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GLOBAL PRODUCTION SHARING AND FDI-TRADE NEXUS: NEW EVIDENCE FROM THE JAPANESE AUTOMOBILE INDUSTRY*

Shuhei Nishitateno§

ABSTRACT

The growing importance of global production sharing makes the analysis of the nexus between outward foreign direct investment (FDI) and trade in intermediate goods ever more important. This study examines the substitution hypothesis that FDI by upstream firms replaces intermediate exports from home, using the case of the Japanese automobile industry. In analysing newly-constructed product-level data covering 37 products and 49 host countries over the period 1999 to 2008, this study finds a complementary relationship between these two variables. The findings cast doubt on the popular view that the growing overseas activity of multinational enterprises could replace intermediate exports from a home country thereby depriving the locals of job opportunities and deindustrialising the domestic economy under ongoing global production sharing.

Keywords: *global production sharing; foreign direct investment; exports; automobile, Japan*

JEL Classification: F14, F23

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1. Introduction

Global production sharing[1] – intra-product specialisation where the production process is sliced into discrete activities, which are then allocated across multiple countries – has been a central feature of world manufacturing trade over past decades. As technological developments in transportation and communication made long-distance transactions feasible, the geographically integrated production process began to separate. Furthermore, development of information technology and the liberalisation of trade and investment have dramatically reduced communication and transaction costs, enabling multinational enterprises (MNEs) to outsource an increasing amount of their production process abroad and organise their value chains globally. This in turn has resulted in a steady rise in the trade of part and components across national borders (Yeats 1998, Kimura and Ando 2005, Athukorala and Yamashita 2006).

Given the growing importance of global production sharing in international trade, the analysis of the nexus between outward foreign direct investment (FDI) and trade in *intermediate* goods has become more important than ever. The concern in policy circles in industrial countries is the 'following-leader' pattern of overseas investments, where part suppliers' investments follow their customers' investments abroad. The root of such a concern being that this pattern could replace intermediate exports from a home country, thereby depriving the locals of job opportunities and deindustrialising the domestic economy (Navaretti and Falzoni 2004, Yamashita and Fukao 2010). The following-leader investments are a result of the localisation strategy of MNEs in host countries and are due to transportation costs and foreign currency risks as well as just-in-time management and modularity (Sturgeon et al 2008).[2]

The important empirical issue relating to intermediate trade is the aggregation bias caused by the nature of the conventional data such as firm-, industry- and country-

[1] In the recent literature an array of alternative terms have been used to describe this phenomenon including 'fragmentation' and 'international outsourcing' (Jones and Kierzkowski 1990, Helpman 2006).

[2] The modularity results in large modules (e.g. Cockpit Module, Chassis Module, Axle Module, Front/Rear End Module, Door Module), which are more difficult and expensive to ship over long distances and are more likely to be coordinated tightly with the final assembly process, leading to the co-location of automaker and parts suppliers (Sturgeon et al 2008).

level trade data. Given that firm-level data, for example, does not provide information on trade by products, it is difficult to separate the substitute effects from the complementary effects. To deal with this problem, previous studies employ product level data that make it possible to estimate the impact of FDI by upstream firms (e.g. part suppliers) on intermediate trade, controlling for the complementary effects resulting from FDI by downstream firms (e.g. automakers) (Blonigen 2001, Head et al 2004).

The purpose of this study is to examine the substitution hypothesis that FDI by upstream firms (i.e. part suppliers) replaces intermediate (i.e. auto part) exports from home, using the case of Japanese automobile industry. The focus on the Japanese automobile industry is motivated by the established view that when Japanese automakers build production plants abroad, they attempt to transplant the efficient supplier relationships forged locally to the host country to achieve competitive advantages. These include a just-in-time inventory system and quality control (Head et al 1995, 1999, Banerji and Sambharya 1996, Blonigen et al 2005).

I analyse newly constructed product level data on auto part exports from Japan covering 37 products and 49 countries over the period 1999 to 2008. The model is estimated by the Poisson pseudo-maximum-likelihood (PPML) technique, which has the advantage of decreased estimation bias.

The results do not support the substitution hypothesis. Rather, this study finds that auto part exports from Japan are positively correlated with the overseas operations of Japanese part suppliers. The interesting finding is that the degree of complementarity between Japanese suppliers' FDI and auto part exports from Japan is stronger than the counterpart between Japanese automakers' FDI and auto part exports from Japan. These findings are consistent with the fact that Japanese suppliers predominantly sell their products to Japanese automakers at the initial stage, but are expanding their business with non-Japanese automakers in host countries over time (IRC 2009). In addition, overseas subsidiaries of Japanese suppliers are now exporting their products to automakers in other countries within the region (IRC 2010).

This paper adds to the fledgling literature on the relationship between FDI and trade in intermediate goods and relates closely to Blonigen (2001). As far as I am aware, this is the first paper to find a complementary relationship between FDI by upstream firms (i.e. part suppliers) and intermediate (i.e. auto part) exports from home, using the product level data. The other contribution of this study is the use of newly constructed product level data, enabling endogeneity and aggregation bias to be addressed simultaneously. Estimations in this paper are also for a larger sample of products (37), cover a wider range of host countries (49) and a more recent time period (1999-2008) than used in Blonigen (2001).

The rest of this paper is structured as follows: Section 2 summarises the literature on the relationship between FDI and exports from home with a particular focus on two empirical issues-endogeneity and aggregation bias. Section 3 presents the empirical model, data and measurement of variables and discusses the estimation methods. Section 4 reports the estimation results and Section 5 discusses the key results of Section 4. Finally, Section 6 concludes the paper.

2. FDI-Trade Nexus: Empirical Issues

Although the empirical analysis of the nexus between FDI and *intermediate* trade is still limited, FDI-trade nexus itself has been a classic agenda in international economics since Mundell's seminal work 'International Trade and Factor Mobility' (1957). One stylised fact is that although the theoretical literature postulates the possibility of both substitution and complementarity between FDI and exports from the home country, empirical research has consistently found a complementary relationship between these two variables (Table 1).[3]

-Table 1 here-

A positive relationship can be explained by at least two factors (Head and Ries 2004). First, the expansion of a firm's product in a given foreign market could lead to an increase in demand for the firm's other products. This is called 'statistical complementarity'. Second, investment abroad by a downstream firm (e.g. automaker) could create demand for parts and components, leading to an increase in export demand for upstream firms (e.g. part suppliers) in a home country. This is called 'economic complementarity'.

The difficulty in finding a substitution relationship between FDI and exports has been an empirical issue which has not been settled over the past decades. Previous research has explored two statistical concerns in an attempt to address this issue. One has been possible endogeneity bias resulting from omitted variables that simultaneously determine FDI and exports. It might be argued that

[3] See Mundell (1957) and Markusen (1995) for theoretical studies.

unobservable variables related to policy in a host country could be a cause of complementarity between FDI and exports. For example, liberalisation policy favourable to trade and FDI in a host country might encourage MNEs to increase both exports from the home country and the activities of their overseas affiliates in the same host country. The other concern is that firm and industry heterogeneity might cause upward bias. Helpman et al (2004) suggest that firm heterogeneity, in terms of productivity and size, is important as a determinant of firms' exports and FDI: the more productive the firm, the more the firm exports and invests overseas. Previous research has attempted to reduce omitted variable bias in one of two ways. The first controls for observable variables at the country, industry, and firm level. Many previous studies employ a gravity equation as an analytical framework, (Table 1) which is able to capture observable country specific factors such as trade costs, market size, and income level. Within the gravity model, Lipsey and Weiss (1981) and Kim (2000) add a dummy variable for membership in the EEC (European Economic Community) to control for the downward bias derived from a free-trade area. Yamawaki (1991) employs industry level data and attempts to control for observable industry-specific variables such as the size of industry, and the industry's capital intensity, while Lipsey and Weiss (1984) employ firm-level data and control for the size of the parent firm. Chedor et al. (2002) and Head and Ries (2001) attempt to control for a wider variety of time varying firm characteristics such as size, capital intensity, productivity, and expenditure on R&D.

The second way to avoid the endogeneity problem is to employ an estimation method such as instrumental variable (IV) estimation (Blomstrom et al 1988, Grubert and Mutti 1991, Clausing 2000). However, previous studies have not found a substitution relationship between FDI and exports overall despite efforts to reduce possible endogeneity bias.

Another statistical concern is aggregation bias which results from the nature of conventional firm, industry and country level trade data. Given that firm level data, for example, does not provide information on trade by product, the greater the extent that the firm is multiproduct, the more difficult it becomes to identify a substitution.[4] For example, if a firm produces two products (A and B) and only

[4] The multiproduct nature is a common feature of contemporary multinational enterprises. For example, automakers produce a wide variety of products, ranging from commercial cars (trucks and buses) and passenger cars to intermediate products such as engines, engine parts and transmission. In addition, it is common that auto parts suppliers involve several types of products.

product A is produced abroad, it is possible that the overseas production of product A increases demand for product B due to statistical complementarity. To the extent that the statistical complementarity for product B offsets the substitution effects arising from decreases in exports of product A, the relationship between FDI and exports would be complementary.

Another example is an economic complementarity. If a firm produces both an intermediate and a final good, it is possible that overseas production of a final product is associated with exports of intermediate goods from the home country. To the extent that the economic complementarity for the intermediate products offsets the substitution effects arising from the decrease in final products, the relationship between FDI and exports would be complementary. Economic complementarity also occurs when vertical networks between upstream and downstream firms play an important role (e.g. automobile industry). Suppose that an intermediate product is produced by an upstream firm A and a final product is produced by a downstream firm B. If only firm B produces a final product in the host country, it would be possible that overseas production of a final product is associated with exports of intermediate goods from an upstream firm A in the home country.

Product level data enables aggregation bias to be addressed by separating the substitute effects from the complementary effects which result from the nature of the vertical networks between upstream and downstream firms (Blonigen 2001). Suppose that an intermediate product is produced by two upstream firms (A and B) and is sold to a downstream firm. Only firm A produces abroad to supply its product to the downstream firm directly in the host country. Controlling for the economic complementarity for exports from firm B at home, it is possible to identify the substitute effects caused by the replacement of exports with overseas production by firm A.

The separation of trade data into intermediates and final goods has important implications for the FDI- trade nexus analysis. This is due to the growing concern over the 'following-leader' investments by part suppliers which could replace intermediate exports from a home country thereby depriving home country locals of job opportunities and deindustrialising the domestic economy (Navaretti and Falzoni 2004, Yamashita and Fukao 2010). The preclusion of economic complementarity allows for a more precise analysis of the impact of FDI by upstream firms on intermediate exports from home.

Despite the growing importance of the FDI and intermediate export nexus, as well as the potential importance of product level data, the empirical evidence is still limited. Blonigen (2001) undertakes product by product analyses by constructing time-series data for 10 products between Japan and the US during the period of 1978 to 1991. This analysis finds auto part exports from Japan are positively correlated with overseas production by Japanese automakers but negatively correlated with overseas production by Japanese suppliers. Head et al (2004) examine the case of the US by constructing three-dimensional panel data covering 53 products and 26 countries from 1989 to 1994, and find similar results.

This study extends Blonigen's analysis in several ways.[5] Firstly, by using newly constructed product level data covering 37 auto parts and 49 countries over the period 1999 to 2008 on exports from Japan, this analysis utilises more comprehensive and up to date data. Using a wider coverage of data gives the opportunity to address endogeneity and aggregation bias simultaneously. The endonegeity issue is addressed by controlling for unobserved country, product and year effects whereas the aggregation bias is tackled through product by product analyses. The increased number of observations also allows a greater estimation efficiency.

The extension of data coverage is prompted by the rapid expansion of global production networks by Japanese automakers and part suppliers over the past two decades. Asia, and particularly China, is emerging as a centre of global production networks whereas the importance of North America, and particularly the United States, is declining.[6] In line with this compositional change in overseas operations, the destination of auto part exports from Japan has shifted toward Asia. In 2008 Asia's share was 40%, followed by North America (31%) and Europe (20%). Thus,

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[5] It is important to note that the differences between this study and Blonigen (2001) are not only the dataset used but also model specification. This study examines determinants of auto parts exports from Japan by estimating a gravity equation whereas Blonigen (2001) estimates a demand function.

[6] Regarding overseas production (in volume) by Japanese automakers, the share of North America dropped from 42% in 1988 to 31% in 2008 whereas the share of Asia rose from 26% to 42% during the same period. In particular, the sharp contrast between these two regions reflects in the rise of China and the fall of the US. Regarding overseas operations by Japanese parts suppliers, their overseas subsidiaries are most concentrated in Asia: Out of 1,203 subsidiaries in 2008, 659 were located in Asia, followed by North America (290), and Europe (186).

the extension of country coverage allows a more accurate analysis of the FDI-trade nexus.

3. Estimation Strategy and Data

The Model and Data

In this section an explanation of the estimation model is followed by a discussion of the variable construction and estimation method. Following the convention, the estimation of the determinants of auto part exports employs a similar functional specification:

$$\ln(EX_{i,j,t}) = \alpha + \beta_1 \ln(FDI\_M_{j,t}) + \beta_2 \ln(FDI\_S_{j,t}) + \beta_3 \ln(DIS_j) + \beta_4 \ln(GDP_{j,t}) + \beta_5 \ln(PGDP_{j,t}) + \beta_6 \ln(NER_{j,t}) + \beta_7 \ln(NJP_{j,t}) + u_{i,j,t} \quad (1)$$

where subscripts i stands for i th auto part: i =1,…,37, j stands for the j th country: j =1,…,49 and t stands for the year: t =1999, 2002, 2005, and 2008.[7] The variables are listed and defined below with the expected sign of the coefficient for independent variables in parentheses:

EX	Export value of auto part *i* from Japan to host country *j* in Japanese yen
FDI_M	Scale of overseas operations by Japanese automakers in host country *j* (+)
FDI_S	Scale of overseas operations by Japanese suppliers in host country *j* (-)
DIS	Distance between Japan and a capital of host country *j* (-)
GDP	Gross domestic product (GDP) in host country *j* (+)
PGDP	GDP per capita in country *j* (+)
NER	Nominal exchange rate index in host country *j* (+)
NJP	Production volume by non-Japanese automakers in host country *j* (+)
α	A constant term
u	An error term

The scale of overseas operations by Japanese automakers (*FDI_M*) is a measure of outward FDI by Japanese automakers into the host country. It is expected that FDI by automakers increases auto part exports from Japan because of economic

[7] See Table 5 for the list of auto parts and the Appendix for the list of host countries.

complementarities (Head and Ries 2004). The scale of overseas operations by Japanese part suppliers (*FDI_S*) is used as a measure of outward FDI by Japanese suppliers into the host country. The negative coefficient supports the substitution hypothesis.

The destination GDP (*GDP*) and distance (*DIS*) are included as measures of market size and trade costs respectively. In addition to these gravity variables, three other control variables are included in the model. GDP per capita (*PGDP*) is added as a measure of the development level of the destination country. Controlling for development level matters because richer countries tend to have better ports, infrastructure, and communication systems that facilitate trade and FDI. More advanced countries also tend to have more developed supporting industries which encourage FDI, replacing exports from home with local procurement. The control for the exchange rate (*NER*) is relevant here because changes in the exchange rate causes changes in the relative price between home and host country, consequently affecting firms' decisions on exporting and FDI. The scale of non-Japanese automobile production in the destination country (*NJP*) allows for the control of the export-creating effect.

Japan's disaggregated trade data, classified according to the harmonised system (HS), in the Trade Statistics of Japan is compiled by the Ministry of Finance. This data enables the identification of auto parts at the 9 digit-level. However, careful attention must be paid to the classification of auto parts. While part and components for motor vehicles are predominantly classified into HS code 87, a large number of auto parts are classified under different headings – including tyres and rubber products (40), glass (70), electronic products (84, 85), seats (94), and so on. I base my classification of auto parts on the Japan Auto Parts Industries Association (JAPIA), which provides comprehensive coverage of auto part based on the HS code at the 9 digit level. The monetary unit of export value is Japanese yen.

The scale of overseas operations by Japanese suppliers is measured by the number of employees working at overseas affiliates of Japanese suppliers, in each destination country. The data is extracted from *Nihon no jidoshabuhin kogyo* [Japanese Auto Part Industry] compiled by the Japan Auto Part Industries Association (JAPIA) over a number of issues.

The scale of overseas operations by Japanese automakers is measured by the number of employees working at overseas affiliates of Japanese automakers in each destination country.[8] This data is taken from *Kaigai kigyo shinshutsu soran* [List of Japanese overseas affiliates] compiled by Toyo Keizai over a number of issues. Though there are a number of possible alternatives to measure the operations by firms, the number of employees is a better indicator and preferred for three reasons. First, the number of employees at overseas affiliates is closely correlated with the scale of production. Second, data on the number of employees at overseas subsidiaries is available for both automakers and suppliers. Third, data on the number of employees at overseas subsidiaries are available for a longer period.

Nominal gross domestic product and GDP per capita measured in $US are taken from World Development Indicators. Distance is obtained from the CEPII database and is measured using the geographical coordinates of the relevant capital cities. The nominal exchange rate index is constructed using the formula,

$$NER_{j,t} = Japanese\ Yen\ per\ \$US_t\ /\ Local\ currency\ per\ \$US_{j,t} = Japanese\ yen_t\ /\ Local\ currency_{j,t}$$

where *j* and *t* represent destination country and year, respectively. An increase in the index indicates the depreciation of the Japanese yen, which should lead to an expansion of auto part exported from Japan. The data for constructing the official exchange rate is obtained from the World Development Indicators. The data on non-Japanese automobile production comes from the International Organization of Motor Vehicle Manufacturers. I report the summary statistics for variables and correlation matrix in Tables 2 and 3.

-Table 2 here-

-Table 3 here-

Estimation Method

An endogeneity problem might arise due to the fact that the error term in equation (1) may include other difficult to control for variables which are correlated with overseas operations by Japanese automakers and suppliers. One

[8] I exclude non-manufacturing affiliates such as those involved in R&D, distribution, insurance and other non-manufacturing services.

such variable may be part specific characteristics including bulkiness, engineering and designing costs, and asset specificity, which could influence FDI and exports simultaneously (Head et al 2004). For example, it is likely that auto parts with higher asset specificity and engineering costs (e.g. catalytic converters, variable valve lift systems) are exported directly from a home country's headquarter plant, in order to avoid a breach of technology or information. On the other hand, bulky part such as body and chassis components are expected to be directly supplied by the host country rather than exported from a home country because of higher transportation costs. Other variables such as country specific effects (e.g. industrial and trade policies of the host country) and time varying factors (e.g. technological change and price changes) may affect overseas operations by MNEs and exports from their home countries.

One way to overcome the endogeneity problem is to employ an estimation method such as instrumental variable (IV) estimation (Blomstrom et al 1988, Grubert and Mutti 1991, Clausing 2000). However, IV approaches are not appropriate because of the difficulties in finding an instrument that is correlated with MNEs overseas activity, does not determine exports from the home country, and is excludable from the equation (Head and Ries 2001). An alternative method is to use a least squares dummy variables (LSDV) model, allowing controls for time-invariant unobservable factors among host countries such as distance, GDP, and so on. Therefore, in an effort to mitigate the possibility of endogeneity bias, I also include country, product, and time dummy variables into the model (1).

The Poisson pseudo-maximum-likelihood (PPML) technique is employed as the estimation method in this study. Estimating the constant-elasticity model (i.e. the log-log model) by ordinary least squares (OLS) might result in inconsistency estimates for two reasons (Silva and Tenreyro 2006). First is the strong assumption that the expected value of the error term is independent from any value of explanatory variables. Violation of this assumption leads to the inconsistency of the OLS estimator. Second, the parameters estimated by OLS might be biased under heterosckedasticity. In order to tackle these problems, Silva and Tenreyro (2006) propose the PPML technique as an alternative and by using a multiplicative form of the constant-elasticity model they demonstrate that PPML estimates are less susceptible to a bias. One of the useful properties of the PPML estimator is a wide range of applicability including panel data analysis (Wooldridge 1999). If we extend the PPML estimator for this study, equation (1) can be rewritten as the multiplicative form of the constant-elasticity model with the conditional expectation:

$$E\,(EX_{i,j,t} \mid FDI\_M_{j,t}\; FDI\_S_{j,t}\; DIS_j\; GDP_{j,t}\; PGDP_{j,t}\; NER_{j,t}\; NJP_{j,t})$$
$$= exp\,[\beta_1 \ln (FDI\_M_{j,t}) + \beta_2 \ln (FDI\_S_{j,t}) + \beta_3 \ln (DIS_j) + \beta_4 \ln (GDP_{j,t}) + \beta_5 \ln (PGDP_{j,t}) + \beta_6 \ln (NER_{j,t}) + \beta_7 \ln (NJP_{j,t})] \qquad (2)$$

Thus, the equation (2) is estimated by the PPML estimator in this study.

4. Results

Table 4 reports PPML estimates with panel data covering almost 7,000 observations. The overall goodness-of-fit of the regression ranges from 0.45 to 0.89, which is sufficient to conduct an econometric analysis. The first column shows the specification within the simple gravity equation where only overseas operations by automakers are included. The coefficient of overseas operations by automakers (*FDI_M*) is positive and statistically significant at the 1% level, predicting that, overall, a 10% expansion of overseas production by Japanese automakers leads to a 1.3% increase in auto part exports from Japan. Likewise, the second column reveals a complementary relationship between overseas operations by Japanese suppliers and auto part exports from Japan. When overseas production by both automakers and suppliers are added to the model (third column), both coefficients are still positive and significant. However, their different magnitudes deserve some attention: the coefficient of overseas operations by suppliers (0.21) is three times larger than that of overseas operations by automakers (0.07). The fourth to seventh columns where relevant variables are controlled show the robustness of this finding: the coefficients of overseas operations by Japanese suppliers are invariably larger comparing with those of overseas operations by Japanese automakers.

-Table 4 here-

The coefficients of the two central gravity variables have expected signs with significant levels. The negative coefficient of distance reflects the importance of proximity for trade. The economic size for host countries is a highly significant predictor of auto part export from Japan. The positive and significant coefficients of GDP per capita support the importance of the development level of the destination country in facilitating trade through better ports, infrastructure, and communication systems. Unexpectedly however, the coefficients of nominal exchange rate are negative and statistically significant. However, this result is not meaningful due to their small economic significance (-0.05). The sign of the coefficient of non-Japanese production in the host country is also against the expectation however, is not statistically significant. It should be noted that the unobservable product-specific characteristics including bulkiness, engineering and designing costs, and asset specificity are important in explaining the significant auto part exports from Japan. Pseudo R-square substantially rises to 0.84 after product dummies are added into the model (column 6).

This study goes one step further by undertaking product by product analyses, estimating equation (2) separately for 37 products. This analysis is motivated by two reasons. The first is to address the possible aggregation bias that complicates the identification of substitution effects (Blonigen 2001). The second is to compare the estimation result with previous studies, particularly that of Blonigen (2001), which undertakes product by product analyses for 10 auto parts in the case of auto part exports from Japan.

Table 5 presents the results. Overall each product has enough observations and the goodness-of-fit of each regression is sufficient (third and fourth columns). As can be seen, the positive and significant coefficients of overseas operations by both automakers and suppliers are found for a wide variety of products. 27 estimates of overseas operations by Japanese automakers are positive and significant with at least a 10% significance level whereas no negative and significant estimate is found. For overseas operations by Japanese suppliers, 32 estimates are positive and significant whereas the negative and significant estimate is not found. The results clearly suggest that overseas operations by Japanese suppliers plays a more important role in increasing auto part exports from Japan than overseas operations by Japanese automakers: in comparison with overseas operations by automakers, the positive and significant coefficients of overseas operations by suppliers are larger for 25 products.

-Table 5 here-

5. Discussion

Through product by product analyses, Blonigen (2001) found that auto part exports from Japan are positively correlated with overseas operations by Japanese automakers but negatively correlated with overseas operations by Japanese suppliers. The empirical analyses in this study support the former finding but not the latter. Furthermore, it has been found that the complementary relationship between overseas operations by Japanese suppliers and auto part exports from Japan is stronger than the counterpart between overseas operations by Japanese automakers and exports. In order to explore these findings further, this section addresses the following two questions: why do overseas operations by suppliers complement exports from home? And also why are overseas operations of automakers and exports complementary?

Why Do Overseas Operations by Suppliers Complement Exports from Home?

One hypothesis is that the market penetration of Japanese part suppliers in host countries is expanding over time, leading to an increase in total demand for the firms' products (statistical complementarity). Japanese suppliers originally follow the overseas investments of Japanese automakers, predominantly selling their products to automakers. Their customers are limited because they are not yet recognised in the host country market. At this stage, it is expected that the substitution effects of overseas operations by Japanese suppliers on auto part exports from Japan is strong as found in Blonigen (2001). Blonigen's empirical analyses (2001) covered the time period of 1978-1991, suggesting that these were the formative period of overseas operations by Japanese auto part suppliers.

In recent years, Japanese auto part suppliers such as Denso have been expanding their overseas operations to meet expanding demand from both Japanese and non-Japanese automakers (IRC 2009).[9] This growing market penetration of Japanese part suppliers tends to increase demand for some part and components produced in Japan. In addition to the domestic market, overseas subsidiaries of Japanese suppliers are exporting their products to automakers in other countries within the regional free trade area such as ASEAN, EU, NAFTA and Mercosur (IRC 2010). The time period covered in this study (1999-2008) could be representative of these new developments. To test this hypothesis, I calculate the equation (2) by years and compare them. The results in Table 6 support this hypothesis. Relative to the coefficient of overseas operations by Japanese part suppliers in 1999 (0.14),

[9] As of 2009, Denso is selling products to GM, Ford and Chrysler in North America, VW, Volvo, Jaguar, Daimler, Audi, Land Rover, Fiat, Iveco, Maserati, Porche, Ford, SEAT, Renault, Alfa Romeo, Ferrari, Lamborghini, Lancia, PSA, and BMW in Europe, GM, BMW, Hyundai, and Tata in Asia (IRC 2009).

the counterpart in the following years are larger (0.21 in 2002, 0.29 in 2005 and 0.21 in 2008).

-Table 6 here-

Why Are Overseas Operations of Automakers and Exports Complementary?

Japanese automakers have gradually expanded their local procurements in host countries. In the case of Toyota, local procurements in North America and Europe reached 80% to 90% by 2008 (IRC 2009). The increasing overseas operations of Japanese part suppliers and the existence of competitive suppliers enables such a high local procurement rate in these regions. On the other hand, the local procurement in developing countries continues to be limited. In China, the local procurement for Land Cruiser is still less than 40% while in India, the local procurements for Innova and Altis are 55% and 35%, respectively (IRC 2009). This low local procurement is mainly due to the absence of competitive suppliers in these countries, although components suppliers have begun to follow the automakers, setting up plants there. Consequently, many components are still imported from Japan. One of the underlying factors that could cause complementary effects of overseas operations by Japanese automakers on auto part exports from Japan is that developing countries, particularly in Asia, have been emerging as a centre of global production networks for Japanese automakers over the past two decades. In order to examine this argument, I estimate the equation (2) by regions. As can be seen from the results in Table 7, the coefficient of overseas operations by Japanese automakers for Asia (0.31) is the largest among regions, suggesting the important role of economic complementarity.

-Table 7 here-

The strong vertical linkages between Japanese automakers and their suppliers can be considered an important element of the complementary relationship between overseas operations by Japanese automakers and auto part exports from Japan. The vertical linkages within production networks between Japanese automakers and their suppliers is characterised by a long-standing and stable hierarchical structure of division of labour (Nishiguchi 1994). It is well documented that the nature of these strong vertical networks limits the degree of substitutability between local procurement within host countries and auto part exports from Japan (Swenson 1997, Hackett and Srinivasan 1998). At the same time, the strong vertical network could reduce the complementarity by facilitating the following-leader investment of suppliers that could substitute for local procurement of auto part exports from Japan. In fact, the estimation results show that the magnitudes of the positive coefficients of overseas operations by Japanese automakers on Japan's auto part exports are smaller when overseas operations by suppliers are included in the model (Table 4). However, the positive coefficient of overseas operations by Japanese automakers remains statistically significant indicating that the export-creating effect of the vertical linkage is large enough to offset the export-reducing effects.

6. Conclusion

The objective of this study was to examine the substitution hypothesis that FDI by upstream firms replaces intermediate exports from home, using the case of the Japanese automobile industry. Through the analysis of newly-constructed product level data, this study has not supported such a hypothesis. The empirical results have rather shown that auto part exports from Japan and overseas operations by Japanese part suppliers are complementary. The interesting finding is that the degree of the complementarity is stronger than the counterpart between Japanese automakers' FDI and auto part exports from Japan. As far as I am aware, this is the first paper to find the complementary nexus between FDI by part suppliers and intermediate exports from home using the product level data. On the other hand, the key finding of this study is consistent with the counterpart of previous research that examines the FDI-trade nexus using the conventional trade data including firm, industry, and country level trade data.

The results of this study cast doubt on the popular view that the growing overseas activity of MNEs could replace exports from a home country thereby depriving the locals of job opportunities and deindustrialising the domestic economy. The expansion of overseas operations of MNEs under ongoing global production sharing could in fact strengthen trade relations between home and host countries. Given that MNEs are increasingly shifting their domestic operations abroad, particularly toward emerging countries such as China, India, Brazil and Russia, policymakers and journalists should respond to domestic employment and deindustrialisation based not on popular sentiment but empirical evidence.

Table 1: **Summary of previous research**[1]

Author	*Period*[2]	*Dependent Variable*[3]	*Measurement of MNEs' Overseas Activities*[4]	*Results*[5]	*Data*[6]	*Control Variables*[7]	*Method*[8]
Lipsey and Weiss (1981)	1970	US Exports, industry-level	Net sales of US affiliates including manufacturing and non-manufacturing	Comple ment	Cross-section (44 destinations)	GDP, Distance, Dummy for membership in EEC	OLS
Lipsey and Weiss (1984)	1970	Exports of US Parent Firms	Sales of manufacturing affiliates minus their imports from the US	Comple ment	Cross-section (1090 firms, 5 areas)	Scale of parent's firm, GDP, Sales by non-manufacturing affiliates	OLS
Blomstrom, Lipsey and Kulchycky (1988)	1982	US Exports, industry-level	Net sales of US affiliates in industry	Mixed	Cross-section (countries)	GDP, Per capita GDP	OLS, 2SLS
Blomstrom, Lipsey and Kulchycky (1988)	1978	Swedish Exports, industry-level	Net local sales	Comple ment	Cross-section (countries)	GDP, Per capita GDP	OLS, 2SLS
Chedor, Mucchielli and Soubaya (2002)	1993	Intra-Firm Exports of French Firms	Number of employees at French overseas affiliates	Comple ment	Cross-section (firm, 21 destinations)	Firm's characteristics (size, capital intensity, R&D), GDP and Distance	OLS
Kim (2000)	1994	South Korea's Exports, industry-level	Value of outward FDI	Comple ment	Cross-section (9 industries and 57 countries)	GDP, PGDP, Dummy for membership in EEC	OLS
Yamawaki (1991)	1986	Total Japanese Exports to US markets, industry-level	Total employment of Japanese distribution affiliates in US	Comple ment	Cross-section (44 industries)	Total industry employment in US, Total industry employment in Japan, etc	OLS
Lipsey, Ramstetter and Blomstrom (2000)	1986 - 1992	Exports of Japanese parent firms	Number of employees in parent's affiliates	Comple ment	Cross-section (firms, regions)	GDP, Per capita GDP, Distance, Total sales of parent	OLS
Lipsey and Ramstetter (2003)	1986 - 1995	Japan's Exports, industry-level	Number of employment in Japanese affiliates	Comple ment	Cross-section (96-98 countries)	GDP, Per capita GDP, Distance	OLS
Head and Ries (2001)	1966 - 1991	Japanese automaker's exports to world	Number of new manufacturing investment by automakers	Substitu te	Panel data (932 firms, 25 years)	Time-varying firm characteristics (Size, Capital	OLS

						Intensity, Labour Productivity, Wage)	
		Japanese supplier's exports to world	Number of new manufacturing investment by suppliers/by automakers	Complement/Complement	Panel data (932 firms, 25 years)	Time-varying firm characteristics (Size, Capital Intensity, Labour Productivity, Wage)	OLS
Blonigen (2001)	1978 - 1991	Japan's auto parts exports to US, product-level	Number of employees of Japanese suppliers' plants in US/ Number of vehicles produced by Japanese automakers in US	Substitute/ Complement	Time series (14 years)	Price, capital, US automobile production	OLS, SUR
Head, Ries and Spencer (2004)	1989 - 1994	US auto parts exports, product-level	Number of employees of US affiliates related to automobile industry/ Number of vehicles produced by Big 3	Substitute/ Complement	Panel data (53 products, 26 countries, 5 years)	Distance, Per capita GDP, Dummy for Mexico and Canada, Dummy for language, and communist	OLS

Notes:
[1] A large number of studies relevant to the relationship between FDI and exports from home country are not listed here due to the space limitation. Since this study examines the case of Japanese automobile industry, I focus only on literature related to developed countries including the United States, France, Sweden, Japan and South Korea. Also, this study has been interested in the analysis at disaggregated level therefore I focus only on industry-, firm-, and product-level analyses.
[2] Period of analysis.
[3] Dependent variables relating to exports from home country measured by various definitions according to the authors.
[4] Key variables related to MNE's overseas activities.
[5] Relationships between FDI and exports from home country derived from the regression analysis.
[6] Datasets employed in each study.
[7] Control variables. EEC represents European Economic Community.
[8] Estimation methods. SUR represents seemingly unrelated regression. 2SLS represents of two stage least squares.

Table 2: **Summary statistics**

Variables	Obs.	Mean	Standard Deviation	Min	Max
Ln Auto part exports, Japanese yen	7,130	11.60	2.86	5.30	19.72
Ln Overseas operations by suppliers	7,130	6.12	4.04	0	12.62
Ln Overseas operations by automakers	7,130	3.93	4.24	0	11.36
Ln GDP, $US	7,130	25.86	1.52	19.25	30.09
Ln GDP per capita, $US	7,130	8.67	1.41	5.59	10.65
Ln Distance, km	6,991	8.99	0.56	7.05	9.83
Ln Nominal exchange rate index	6,863	2.59	2.65	-5.06	5.61
Ln Non-Japanese automobile production	7,039	9.05	5.88	0	16.15

Table 3: **Correlation matrix**

	FDI_S	*FDI_M*	*GDP*	*PGDP*	*DIS*	*NER*	*NJP*
Ln Overseas operations by suppliers (*FDI_S*)	1						
Ln Overseas Operations by automakers (*FDI_M*)	0.62	1					
Ln GDP (*GDP*)	0.49	0.41	1				
Ln GDP per capita (*PGDP*)	0.10	-0.11	0.53	1			
Ln Distance (*DIS*)	-0.34	-0.06	-0.09	0.11	1		
Ln Nominal exchange rate index (*NER*)	-0.05	-0.06	0.29	0.63	0.38	1	
Ln Non-Japanese automobile production (*NJP*)	0.52	0.45	0.63	0.12	0.00	0.03	1

Table 4: **Poisson pseudo-maximum-likelihood (PPML) estimation**

Dependent variable: Exports of auto part from Japan (*EX*)	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Ln Overseas operations by Japanese automakers (*FDI_M*)	0.13***		0.07***	0.09***	0.10***	0.10***	0.08***
	(0.01)		(0.01)	(0.01)	(0.01)	(0.01)	(0.03)
Ln Overseas operations by Japanese suppliers (*FDI_S*)		0.29***	0.21***	0.21***	0.21***	0.22***	0.10**
		(0.03)	(0.03)	(0.03)	(0.03)	(0.02)	(0.04)
Ln Distance from Japan (*DIS*)	-0.27***	-0.01	-0.07	-0.20**	-0.20**	-0.23***	-0.36***
	(0.07)	(0.07)	(0.07)	(0.09)	(0.09)	(0.05)	(0.10)
Ln GDP in the Host Country (*GDP*)	0.72***	0.53***	0.54***	0.48***	0.48***	0.49***	0.52***
	(0.04)	(0.05)	(0.05)	(0.07)	(0.07)	(0.04)	(0.08)
Ln GDP per capita in the host country (*PGDP*)				0.22***	0.22***	0.23***	0.07
				(0.04)	(0.04)	(0.03)	(0.06)
Ln Nominal exchange rate (*NER*)				-0.05**	-0.05**	-0.05***	0.05
				(0.02)	(0.02)	(0.01)	(0.04)
Ln Non-Japanese production in the host country (*NJP*)				-0.02	-0.02	-0.02**	-0.08***
				(0.01)	(0.01)	(0.01)	(0.02)
Year dummy	No	No	No	No	Yes	Yes	Yes
Product dummy	No	No	No	No	No	Yes	Yes
Country dummy	No	No	No	No	No	No	Yes
Number of observations	6,991	6,991	6,991	6,701	6,701	6,701	6,701
Pseudo R-squares	0.45	0.46	0.46	0.47	0.47	0.84	0.89

Notes:
***, **, and * indicate statistical significance at the 1, 5, and 10 percent levels. Clustered heteroscedasticity-consistent standard errors are in parentheses. Coefficients on constants, year dummies, product dummies and country dummies are not reported.

Table 5: **Poisson pseudo-maximum-likelihood estimation (PPML) by products**

Dependent variable: Exports of auto parts from Japan (*EX*)		Ln Overseas operations by Japanese automakers (*FDI_M*)	Ln Overseas operations by Japanese suppliers (*FDI_S*)	R^2	Number of observations
1	Tire	-0.02	0.06	0.77	221
2	Glass	0.03	0.17	0.59	204
3	Leaf springs	0.05	0.28**	0.76	156
4	Mountings	0.21***	0.44***	0.86	170
5	Engine	0.22***	0.25**	0.83	211
6	Engine parts	0.11***	0.35***	0.87	219
7	Air Conditioners	0.02***	0.04**	0.65	192
8	Filters	0.08***	0.10**	0.69	209
9	Jacks/hoists	0.05	0.15**	0.61	150
10	Shafts and cranks	0.05**	0.37***	0.89	217
11	Gaskets	0.06***	0.12***	0.82	215
12	Electric engine parts	0.00	0.18***	0.89	211
13	Component of electric engine parts	0.09***	0.71***	0.85	191
14	Lighting/signaling equipment	0.13***	0.10*	0.75	209
15	Component of lighting/signaling equipment	0.12***	0.31***	0.83	198
16	Speakers	-0.01	0.33***	0.60	120
17	Car audio and radio	-0.03	0.25***	0.82	177
18	Lamps	0.08**	0.38***	0.87	195
19	Wire harness	0.14***	0.11***	0.85	186
20	Chassis and body	0.17***	0.25**	0.43	164
21	Bumpers	0.06	0.09	0.71	202
22	Seat belts	0.07***	0.44***	0.70	137
23	Body parts	0.15***	0.22***	0.86	215
24	Brake system	0.11***	0.32*	0.86	53
25	Gear box	0.12***	0.29***	0.87	205
26	Transmission	0.14***	0.41**	0.84	192
27	Wheels	0.06**	0.21**	0.89	197
28	Shock absorbers	0.03*	0.14**	0.69	213
29	Radiators	0.09**	0.10*	0.67	201
30	Mufflers and exhaust pipes	0.11***	0.17***	0.82	185
31	Clutches	0.04**	0.28***	0.81	212
32	Steering wheels	0.10**	0.12**	0.74	189
33	Airbags	0.02	0.68***	0.81	49
34	Other parts of motor vehicles	0.18***	0.37***	0.93	217
35	Motorcycle parts	0.02***	0.39***	0.76	204
36	Clocks	0.31***	0.43	0.80	83
37	Seats	0.16	-0.20	0.66	132
Pooled estimate with time dummy		0.10***	0.21***	0.47	6,701
Pooled estimate with time & country dummy		0.03	0.09***	0.89	6,701

Notes:
***, **, and * indicate statistical significance at the 1, 5, and 10 percent levels. Standard errors and coefficients on other variables (distance, GDP, GDP per capita, exchange rate, non-Japanese automobile production) are not reported. Time-specific effects are controlled for, but not reported.

Table 6: **Poisson pseudo-maximum-likelihood (PPML) estimation by years**

Dependent variable: Exports of auto part from Japan (*EX*)	1999	2002	2005	2008	Pooled Estimates
Ln Overseas operations by Japanese automakers (*FDI_M*)	0.09***	0.13***	0.09***	0.08***	0.10***
	(0.02)	(0.02)	(0.03)	(0.02)	(0.01)
Ln Overseas operations by Japanese suppliers (*FDI_S*)	0.14***	0.21***	0.29***	0.21***	0.22***
	(0.03)	(0.05)	(0.05)	(0.05)	(0.02)
Ln Distance from Japan (*DIS*)	-0.22**	-0.19*	-0.23**	-0.26***	-0.23***
	(0.10)	(0.11)	(0.09)	(0.08)	(0.05)
Ln GDP in the Host Country (*GDP*)	0.61***	0.55***	0.43***	0.43***	0.49***
	(0.06)	(0.08)	(0.09)	(0.07)	(0.04)
Ln GDP per capita in the host country (*PGDP*)	0.30***	0.31***	0.22***	0.15***	0.23***
	(0.05)	(0.06)	(0.06)	(0.06)	(0.03)
Ln Nominal exchange rate (*NER*)	-0.04	-0.12***	-0.03	-0.03*	-0.05***
	(0.03)	(0.03)	(0.03)	(0.02)	(0.01)
Ln Non-Japanese production in the host country (*NJP*)	-0.03*	-0.06***	-0.02	-0.00	-0.02**
	(0.02)	(0.02)	(0.02)	(0.01)	(0.01)
Year dummy	No	No	No	No	Yes
Product dummy	Yes	Yes	Yes	Yes	Yes
Number of observations	1,648	1,621	1,630	1,802	6,701
Pseudo R-squares	0.85	0.87	0.87	0.83	0.84

Notes: ***, **, and * indicate statistical significance at the 1, 5, and 10 percent levels. Clustered heteroscedasticity-consistent standard errors are in parentheses. Coefficients on constants, year dummies and product dummies are not reported.

Table 7: **Poisson pseudo-maximum-likelihood (PPML) estimation by products**

Dependent variable: Exports of auto part from Japan (*EX*)	Asia	Europe	North America	South America	Pooled Estimates
Ln Overseas operations by Japanese automakers (*FDI_M*)	0.31***	0.06***	0.05	0.05	0.10***
	(0.03)	(0.01)	(0.03)	(0.04)	(0.01)
Ln Overseas operations by Japanese suppliers (*FDI_S*)	-0.02	0.16***	0.17	0.04	0.22***
	(0.04)	(0.03)	(0.32)	(0.17)	(0.02)
Ln Distance from Japan (*DIS*)	-0.14	-2.99***	47.54**	-1.31	-0.23***
	(0.10)	(0.53)	(23.10)	(3.66)	(0.05)
Ln GDP in the Host Country (*GDP*)	0.38***	0.24***	-1.19	0.88	0.49***
	(0.06)	(0.08)	(1.14)	(0.95)	(0.04)
Ln GDP per capita in the host country (*PGDP*)	0.82***	0.58***	3.10*	-0.71	0.23***
	(0.06)	(0.10)	(1.69)	(0.68)	(0.03)
Ln Nominal exchange rate (*NER*)	-0.08***	0.07	0.14	0.04	-0.05***
	(0.02)	(0.06)	(0.50)	(0.18)	(0.01)
Ln Non-Japanese production in the host country (*NJP*)	0.01	0.10***	0.99*	0.07	-0.02**
	(0.01)	(0.02)	(0.53)	(0.12)	(0.01)
Year dummy	Yes	Yes	Yes	Yes	Yes
Product dummy	Yes	Yes	Yes	Yes	Yes
Number of observations	1,928	2,658	651	624	6,701
Pseudo R-squares	0.82	0.72	0.97	0.87	0.84

Notes: ***, **, and * indicate statistical significance at the 1, 5, and 10 percent levels. Clustered heteroscedasticity-consistent standard errors are in parentheses. Coefficients on constants, year dummies and product dummies are not reported.

Appendix : **List of Countries**

Asia	**Europe**	**North America**	**South America**	**Others**
China	Austria	Canada	Argentina	Australia
Hong Kong	Belgium	Mexico	Brazil	South Africa
India	Bulgaria	United States	Columbia	New Zealand
Indonesia	Czech Republic		Ecuador	Samoa
Iran	Finland		Peru	Saudi Arabia
Malaysia	France		Venezuela	
Pakistan	Germany			
Philippines	Hungary			
Republic of Korea	Ireland			
Singapore	Italy			
Sri Lanka	Netherlands			
Taiwan	Norway			
Thailand	Poland			
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References:

Athukorala, P. C., Yamashita, N., 2006. Production fragmentation and trade integration: East Asia in a global context. *The North American Journal of Economics and Finance* 17, 233-256.

Banerji, K., Sambharya, R. B., 1996. Vertical Keiretsu and International Market Entry: The Case of the Japanese Automobile Ancillary Industry. *Journal of International Business Studies* 27 (1), 89-113.

Blonigen, B., 2001. In search of substitution between foreign production and exports. *Journal of International Economics* 53, 81-104.

Blonigen, B., Ellis, C.J., Fausten, D., 2005. Industrial groupings and foreign direct investment. *Journal of International Economics* 65, 75- 91.

Blomstrom, M., Lipsey, R.E., Kulchycky, K., 1988. U.S. and Swedish Direct Investment and Exports. In: Baldwin, R. (Eds.). *Trade Policy Issues and Empirical Analysis*. Chicago:University of Chicago Press, 259-297.

Chedor, S., Mucchielli, J.L., Soubaya, I., 2002. Intra-firm trade and foreign direct investment: an empirical analysis of French firms. In: Lipsey, R., Mucchielli, J.L. (Eds.). *Multinational firms and impacts on employment, trade and technology*. New York: Routledge, 43-83.

Clausing, K.A., 2000. Does Multinational Activity Displace Trade? *Economic Inquiry* 38 (2), 190-205.

Grubert, H., Mutti, J., 1991. Taxes, Tariffs, and Transfer Pricing in Multinational Corporate Decision Making. *Review of Economics and Statistics* 73, 285-293.

Hackett, S. C., Srinivasan, K., 1998. Do supplier switching costs differ across Japanese and US multinational firms? *Japan and the World Economy* 10, 13-32.

Head, K., Ries, J., 2001. Overseas Investment and Firm Exports. *Review of International Economics* 9, 108-122.

Head, K., Ries, J., 2004. Exporting and FDI as Alternative Strategies. *Oxford Review of Economic Policy* 20 (3), 409-423.

Head, K., Ries, J., Swenson, D., 1995. Agglomeration benefits and location choice: Evidence from Japanese manufacturing investments in the United States. *Journal of International Economics* 38, 223-247.

Head, K., Ries, J., Swenson, D., 1999. Attracting foreign manufacturing: Investment promotion and agglomeration. *Regional Science and Urban Economics* 29 (2), 197-218.

Head, K., Ries, J., Spencer, B.J., 2004. Vertical Networks and Auto Part Exports: Is Japan different?' *Journal of Economics and Management Strategy* 13, 37-67.

Helpman, E., Melitz, M.J., Yeaple, S.R., 2004. Export versus FDI with Heterogeneous Firms. *American Economic Review* 94, 300-316.

Industrial Research & Consulting (IRC)., 2009. *Toyota jidosha no sekaisenryaku zittaichosa 2009* [Investigation on Global Strategy of Toyota Motors 2009]. Nagoya: IRC Co., Ltd.

Industrial Research & Consulting (IRC)., 2010. *Nihon jidosha buhinsangyo no zittai 2010* [Investigation on Japanese auto part industry 2010]. Nagoya: IRC Co., Ltd.

Kim, S., 2000. Effects of Outward Foreign Direct Investment on Home Country Performance: Evidence from Korea. In: Ito, T., Kruger, A. (Eds.). *The Role of Foreign Direct Investment in East Asian Economic Development*. Chicago: The University of Chicago Press, 295-317.

Kimura, F., Ando, M., 2005. Two-dimensional fragmentation in East Asia: Conceptual framework and empirics. *International Review of Economics and Finance* 14, 317-348.

Lipsey, R.E., Ramstetter, E., Blomstrom, M., 2000. Outward FDI and parent exports and employment: Japan, the United States, and Sweden. *Global Economic Quarterly* 1, 285-302.

Lipsey, R.E., Ramstetter, E., 2003. Japanese exports, MNC affiliates, and rivalry for export markets *Journal of the Japanese and International Economies* 17 (2), 101-117.

Lipsey, R.E., Weiss, M.Y., 1981. Foreign Production and Exports in Manufacturing Industries. *The Review of Economics and Statistics* 63, 488-494.

Lipsey, R.E., Weiss, M.Y., 1984. Foreign Production and Exports of Individual Firms. *The Review of Economics and Statistics* 66, 304-308.

Markusen, J. R., 1995. The Boundaries of Multinational Enterprises and the Theory of International Trade. *Journal of Economic Perspectives* 9 (2), 169-189.

Mundell, R. A., 1957. International Trade and Factor Mobility. *American Economic Review* 47, 321-335.

Navaretti, G. B., Venables, A.J., 2004. Home Country Effects of Foreign Direct Investment. In: Navaretti, G.B., Venables, A.J. (Eds.).*Multinational Firms in the World Economy*. Princeton and Oxford: Princeton University Press, 217-239.

Nishiguchi, T., 1994. *Strategic Industrial Sourcing: the Japanese Advantage*. New York: Oxford University Press.

Silva, J.M.C.S., Tenreyro, S., 2006. The log of gravity' *Review of Economics and Statistics* 88, 641-658.

Sturgeon, T., Biesebroeck, J.V., Gereffi, G., 2008. Value Chains, Networks and Clusters: Reframing the Global Automotive Industry. *Journal of Economic Geography*, 1-25.

Swenson, D.L., 1997. Explaining Domestic Content: Evidence from Japanese and U.S. Automobile Production in the United States. In: Feenstra, R. (Eds.). *The Effects of U.S. Trade Protection and Promotion Policies*. Chicago: University of Chicago Press, 33-53.

Yamashita, N., Fukao, K., 2010. Expansion abroad and jobs at home: Evidence from Japanese multinational enterprises. *Japan and the World Economy* 22 (2), 88-97.

Yamawaki, H., 1991. Exports, and Foreign Distributional Activities: Evidence on Japanese Firms in the United States. *The Review of Economics and Statistics* 73 (2), 294-300.

Yeats, A. J., 1998. Just How Big is Global Production Sharing? *Policy Research Working Paper* 1871, Washington, DC: The World Bank.

Wooldridge, J. M., 1999. Distribution-Free Estimation of Some Nonlinear Panel Data Models. *Journal of Econometrics* 90, 77-97.

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