacturers that invested just before the imposition of antidumping duties (Phoenix Electric and Iwasaki Electric) closed their small-scale assembly activities again within a year after the repeal of the duties. The halogen lamp case appears the most illustrative example of short-term 'antidumping jumping' investment with the sole goal of circumventing antidumping duties. In contrast again, only one divestment is recorded among the six audiocassette production lines.

A number of further observations can be made on the basis of Appendix A and newspaper reports. In a relatively large number of cases, outright divestments of plants or subsidiaries involved smaller operations with fewer than 100 employees. Examples are Seikosha's (printers), Shintom (video recorders), Nippon Columbia (CD players) in Germany, Phoenix Electric (halogen lamps) in the UK, and JVC (CD players) and Kyocera (printers) in France. But there are a number of cases where more than 300 employees were dismissed: Minolta (copiers), Hitachi (video recorders), and Toshiba (video recorders) in Germany, and Mitsubishi Electric (video recorders) and Star (printers) in the UK. In order to determine more precisely the employment consequences of the 'antidumping jumping' divestments, it is necessary to take into account reductions in scale in remaining plants after divestment of particular production lines. In a number of cases for which data are available these reductions involve several hundreds of employees as well (e.g. Japan Victor's Berlin video recorder plant, and Brother's UK plant). Systematic and comparable data on employment in 1999 are unfortunately not available.¹¹

Another issue is to what extent divestments involve relocation of manufacturing activities and to which locations operations are transferred. A number of early divestments involved the closure of production lines or plants and an at least partial transfer to other plants operated by the firm within the EU. JVC concentrated CD player manufacturing in France in the early 1990s and closed its UK production line (which was subsequently closed), and Hitachi moved production of video recorders from Germany to the UK. But the available information suggests that divestments more often involved relocation to Japan as well as lower cost Asian locations. Shintom concentrated video recorder manufacturing in Batam

¹⁰ The 1987 video recorder antidumping case was exceptional because measures were specifically directed at two Japanese producers (Funai and Orion), allegedly because they had been ignoring the voluntary export restraint for Japanese video recorder manufacturers negotiated in 1983. The new investigation in 1987 and the imposition of duties in 1989 did signal a threat of further action against Japanese video recorder imports. A wave of new plant establishment was recorded in 1987-1988, by Funai and Orion as well as number of other Japanese exporters [Belderbos (1997a, 30-31).

¹¹ The JETRO reports stopped reporting manufacturing employment figures in 1996.

(Indonesia), Hitachi transferred operations to Malaysia, and Funai to China. Star transferred printer manufacturing to China and Kyocera relocated printer assembly to Japan. Tokyo Electric transferred its typewriter operations to an existing plant in the US. Eastern Europe has only recently become a destination for manufacturing relocations. Although Eastern European countries have attracted a relatively large number electronic components plants, only Sony was producing final products in the antidumping expiry list by 1999: video recorders and CD players in its Hungarian plant [JETRO (1999)].

Assessment

How should these findings be interpreted? The 31 percent plant divestment ratio can be compared to average post-entry performance patterns found for manufacturing industries. At first sight the conclusion would be that this ratio is not particularly high. Dunne et al (1989), for instance, show that of all entrants firms in U.S. 3-digit industries, only 20% survived after 10 years, while a 40 percent survival ratio has been reported for Canadian industries [Geroski (1995, p. 424)]. However, a stylised fact of exit patterns is that the larger majority of exits are by *de novo* entrants (start up firms), while closure of plants set up by existing firms diversifying into a new industry is 5 to 7 times less likely to occur [Geroski (1995, p.425)]. The Japanese firms that set up manufacturing plants in the EU are all established firms, with competitive manufacturing technologies, manufacturing capacity in Japan, and often established marketing channels and brand names in the EU (given that they had been successful exporters, which led to the imposition of antidumping measures in the first place).¹² On the other hand, the fact that the Japanese entrants are foreign firms investing in the EU where they may be at a relative competitive disadvantage vis-à-vis established EU competitors would suggest higher exit rates. The empirical literature on FDI survival has in general found relatively high failure rates for foreign owned entrants. For instance, Mata and Portugal (1999) report an average plant closure rate of 5.9% for foreign-owned plants in Portugal, implying a 10-year divestment ratio of almost 60%.¹³ Yet another stylised fact of entry and exit in industries is that exit in an industry occurs in cycles with the largest number

¹² Another factor complicating comparisons is that the literature on exit analyses the longevity of new entrants entering in a given year, while many of the Japanese manufacturing subsidiaries had been in operations for several years in 1990. Since divestment ratios are found to decline with the age of the subsidiary [e.g. Mata and Portugal (2000)], one would expect lower divestment ratios for the sample of Japanese subsidiaries.

¹³ Larimo (2000) surveys the literature on survival of FDI and finds that exit rates of 30-60% over a period of 10 years are common. Most of these studies also included non-manufacturing subsidiaries, which generally show higher exit rates than manufacturing subsidiaries.

of exits occurring when markets are maturing. Among the seven products, electric typewriters is the most extreme example of a maturing and declining market as typewriters and word processors have to a large extent been substituted for by personal computers. The market for electronic typewriters more than halved between 1992 and 1999 to an estimated 244 million \$ [Elsevier (1994, 1998)]. The market for magnetic media has also shown a decline in the period (an annualised growth rate of - 1.5 percent). Limited growth of around 1 percent has been recorded for video recorders and copiers, while higher growth rates characterize the markets for CD players (7.5 percent), and peripherals (2.8 percent).

The above discussion perhaps raises the question why plant divestment ratios have not been higher than the reported 31 percent. One clear candidate is the *threat* of recurrence of antidumping measures. After the repeal of existing measures, there is nothing to withhold the EU industry from lodging a new complaint if imports from Japanese firms regain volume. In fact, the Commission took this into account and articulated this precisely when deciding to repeal duties on Japanese typewriters:¹⁴

"In reaching this conclusion, the Commission has taken into account the fact that, if the Community industry were to suffer material injury as a result of dumped imports made by Japanese producers in the Community market in the future, the Community industry could resort to the Commission to request that a new proceeding be opened."

Foreign firms may be advised in many cases to maintain at least small scale manufacturing operations within the EU, such that a quick response in the form of an extension of EU manufacturing capacity is feasible in case a new investigation is opened. A plant in the EU buys Japanese firms an option to expand again if necessary.¹⁵ Empirical evidence has shown that the threat of antidumping actions by the local industry has a significant impact on FDI decisions [Blonigen and Feenstra (1997), Azrak and Wynne (1995)]. This threat is likely to be large if the industry has already once petitioned successfully for antidumping protection. The threat will be low in case EU firms themselves have relocated manufacturing operations to lower cost locations. This occurred in the CD players and typewriters industries (as noted above): two industries with the highest divestment ratios.

¹⁴ Commission Decision of 16 June 1993 terminating the review of anti-dumping measures adopted under Council Regulation (EEC) 1698/85 imposing a definitive anti-dumping duty on imports of electronic typewriters originating in Japan, Official Journal L 157, 29/06/1993.

¹⁵ Funai's video recorder manufacturing operations in Germany are a good example. Although Funai did not close operations, the employee count was reduced from over 200 in 1990 to just 30 in 1996.

Another, more systematic, approach to assess the impact of repealed antidumping measures on divestment is to compare divestment behaviour with the divestment patterns of similar plants not affected by antidumping and antidumping repeals. In the next sections I develop and test an empirical model of plant divestments that allows for a comparison of divestments of plants affected by (repealed) antidumping duties with other Japanese plants in the wider electronics industry within the EU. I test whether, after controlling for a number of factors expected to influence divestment behaviour, the repeal of antidumping measures has an independent positive impact on the probability of divestment. Two limitations should be noted in this explorative empirical research. First, to make comparison with other manufacturing activities possible, the analysis is at the subsidiary level and not at the product level. Hence only the 17 complete plant and subsidiary divestments are included as 'antidumping jumping' divestments.¹⁶ Second, I cannot take into account the influences of remaining threats of antidumping measures on divestment behaviour, as no good proxies are available at this detailed level of analysis.

3. An Empirical Model of Foreign Manufacturing Divestments

To develop an empirical model of plant divestments by foreign-owned manufacturing, I build on the existing industrial organization literature on exit and post entry performance of firms [e.g. Evans (1987), Dunne et al (1988), Geroski (1995)] and the emerging literature on the longevity of foreign direct investments [e.g. Larimo (2000), Mata and Portugal (2000), Hennart et al (1998)], which has recently also focused on the international relocation of plants [Pennings and Sleuwaegen (2000), Buckley and Muchielli (1997)]. I will review this literature briefly to determine the most important influences on plant divestment, after which I define the model and the dependent and explanatory variables.

An important inspiration for empirical analysis of firm survival is the seminal theoretical model of Jovanovic (1982). Jovanovic shows how an adaptive learning process and uncertain industry conditions lead to a pattern of gradual plant enlargements by successful firms and early exits of smaller firms. Learning effects take place in particular in the early phase after entry, which implies that older firms, while less likely to fail, grow at a

¹⁶ Determining whether other (non 'antidumping jumping') plants have divested manufacturing lines for specific products would be extremely difficult as good information on lines of business is often lacking and a decision on what constitutes an individual product would necessarily be arbitrary in many cases.

smaller pace. These predictions are consistent with empirical findings that the probability of exit is negatively related to the size and experience of the firm [Evans (1987) and Dunne et al (1988), Caves (1998)]. Another factor affecting firm survival is the degree to which exit involves exit costs. For instance, exit costs may involve legally required severance payments to employees in case of mass layoffs. Exit costs are expected to be particularly high if firms had to incur 'sunk' costs (costs that cannot be recouped in case of withdrawal) to manufacture and operate successfully in the market. Sunk costs are high if manufacturing requires large capital investments in dedicated manufacturing equipment', or if successful manufacturing and marketing operations require dedicated investments in R&D or advertising. While the sale of dedicated tangible or intangible assets to other firms may be possible, this is likely to occur at a substantial discount to the original value of the investments. In this view, firms will exit if expected operational losses are higher than the sunk and other exit costs.

The literature on the longevity of foreign direct investments has paid attention to the specific conditions inherent to cross border investments. Foreign firms entering a country by investing in manufacturing operations in general will have a number of disadvantages (the 'liability of foreignness') vis-à-vis established local firms as they have to learn how to operate in an unfamiliar environment [e.g. Caves (1996)].¹⁷ This explains a common finding in empirical studies of FDI that multinational firms that have learned how to operate in a country through existing operations are less likely to fail in new ventures in that country [e.g. Hennart et al (1998), Park and Park (2000), Larimo 2000]. In general, characteristics of the parent firm of the subsidiary, such as international experience and competitiveness based on investments in intangible assets (R&D or marketing) matter for divestment decisions, in addition to subsidiary characteristics. Another feature of entries abroad by multinational firms is the importance of the choice of entry mode [e.g. Shaver (1998)]. Joint ventures abroad with local partners may be inherently unstable due to organizational complexities or due to changing valuations of the partner of the venture over time. As multinational firms learn from an initial joint venture they may become more able to operate wholly owned manufacturing plants. This could either lead to a sale of their stake to the local partner or the purchase of the partner's stake [e.g. Kogut (1988)]. If multinational firms enter foreign markets through an acquisition of a foreign firm, unfamiliarity with the local firms operations' and business culture often leads to failure and subsequent sale or closure [e.g. Benito (1996), Li (1995), Barkema et al (1996), Larimo (2000)].

The literature on international relocation of manufacturing activities stresses that not all closures of plants are due to business failure. Relocation may frequently occur of profitable operations, in case production at other locations substantially increases this profitability. Multinational firms with an existing configuration of multiple manufacturing plants can transfer production to existing plants at lower costs and are more often involved in international relocations [Pennings and Sleuwaegen (2000)]. The relocation perspective on plant closure further defines the exit costs explanation of plant closures: plant closure due to relocation will occur if the difference in operational profits between manufacturing in the current and other plants are lower than the fixed costs of relocation. The latter consist of fixed investment or adjustment cost in the new plant and the exit costs of the current plant.

Model and Dependent Variable

The empirical model should explain whether a Japanese manufacturing plant in the EU operational in 1990 still operates in 1999. Plants for which this is not the case belong to 1) subsidiaries that are dissolved 2) subsidiaries that ceased all manufacturing activities but remain involved in import and/or distribution 3) subsidiaries that were sold to other, non-Japanese, firms. Hence, divestments may occur because of business failure, relocation of not necessarily unprofitable operations to other plants, or sale of the subsidiary (e.g. in case of joint venture buyouts by the local partner). Although the latter form of divestments was not observed for the 17 divested 'antidumping jumping' plants, I was not able to determine the form of divestment for all other divested Japanese electronics plants.¹⁸ In case manufacturing subsidiaries changed names or in case of restructuring in which a subsidiary is closed but the plants survived as part of a different legal entity, no divestments were recorded.

The dependent variable *divestment* is binary, and has the value 1 if the plant was divested and 0 otherwise. An appropriate econometric specification in this case is the logit model, which relates the probability of divestment to a set of explanatory variables X :¹⁹

¹⁷ This is one reason why firms that possess competitive advantages (e.g. based on superior technologies) and are able to transfer these abroad are more likely to engage in foreign direct investment.

¹⁸ Hence, I am not able to allow for differential explanatory power of variables for plant sales versus plant closures as in Mata and Portugal (2000).

¹⁹ Since I could not determine the exact year of divestment in several cases, it was impossible to use a hazard rate model in which divestment in a given year depends on explanatory variables at the beginning of that year. Furthermore, data on parent firm and subsidiary characteristics often are not available for every year.

$$(1) \quad \text{Prob}(\text{divestment} = 1) = \frac{\exp(\alpha + \beta X)}{1 + \exp(\alpha + \beta X)}$$

Explanatory Variables

I first discuss variable related to (the repeal of) antidumping measures. Apart from the repeal of antidumping measures there are a number firm- and location-specific factors that are expected to affect the survival probability of manufacturing plants. I control for the influences found to be most important in the empirical literature.

Antidumping

The main hypothesis of this study is that plants that were set up in order to circumvent antidumping measures are more likely to be divested if these antidumping measures have been repealed. The variable *repealed antidumping duties* is the number of products a subsidiary was producing in 1990 for which antidumping measures have been repealed in the 1990s. *Repealed antidumping duties* is expected to have a positive impact on the probability of divestment during 1991-1999.

Another influence of repealed antidumping measures operates through component procurement by Japanese firms manufacturing in the EU. A large number of Japanese component suppliers followed Japanese consumer goods and office equipment manufacturers to the EU by setting up their own manufacturing operations, in most cases dedicated to supply Japanese final goods producers with whom they had an existing supplier relationship in Japan [Belderbos (1997, p. 45-49)]. The investments in component plants were also induced by local content rules for Japanese 'antidumping jumping' plants, stipulating that at least 40 percent of components used should come from other countries than Japan. These local content rules, legislated as an amendment to EU antidumping law in 1987 as a means to counter circumvention of antidumping measures, were imposed on Japanese plants producing typewriters, copiers, printers, and video recorders. The amendment was formally revoked in 1990, when a GATT panel found the content rules incompatible with GATT antidumping rules. The EU Commission however confirmed that existing content rules affecting Japanese plants would remain in force. To the extent that Japanese component plants are relying on sales to Japanese plants affected by antidumping measures, they may lose substantial sales opportunities if these plants are divested due to the expiry of antidumping measures, or if

these plants are free to source components from more cost-effective locations in Japan or Asia. Hence, one may expect a relatively high divestment probability for Japanese plants manufacturing components for office equipment and consumer electronics manufacturers. To capture this influence, I include the variable *supplier to antidumping plants*, which takes the value 1 if the subsidiary is producing such components, and 0 otherwise. Subsidiaries are classified as *supplier to antidumping plants* if they are producing electronic components used in office machinery and consumer electronics or if their line of business description specifically states that their output is destined for one of the seven antidumping products. Such components include capacitors and semiconductors, printed circuit boards, transformers and power sources, small motors, plastic and metal pressed parts destined for office equipment and consumer electronics, rollers and lamps for copiers, etc.²⁰

Apart from the seven cases of a clear repeal of antidumping duties, there are four other Japanese export products that were for a period affected by (the threat of) antidumping actions in the EU. In case of car telephones and microwave ovens, an antidumping investigation was launched in the 1980s, but not duties were ever levied. The threat of the imposition of duties however apparently was significant in inducing a number of Japanese firms to invest in EU plants [Belderbos (1997a, p. 37), Belderbos (1997b)]. In case of DRAM and EPROM semiconductors, antidumping investigations led to the imposition of price undertakings. Measures were repealed in 1997, but in case of DRAMs replaced by an industry-to-industry agreement. While in all these cases there was no clear change in the antidumping regime in the 1990s, the lack of antidumping duties during the period may have made a divestment decision easier. I control for this potential influence by including the dummy variable *other antidumping*, taking the value 1 if the subsidiary produced one or more of the above products (car/mobile telephones, microwave ovens, DRAMs, EPROMs), and 0 otherwise.

Subsidiary Characteristics

The study of Jovanovic (1982) and the empirical evidence on post-entry performance [Geroski (1995)] suggest that the age of a firm has a positive influence on its probability of survival. Similar results have been obtained in studies of foreign direct investments. Yamawaki (1999) found that the probability of failure of foreign-owned subsidiaries in Japan

²⁰ 66 subsidiaries were producing parts and components used in consumer electronics and office equipment industries. In 23 cases these subsidiaries were established by a parent also producing the final products in the EU.

was negatively related to the age of the subsidiaries. Benito (1997), Larimo (2000), Shaver et al (1997), and Caves (1996, p.263) report similar effects for foreign direct investments in other countries. Subsidiaries that have operated longer are likely to have learned how to increase productivity more effectively. In case of foreign direct investment, operating experience reduces the liability of foreignness as the multinational firm learns to adapt operations to the host country environment.²¹ I include the variable *subsidiary age*, measuring the number of years lapsed between subsidiary establishment and 1990, and expect a positive effect. Since the effect of experience is expected to be largest in the early years after entry, *subsidiary age* is taken in logarithmic form.²²

Previous studies have also found a positive relationship between subsidiary size and survival [e.g. Mata and Portugal (2000), Yamawaki (1999), Dunne et al (1988)]. Pennings and Sleuwaegen (2000) find that the probability of international relocation is higher for larger Belgian firms and larger Belgian subsidiaries of multinational firms. Subsidiaries that are relatively large are likely to have grown successfully in the past [Jovanovich (1982)], which may indicate the presence of firm-specific competitive advantages. In addition, the closure of large plants is more visible and is more likely to have a negative impact on the reputation of the foreign firm in host countries. Large plants also face stricter reporting requirements on closures and may be forced to offer more generous severance payments to employees. I include the variable *subsidiary size*, the logarithm of the number of employees in the subsidiary, and expect a negative sign.

The relative importance of exit costs in case of manufacturing plant divestment has a negative effect on the probability of divestment. Exit costs are closely related to the extent costs are sunk in the subsidiary. Sunk costs are likely to be higher, the greater the subsidiary has invested in (dedicated) machinery and buildings. Sleuwaegen and Pennings (2000) found that the probability of Belgian firm closures and relocation of the manufacturing operations abroad was negatively affected by the capital-labour ratio of the firm's operations.²³ Park and Park (2000) found a consistently negative but insignificant effect of the average ratio of fixed to total capital for the industry in which Korean subsidiaries abroad operate on the probability

²¹ On the other hand, there is also a possibility that older subsidiaries produce the most mature types of products with relatively poor demand prospects. Li (1995) suggests that this would be the case in particular in industries characterized by rapid technological developments and turbulence in market leadership. He finds no significant effect of subsidiary age on survival and growth for a sample of foreign-owned affiliates in the U.S. computer industry, in contrast to a positive finding for the pharmaceutical industry.

²² Since there are subsidiaries without a full year of operating experience (*subsidiary age* = 0), we add the value 1 to *subsidiary age* before taking the logarithm.

of divestment. In the present study, lack of data on fixed capital necessitates use of a rather imperfect proxy of sunk cost to control for differences in relative exit costs. I include the variable *capital intensity*, which is the ratio of paid in capital of the subsidiary (in British pounds) to the number of employees in 1990. Paid in capital, which is the equity capital part of the asset base of the subsidiary, should be closely correlated with the capital requirements of the subsidiary.

The analysis also controls for systematic differences in divestment probability related to the entry mode of the subsidiary. Joint ventures with local (EU) firms may be established with a specific purpose and time frame in mind, or may be organizationally unstable (Kogut 1989). Yamawaki (1997) shows a higher divestment rate for joint ventures among Japanese subsidiaries in the EU and the US. Empirical evidence that joint ventures are systematically more likely to be divested is reported in Li (1995), Benito (1997), Hennart et al (1998) and Larimo (2000). I include the variable *joint venture*, which takes the value one if the subsidiary is a joint venture with a EU firm, and zero otherwise. Likewise, I control for potential higher divestment rates for acquired firms, by including the variables *acquisition*, which takes the value 1 if the subsidiary was an existing firm that came under control of the Japanese firm through an acquisition. Benito (1997), Li (1995), Mata and Portugal (2000), Barkema et al (1996), and Larimo (2000) find that acquired foreign firms are more likely to be divested. They attribute this to the difficulties in managing post-acquisition integration, in particular if the acquired firm operates in an unrelated business and has a different business culture and organizational routines. In addition, subsidiaries that originally were acquired are also likely to be more suitable for resale to third parties [Mata and Portugal (2000)].

Parent Firm Characteristics

The probability of subsidiary survival has been found to be positively related to the experience of the parent firm in operating in the host country [Hennart et al (1998), Park and Park (2000), Larimo (2000), Shaver and Flyer (2000)]. Parent firms with previous manufacturing experience in a host country face lower costs of starting up a new plant and are more able to take informed investment decisions. In addition, operating multiple plants may provide operational benefits from scale and scope economies in marketing, distribution, and procurement. I include the variable *previous EU experience*, which measures the number of years that the parent firm had already been operating another manufacturing plant in the

²³ They also suggested that this negative influence could be due to Belgium's comparative advantage in capital-

EU at the time of the establishment of the manufacturing subsidiary, and expect a negative sign. The variable takes the value zero if other plants were established later or if the parent firm only operates one plant.²⁴

Pennings and Sleuwaegen (2000) find that large multinational firm have a significantly higher probability of closing Belgian plants and relocate manufacturing activities to other countries. Multinational firms with an existing dispersed network of manufacturing plants can transfer manufacturing operations to other locations at lower costs. Kogut and Kulatilaka (1994) show that operating a multinational network of plants and maintaining the option to vary capacity loadings of different plants in response to relative cost changes is an important competitive advantage of the multinational firm. In the case of Japanese manufacturing plants in the EU, relocation (in particular after repeal of antidumping duties) is most likely to involve transfer of operations to locations outside of Europe. Hence the number of foreign plants outside of the EU is likely to facilitate such relocations. I include the variable *parent plants outside EU*, which measures the number of foreign manufacturing subsidiaries that the firm operated outside of the EU in 1990, and expect a positive effect on divestment.

As an alternative to *parent plants outside EU*, I include *parent size*, taken as the logarithm of the number of parent firm employees in 1991. Parent firm size has been found to reduce the survival chances of foreign subsidiaries [Hennart et al (1998), Benito (1997), Li (1995), Larimo (2000)]. Parent firm size has been used as a proxy for lower cost of relocation as larger firms tend to have more international operations. In addition, as foreign subsidiaries affect parent finances to a smaller extent for large firms, closure or restructuring decisions are more easily taken.²⁵

Firms that possess competitive advantages based on intangible assets such as superior technologies, organizational skills, or advertising and brand strength are more likely to survive in foreign markets [Caves (1996), Chang (1996), Mata and Portugal (2000)]. To the extent that these assets are adapted to local market and manufacturing conditions in the host country, they also involve sunk costs, increasing the cost of plant closure. For both reasons, a lower probability of divestment is expected. I include two alternative variable to control for this influence: *parent R&D intensity* measures the ratio of parent R&D expenditure to parent employment in 1992, and *parent patent intensity* measures the ratio of the number of US

intensive production processes.

²⁴ I include the variable in natural logarithm after adding the value 1.

patents granted to the parent firm and its subsidiaries during 1990-1993 to the number of employees in 1992.

Location

I control for differential developments in costs and market conditions across countries in the EU by including a set of country dummies for the five large EU economies: Germany, UK, France, Italy, and Spain. Since most Japanese plants serve the EU market rather than national markets [Belderbos 1997]), differences in subsidiary survival across countries are less likely related to market developments in individual countries. On the other hand, differential developments in labour costs, productivity and taxes may be more important. Exchange rate changes are potentially a major influence on cost developments: Park and Park (2000) find a significantly negative influence of exchange rate appreciation on the probability of survival for South Korean firms' foreign manufacturing subsidiaries. The only countries in the sample outside the EMU with divergent development in exchange rates are Denmark (one subsidiary) and the UK. The UK dummy should pick up any influence of differential exchange rate movements during the period.

Data Sources and Sample

Data on Japanese (manufacturing) subsidiaries were gathered from JETRO (1989-1999), Toyo Keizai 1990-2000), and Bureau Van Dijk (2000), in addition to newspaper reports and press release compilations in Denshi Keizai Kenyujo (1994-1998). Using these sources, I determined whether Japanese subsidiaries in the broad electronics industry established in 1990 were still in operation under the Japanese firm's control by 1999. The electronics industry here is defined to include consumer electronics, office equipment, household electrical equipment (e.g. vacuum cleaners, microwave ovens, sewing machines), computers and telecommunication equipment, electrical industrial machinery (power tools, industrial air conditioners, numerically controlled machine tools), measuring and control equipment, semiconductors and electronic components, and plastics and metal components for final electronics products.

²⁵ On the other hand, larger firms may be more able to afford loss making foreign subsidiaries for a longer period of time because of superior financial resources [Pennings et al (1994)].

I recorded 213 Japanese manufacturing subsidiaries in the EU in 1990, of which 54 were manufacturing one of the seven products for which antidumping duties were repealed during the 1990s. Among the 159 other subsidiaries, 39 were divested, which implies a divestment ratio of 24 percent, well below the 31 percent ratio for the subsidiaries producing the seven products. The largest number of subsidiaries (73) is in the UK, followed by Germany (51), and France (34). There are 27 joint ventures and 39 acquired subsidiaries. The age of the subsidiaries ranges from less than a year to 26 years with an average of 6 years.

The information on products produced, subsidiary characteristics, and parent firm experience is taken from JETRO (1989-1991) Toyo Keizai (1990-1991) and Belderbos (1997a). Toyo Keizai (1990-1991) and Denshi Keizai Kenkyujo (1993) were used to determine the number of non-EU manufacturing subsidiaries, and parent firm size and R&D are taken from Toyo Keizai (1990b-1993b) and Toyo Keizai (1990-1991). The number of US patents granted to the parent firm or its overseas subsidiaries during 1990-1993 are taken from the US patent office database.²⁶ Information on R&D expenditures is only available for firms listed at Japanese stock exchanges, and including R&D intensity reduces the number of observations to 178. Reliable data on US patent grants could be gathered for 181 firms.

4. Empirical Results

The empirical results of the logit model are presented in Table 3. Table 3 contains the results of five model specifications. The first three models do not include parent technology intensity measures. The models include 207 or 206 subsidiaries for which full information on the explanatory variables was available.²⁷ Model 4 includes the parent firm variable *R&D intensity* and model 5 the alternative variable *patent intensity*: the number of observations reduces to 178 and 181, respectively. The main finding is that in all models, the coefficient of *repealed antidumping duties* is positive and significantly different from zero at the 5 percent level. Hence, after controlling for various other factors affecting divestment decisions, plants producing products for which antidumping duties were repealed are significantly more likely to be divested. It can be calculated that the magnitude of this effect is substantial: the average probability of divestment increases from 22 to 34 percent points (a more than 50 percent

²⁶ See Belderbos (2001) for a description and analysis of these patent data.

²⁷ For 6 subsidiaries, no information could be obtained on parent firm size and for one subsidiary, the parent's number of foreign plants could not be established.

proportional increase) if the value of repealed antidumping duties is increased from zero to one. These results confirm that 'antidumping jumping' investments are less sustainable than other manufacturing investments. There is no evidence, on the other hand, that these effects cascade down to Japanese supplier plants in the EU. While, the coefficient of antidumping suppliers is consistently positive, it never reaches conventional significance levels.

INSERT TABLE 3

Model 1 performs relatively well. All variables have the expected sign. The percentage of 'correct' predictions is 77 percent if a threshold probability level of 50 percent is used, and 93 percent if sample probability threshold levels of 25 (divestments) and 75 (survival) are used. In model 1, subsidiary age and subsidiary size have a negative and significant impact on divestment, in accordance with previous empirical results and conceived theory. The proxy for capital intensity as an indicator of relative sunk costs has the expected negative sign but is not significant. The joint venture and acquisition dummies have a positive sign as predicted but are neither significant. Among the parent firm variables, parent firm size has a significantly positive impact, suggesting that large firms find it easier to close or relocate manufacturing activities. The parent firm's previous experience in the EU has the expected negative sign but is not significant. The coefficients of the location dummies suggest that plants in Germany are more likely to be divested. The difference is significant with the reference group of small European countries, and with the UK and Italy. UK plants are among the least likely to be divested. If the appreciation of the pound in the 1990s has had a negative impact on plant survival chances, than this effect has been more than compensated by factors positively affecting the investment climate in the UK.

Model 2 tests for the potential effect of other antidumping investigations, which have not led to the imposition of duties. The coefficient of other antidumping has an unexpected negative sign, but is not significant. All other estimates remain almost unchanged. In model 3, parent firm size is substituted for by the number of overseas plants operated by the parent outside of the EU in 1990. The coefficient of parent plants outside the EU is positive as expected but not significant, and the fit of the model is reduced. In model 4, the parent firm's R&D intensity is included. This variable has the expected negative sign and is significant at the 10 percent level. The parent's patent intensity included in model 5 has a similar negative sign and is significant at the 5 percent level. These results confirm that plants established by firms possessing strong competitive advantages are generally more likely to survive. In

models 4 and 5, the effect of repealed antidumping duties remains robust with a largely unchanged coefficient.

5. Conclusion

This paper explored the relationship between the repeal of EU antidumping measures and Japanese firm's manufacturing divestments in the EU. It tested whether evidence could be found for a simple proposition: plants that are established within the EU mainly to circumvent payment of antidumping duties ('antidumping jumping FDI') are likely to be closed, and manufacturing operations transferred to lower cost locations, once such antidumping duties are repealed. In the 1990s, antidumping duties against Japanese exporters have been repealed for seven consumer electronics and office machinery products. Earlier work has shown that each of these antidumping cases was associated with 'antidumping jumping' investments by the affected Japanese firms in the 1980s. The available information on these manufacturing activities shows that out of 67 production lines in operation in 1990, 36 (55 percent) had been closed by 1999. In more than half of these divestment cases, while production of the antidumping product stopped, the manufacturing plant remained in operation producing other products (in several cases at a smaller scale). The plant divestment ratio over the 1991-1999 period was therefore lower and reached 31 percent. This plant divestment ratio was higher than the plant divestment ratio (25 percent) recorded for other Japanese plants operating in the EU in the broadly defined electronics and electrical machinery industry.

In order to establish whether the repeal of antidumping duties indeed has a systematic effect on the likelihood of divestment, an empirical model of plant divestments was developed and tested on the full sample of Japanese manufacturing establishments in the EU in the broadly defined electronics industry. The analysis controlled for a range of other factors expected to affect divestment decisions, such as subsidiary age and size, parent firm technology intensity, and location of the plant. In all model specifications, the variable measuring that a plant produced goods for which antidumping duties had been repealed increased the probability of divestment significantly. The magnitude of this effect was relatively large as the average estimated probability of divestment showed a proportional increase of over 50 percent.

The results suggest that the potential indirect benefits of antidumping actions in the form of induced inward investment are not always sustainable. Often the 'second best' character of 'antidumping jumping' investments, creates strong incentive to relocate manufacturing activities to lower cost or higher productivity locations once antidumping measures are repealed. This implies that the (longer term) contribution of 'antidumping jumping' FDI to the EU economy can easily be overstated. Likewise, the case for antidumping actions as promoting the 'Community Interest' because they attract or maintain inward investment, may be weaker than currently perceived.

The analysis in this paper had its limitations, as it was restricted to the effects of seven repealed EU antidumping measures against Japanese firms. There is an obvious need to explore the relationship between divestment and antidumping measures further to examine whether the results hold for multinationals from other countries, in other antidumping jurisdictions, and in other industries. An extension the analysis of Blonigen (2000) of 'antidumping jumping' FDI by foreign firms in the US to cover divestments would be an interesting project. Another avenue for future research would be analysis of FDI by multinational firms from developed countries in developing economies. The rapidly increasing popularity of the antidumping instrument in developing countries such as India, Argentina, Brazil and Mexico and its use against exporters from developed countries could well be associated by an increase in 'antidumping jumping' FDI in these markets.²⁸ Following the analysis in this paper, these investments may be subject to divestment and relocation more frequently.

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²⁸ See for instance, EU Leads in Anti-Dumping Claims, *Financial Times*, 17 April 2000.

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TABLE 1. Imposition and Repeal of EU Antidumping Duties Against Japanese Consumer Electronics and Office Machinery Imports

Product	Year		Duty Levels	Date	
	Investigation	Definitive Measures		Repeal	Reason for Repeal
Typewriters	1984	1986	17-35	16.06.1993	Non-affirmative review
Copiers	1985	1987	7-20	04.10.1997	Expiry of extended measures
CD players	1987	1989	8-32	24.08.1993	Withdrawn by complainant
Computer printers	1987	1988	5-47	17.11.1993	Expiry of measure
Videorecorders	1987	1989	13	16.02.1994	Expiry of measure
Halogen lamps	1989	1991	36-47	20.01.1996	Expiry of measure
Audiocassettes	1989	1991	2-26	04.05.1996	Expiry of measure

Sources: Official Journal of the European Communities (various issues), Belderbos (1997a), CEC (1995-1999)

TABLE 2. Divestments of Japanese Firms' Production Lines in the EU for 7 Electronics Products

	# Production	# Production	# Production	Divestment	Type of Divestments:		
	Lines	Lines	Lines		Ratio	line	plant
	1990	1999	divested	%	closure	closure	closure
Typewriters	5	1	4	80	4	1	0
Copiers	11	9	2	18	1	1	0
CD Players	12	3	9	75	5	2	2
Computer printers	14	7	7	50	2	2	3
Videorecorders	17	6	12	71	4	3	4
Halogen lamps	2	0	2	100	0	0	2
Audiocassettes	6	5	1	17	1	0	0
Total	67	31	37	55	17	9	11
				Divestment			
	# 1990	#1999	# divestments	Ratio			
Total, unique plants*	54	37	17	31			

* Excluding double counting of subsidiaries and plants producing multiple products.

Source: Appendix A

TABLE 3. Logit Analysis of the Probability of Japanese Manufacturing Divestments in the EU, 1991-1999

	model 1		model 2		model 3		model 4		model 5	
	<i>coefficient</i>	<i>st.err</i>	<i>coefficient</i>	<i>st.err</i>	<i>coefficient</i>	<i>st.err</i>	<i>coefficient</i>	<i>st.err</i>	<i>coefficient</i>	<i>st.err</i>
repealed antidumping duties	0.736	0.335 **	0.750	0.340 **	0.684	0.329 **	0.714	0.352 **	0.727	0.365 **
supplier to antidumping plants	0.308	0.422	0.345	0.427	0.101	0.424	0.407	0.470	0.243	0.493
other antidumping			-0.463	0.787						
subsidiary age	-0.382	0.228 *	-0.371	0.229	-0.337	0.227	-0.126	0.258	-0.268	0.250
subsidiary size	-0.781	0.201 ***	-0.789	0.202 ***	-0.594	0.170 ***	-0.679	0.236 ***	-0.709	0.216 ***
capital intensity	-1.648	1.642	-1.733	1.645	-0.791	1.582	-0.844	1.680	-1.297	1.612
joint venture	0.541	0.536	0.513	0.539	0.550	0.534	0.639	0.577	0.667	0.599
acquisition	0.724	0.500	0.702	0.501	0.404	0.498	0.459	0.552	0.224	0.549
parent previous EU experience	-0.262	0.201	-0.275	0.202	-0.071	0.225	0.032	0.234	-0.141	0.218
parent size	0.345	0.153 **	0.377	0.163 **			0.286	0.187	0.291	0.185
parent plants outside EU					0.010	0.018				
parent R&D intensity							-0.241	0.137 *		
parent patent intensity									-16.670	7.299 **
UK	-0.058	0.586	-0.036	0.587	-0.134	0.582	0.234	0.665	-0.230	0.645
Germany	1.037	0.592 *	1.023	0.593 *	1.077	0.588 *	1.087	0.676	0.850	0.650
France	0.473	0.648	0.471	0.648	0.446	0.658	0.584	0.734	0.221	0.740
Spain	0.216	1.025	0.160	1.032	0.327	0.986	0.003	1.319	0.617	1.158
Italy	-0.242	1.011	-0.245	1.011	-0.268	1.005	-0.919	1.293	-0.599	1.096
constant	-0.434	1.123	-0.651	1.182	1.412	0.874	-0.519	1.437	0.388	1.429
observations		207		207		206		178		181
Chi-2		32.7 ***		33.1 ***		27.8 ***		26.4 ***		36.9 ***

APPENDIX A. Japanese Electronics Firms' Manufacturing Activities in the EU by Subsidiary and Product, 1990 and 1999

Japanese Firm	subsidiary name	country	subsidiary	still	type of divestment	Empl 1990
			operations started	producing		
typewriters						
Brother	Brother Industries(U.K.)Ltd.	UK	1985	yes		790
Canon	Canon Bretagne S.A.	France	1983	no	production line closed	520
Kyushu Matsushita	Kyushu Matsushita Electric(U.K.)Co.,Ltd.	UK	1986	no	production line closed	473
Sharp	Sharp Electronics(UK)Ltd.	UK	1985	no	production line closed	1503
Tokyo Electric/Toshiba TEC	TEC Elektronik Werk GmbH	Germany	1986	no	manufacturing operations ceased	145
copiers						
Canon	Canon Bretagne S.A.	France	1983	yes		520
Canon	Canon Giessen GmbH	Germany	1972	yes		600
Canon	Olivetti-Canon Industriale S.p.A.	Italy	1987	yes		670
Konica	Konica Business Machines Mfg.GmbH	Germany	1987	yes		120
Matsushita	Matsushita Business Machine(Europe)GmbH	Germany	1986	yes		157
Minolta	Develop Dr.Eisbein GmbH & Co./Develop Co	Germany	1986	no	manufacturing operations ceased	450
Ricoh	Ricoh Industrie France S.A.	France	1988	yes		260
Ricoh	Ricoh UK Products Ltd.	UK	1985	yes		610
Sharp	Sharp Electronics(UK)Ltd.	UK	1985	no	production line closed	1503
Sharp	Sharp Manufacturing France S.A.	France	1989	yes		119
Toshiba	Toshiba Systems(France)S.A.	France	1986	yes		272
CD players						
Aiwa	Aiwa(U.K.)Ltd.	UK	1976	yes		568
Akai	Akai Electric France S.A.	France	1981	no	manufacturing operations ceased	441
Funai Electric	Funai Electric(UK)Ltd.	UK	1987	no	subsidiary dissolved	116
Japan Victor (JVC)	JVC Manufacturing France S.A.	France	1989	no	subsidiary dissolved	80
Japan Victor (JVC)	JVC Manufacturing U.K.Ltd.	UK	1988	no	production line closed	280

Kenwood	Sofradore Trio Kenwood / Kenwood Bretagne	France	1985	no	production line closed	49
Matsushita	MB Video GmbH/Matsushita Audio Video	Germany	1982	yes		680
Nippon Columbia	Denon Consumer Electronics GmbH	Germany	1988	no	manufacturing operations ceased	170
Pioneer	Pioneer Electronics France S.A.	France	1985	no	production line closed	82
Sharp	Sharp Electronics(UK)Ltd.	UK	1985	no	production line closed	1503
Sony	Sony France S.A.	France	1973	yes		1900
Yamaha	Yamaha Electronique Alsace	France	1990	no	production line closed	90
computer printers						
Brother	Brother Industries(U.K.)Ltd.	UK	1985	yes		790
Canon	Olivetti-Canon Industriale S.p.A.	Italy	1987	yes		670
Citizen	Citizen Manufacturing(UK)Ltd.	UK	1987	no	subsidiary dissolved	180
Fujitsu	Fujitsu Espana S.A.	Spain	1973	no	production line closed	2144
Hitachi Koki	Dataproducs/Hitachi Koki Imaging Solutions	Ireland	1990	yes		350
Kyocera	Kyocera Manufacturing France	France	1990	no	subsidiary dissolved	24
Kyushu Matsushita	Kyushu Matsushita Electric(U.K.)Co.,Ltd.	UK	1986	no	production line closed	473
NEC	NEC Technologies(UK)Ltd.	UK	1987	yes		580
Oki	Oki(UK)Ltd.	UK	1987	yes		584
Seiko Epson	Epson Engineering(France)S.A.	France	1990	yes		130
Seiko Epson	Epson Telford Ltd.	UK	1988	yes		500
Seikosha	Seikosha Europe GmbH	Germany	1988	no	manufacturing operations ceased	39
Star Micronics	Star Micronics Manufacturing U.K.Ltd.	UK	1987	no	subsidiary dissolved	306
Tokyo Electric/Toshiba TEC	TEC Elektronik Werk GmbH	Germany	1986	no	manufacturing operations ceased	145
videorecorders						
Akai	Akai Electric France S.A.	France	1981	no	manufacturing operations ceased	441
Funai Electric	Funai Electric(Europe)GmbH	Germany	1988	yes		214
Funai Electric	Funai Electric(UK)Ltd.	UK	1987	no	subsidiary dissolved	116
Hitachi	Hitachi Consumer Products(Europe)GmbH	Germany	1982	no	subsidiary dissolved	430
Hitachi	Hitachi Consumer Products/Home Electronics (U.K.)	UK	1984	no	production line closed	1000
JVC	J2T Video Berlin GmbH	Germany	1982	yes		1002
Matsushita	MB Video GmbH/Matsushita Audio Video	Germany	1982	yes		680

Matsushita	Panasonic de Espana S.A./Matsushita Espana	Spain	1973	no	production line closed	778
Matsushita	Panasonic France S.A./Matsushita France	France	1987	no	production line closed	75
Mitsubishi Electric	Mitsubishi Electric(U.K.)Ltd.	UK	1979	no	manufacturing operations ceased	965
NEC	NEC Technologies(UK)Ltd.	UK	1987	no	production line closed	580
Orion	Orion Electric(UK)Ltd.	UK	1986	yes		400
Sanyo Electric	Sanyo Industries Deutschland GmbH	Germany	1984	yes		488
Sharp	Sharp Electronics(UK)Ltd.	UK	1985	yes		1503
Shintom	Shintom Elektronik Deutschland	Germany	1990	no	subsidiary dissolved	62
Sony	Sony Wega Produktions GmbH	Germany	1975	no	production line closed	650
Sony	Sony France S.A.	France	1973	no	production line closed	1900
Toshiba	Toshiba Consumer Products Europe GmbH	Germany	1990	no	subsidiary dissolved	357
			0			
audiocassette tapes			0			
Fuji Photo Film	Fuji Magnetics Germany GmbH	Germany	1987	no	production line closed	174
Hitachi Maxell	Maxell(U.K.)Ltd.	UK	1980	yes		400
TDK	TDK Manufacturing Deutschland	Germany	1986	yes		320
TDK	TDK Recording Media Europe L	Lux	1990	yes		600
Sony	Sony France S.A.	France	1973	yes		1900
Sony	Sony Italia S.p.A.	Italy	1981	yes		110
halogen lamps						
Phoenix Electric	Phoenix Lighting UK	UK	1990	no	subsidiary dissolved	61
Iwasaki Electric	S&I Electric	Belgium	1990	no	subsidiary dissolved	25

Sources: Belderbos (1997a), Bureau Van Dijk (2001), JETRO (1989-1999),Toyo Keizai (1990-2000),Bürger and Green (1991), Denshi Keizai Kenkyuujo (1993), telephone interviews