The Effects of Overseas Operations on Home Employment of Japanese Multinational Enterprises*

Nobuaki Yamashita
Faculty of Economics and Finance, La Trobe University
E-mail: N.Yamashita@latrobe.edu.au

and

Kyoji Fukao
Institute of Economic Research, Hitotsubashi University
E-mail: k.fukao@srv.cc.hit-u.ac.jp

May 28, 2008

Abstract:
This paper examines the 'exporting job' hypothesis that expansion of overseas operations of Japanese manufacturing multinational enterprises (MNEs) reduces home employment. While the existing studies are mainly based at the industry level, this paper presents the evidence using a newly constructed firm-level panel data set over the period 1991-2002. In spite of concerns expressed about the adverse effects of FDI on the domestic economy, the evidence does not support the view that overseas operations expand at the cost of home employment in Japan. On the contrary, there is some evidence to suggest that overseas operations may have helped to maintain the level of home employment in Japanese manufacturing during the period under study.

Key Words: Multinational Enterprises, FDI, Labour demand, Hollowing out of Japanese manufacturing, Globalisation
JEL Classification: F14, F16, F23, J23

*This study was conducted as part of the project on industry and firm-level productivity in Japan undertaken by Research Institute of Economy, Trade and Industry (RIETI). The authors would like to thank RIETI and the Ministry of Economy, trade and Industry (METI) for the dataset available to this study. We are grateful to Prema-chandra Athukorala for useful comments and suggestions. The detailed comments from Sisira Jayasuriya and Shiro Armstrong are also greatly acknowledged. The part of this research was undertaken when the first author was visiting the Institute of Economic Research at Hitotsubashi University, which provided a supportive and hospitable environment.

The Effects of Overseas Operations on Home Employment of Japanese Multinational Enterprises

1 Introduction

The debate over the possible adverse effects of overseas production by multinational enterprises (MNEs) on home employment first emerged in the US in the late 1960s and has gained increased attention in policy circles of industrial countries in recent years with the growing importance of international fragmentation of production (Lipsey 1995; Harrison and McMillan 2006). The relocation of production to overseas location and the associated shift in employment is known as the 'exporting jobs hypothesis' in the literature (Kravis and Lipsey 1988). It also became the subject of heated policy debate in Japan under the label of 'manufacturing hollowing-out' following a surge of Japanese FDI outflow associated with the spread of production networks to low cost countries in East Asia from the mid-1980s.

Despite its importance, very few systematic empirical studies are available for Japan and they are based on readily-available industry-level FDI (Fukao 1995; Fukao and Amano 1998; Fukao and Yuan 2001). There is virtually no information on the impact of MNEs foreign operation on their home employment levels.[1] This is certainly an area where studies on Japanese MNEs lag behind those of the US and Sweden-based MNEs (Lipsey 1995; Brainard and Riker 1997; Braconier and Ekholm 2000; Fors and Kokko 2000; Desai et al. 2005; Harrison and McMillan 2006).

This paper aims to fill this gap by undertaking firm-level analysis of the effects of expanded overseas operations of Japanese MNEs on home (domestic) employment, controlling for industry aggregation and geographic locations of foreign affiliates reflecting the specific regional and characteristics of overseas operation of MNEs. The panel data set compiled from the unpublished returns to two firm-level surveys of Japanese firms and their foreign affiliates, *the Basic Survey of Business Structure and Activity* and *the Basic Survey of Overseas*

[1] The exception is Head and Ries (2002) whose work examines data for Japanese manufacturing MNEs from Toyo Keizai, but they focus on the effects of expanded overseas operations on skill composition of home employment in Japanese firms.

Japanese Business Activity, collected by Japan Ministry of the Economy, Trade and Industry (METI) over the period 1991-2002.[2]

The findings of this paper do not support the hypothesis that the expanded overseas operations have had any adverse effects on home employment of Japanese manufacturing MNEs over the period under study, despite concerns expressed on the adverse effects of outward FDI. Instead, some evidence of a complementary relationship between overseas operations of MNEs and their home employment is found.

The next section summarises the theoretical discussion and the existing empirical evidence on the impacts of overseas operation on MNEs' home economic activity. Section 3 describes construction of the firm-level panel data set employed in our analysis. The following section introduces the econometric specification and the estimation method, followed by interpretation on the results in Section 5. Section 6 concludes.

2 The Effect of the Overseas Operations on Domestic Operations of MNEs

Theory

In principle, there is little guidance from theory on the effects of overseas operations of MNEs on home economic activity. One view argues that for a fixed level of overall production including parent and affiliate production, any expansion in the overseas operations of MNEs simultaneously reduces domestic operations (*the substitution effect*). However, this simplistic substitution story ignores the positive effects of overseas expansion on domestic activity. It is equally possible that increased overseas operations might enhance the scale of home economic activity due to better resource allocations and the expanded overseas market (*the scale effect*). Therefore, the net impact of increased overseas operation on home economic activity can be either *positive* or *negative*, depending on the magnitude of the scale and the substitution effects (Hanson et al. 2003).

[2] Fortunately, Japan is one of the few countries, besides the US and Sweden, where detailed information on the overseas operations of national firms has been collected systematically over a long period of time. (Lipsey 2003) Recently, these firm-level surveys containing direct measures of Japanese MNEs' performance have become increasingly available to researchers (Kimura and Ando 2003, 2005; Ando and Kimura 2005; Hijzen et al. 2006; Kimura and Kiyota 2006; Shimizutani and Todo 2007; Todo and Shimizutani 2008). However, none of them has explored the issue of our paper.

The net effect of overseas operation can also vary with different types of MNEs (Caves 1996). In general, the theory postulates two types of MNEs, depending on the investment motivation: *vertical* or *horizontal.* The former type of MNEs vertically separate the production process between parent MNEs and their foreign affiliates. MNEs of this type are usually motivated to take advantage of the existence of international factor price differentials between home and host country. In this case, overseas and domestic employment can be substitutes, since some domestic operations are directly relocated to overseas locations. However, it is possible that the domestic operation is expanded due to the enhanced production efficiency of vertical specialisation.

The horizontal type of MNE overseas operations are motivated by the objective of expanding overall sales. In this case, expanded overseas operations may either have little effect on the scale of the domestic operation of MNEs or their domestic operations may even expand due to the expanded worldwide scale of production.[3] Beyond this theoretical classification of MNE types, the postulated relationship between overseas and domestic employment might also depend on the extent to which overseas operations are located in developed as opposed to developing countries, and also whether foreign affiliates have plant-level or firm-level economies of scale. To date, the theory of MNEs does not provide clear-cut predictions about the possible effects of foreign production on home operations.

Evidence

Much of empirical research on the effects of overseas operations on home operations is based on US MNEs (Kravis and Lipsey 1988; Lipsey 1995; Brainard and Riker 1997; Hanson et al. 2003; Desai et al. 2005; Harrison and McMillan

[3] Complex integration forms another type of MNEs (UNCTAD 1998, 2002; Yeaple 2003). This type shares certain features of both the vertical and horizontal types. Any MNE might set up integrated production to serve a foreign country market, and might also choose to operate in another host foreign country for the purpose of assembly. They establish foreign affiliates to save on transportation costs, and also establish affiliates in other foreign countries in order to benefit from international factor price differentials. As a result, the net impact of all of these overseas operations depends on the extent and magnitude between the vertical and horizontal type of operations.

2006). These studies make use of firm-level survey data from the Bureau of Economic Analysis (BEA), the US Department of Commerce.[4]

Kravis and Lipsey (1988) and Lipsey (1995) examined the impact of foreign production on the home employment of US MNEs and found that foreign production in developing countries reduces home employment. Brainard and Riker (1997) in a more systematic analysis found evidence of a rather weak substitution relationship between foreign and domestic employment for the period 1983-1992. A strong substitution relationship was found among the various foreign affiliates of MNEs, operating in developing countries. The evidence suggests that any employment substitution effect takes place mainly among foreign affiliates of MNEs operating in overseas locations rather than between parent firms and their foreign affiliates.

Hanson et al. (2003) find that expansion in the sales of foreign affiliates of US MNEs raise labour demand for their home operations, although the quantitative effect is small. This finding supports a hypothesis of a mild complementary relationship between increased overseas sales and parent employment. Their second major finding suggests that changes in the prices of high-skilled employment in foreign affiliates tend to increase overall employment, both in foreign affiliates and parent firms. On the other hand, where the cost of unskilled labour for foreign affiliates is lower, the US parent firms reduce home employment.

Desai et al. (2005) find evidence that of increased overseas operations of US MNEs enhance the scale of home operations, using various indicators. Harrison and McMillan (2006) also explore the BEA data sets, covering the long period of 1977-1999. They find strong evidence that the employment of foreign affiliates in developing countries substitutes for the home employment of parent firms in US manufacturing. However, the effect is quantitatively small. On the other hand, home employment in the US and the employment of foreign affiliates in developed countries are found to be complementary, characterised by a decline

[4] The BEA data is a comprehensive and integrated data set for tracking the operations of US MNEs' non-bank foreign affiliates in host countries and the operation of parent firms in their home countries. The survey began in 1929, but its scope was initially limited to one question – the value of foreign commercial assets controlled by US companies (See Mataloni (1995) for more details).

in employment both at home and developed countries. By and large, their findings are consistent with those of Brainard and Riker (1997).

Fukao (1995) makes an early attempt to examine the possible impacts of foreign affiliate production on domestic employment for Japan.[5] Fukao and Yuan (2001) develop a 3-digit level of cross-industry data, concerning the impact of FDI on the employment growth rate over the period 1989 to 1998. The unique feature of their study is the differentiation of FDI by investment motivation and region of the host country. Fukao and Yean (2001) find that Japanese FDI in East Asia led to shedding of around 600,000 workers at home. They also find that market-oriented FDI in East Asia appeared to increase home country employment.

Overall, two major inferences can be drawn from the existing studies. First, the evidence on the net effects of overseas operations on home employment of MNEs is, at best, mixed (at least, for the US MNEs studies). Second, the results obtained are largely affected by the geographic location of foreign affiliates and income level of host countries. These considerations are taken into account in the following econometrics analysis.

3 Construction of the Panel Data[6]

The data set used in this study using information on parent firms extracted from the Basic Survey of Business Structure and Activity (*Kigyo Katsudou Kihou Chosa* in Japanese) and the information on their corresponding foreign affiliates from the Basic Survey of Overseas Japanese Business Activity (*Kaigai Gigyou Katsudou Kihon Chosa* in Japanese). Both surveys are conducted by the Ministry of Economy, Trade and Industry (METI) (Appendix 1 discusses each survey in detail). For brevity, the former will henceforth be called the 'METI Firm survey' and the latter the 'METI Foreign Affiliates survey'.

The panel data set cover the period 1991-2002. The starting point of the panel data is 1991 when the first METI Firm survey was conducted. There is a

[5] Of the available studies on Japanese MNEs, a disproportionately large number of studies have focussed on the relationship between overseas production and Japan's exports (Fukao and Amano 1998; Lipsey et al. 1999; Head and Ries 2001; Kimura and Kiyota 2006).
[6] During work on this data set, we have extensively referred to Matsuura and Kiytao (2004) and the resources available from the RIETI website at http://www.rieti.go.jp/jp/database/d02.html#01.

gap in the time coverage between 1992 and 1993 since the METI Firm survey was not conducted in these two years. The panel data set includes parent firms that have both more than 50 employees and capital of more than 30 million yen. The industry classification is available at 3-digit level of Japan Standard Industrial classification (JSIC).

Creating a matched panel data set using these two METI surveys involved the following steps. First, information from both surveys was restricted to manufacturing industry by excluding non-manufacturing industry data. After limiting the data to the manufacturing sector, a consistent 3-digit level of the manufacturing industry classification throughout the period 1991-2002 was assigned to each parent-affiliates. This was needed because there were some changes in the industry classification over the entire time period.

Second, the two surveys were linked by using the permanent identifier assigned to each individual parent firm of the METI Firm survey to the same code reported by each individual foreign affiliate from the METI Foreign Affiliate survey. To ensure successful matching, careful cross-checking was done by examining the name and the address of parent firms and the ownership structure. This procedure systematically combined information on the overseas operations of Japanese MNEs with domestic economic activity of parent firms.

Third, following Hanson et al. (2003) and Harrison and McMillan (2006), sales weighted averages of foreign affiliate variables were constructed (see section 4.1 for the construction of foreign affiliate variables).[7] This was essential to make the panel data estimation operational, because Japanese parent firms often own several foreign affiliate operating in multiple locations. For instance, Toyota has foreign affiliates in Thailand, the US, UK and many other countries.

Lastly, about 1 percent of the data was excluded from the original dataset as outliers which are reported abnormally large or small values. Parent firms were

[7] In principle, it would be possible to include variables for each host country where foreign affiliates potentially operate without aggregating foreign affiliate variables. However, this creates the problem of repeating the same information for the corresponding parent firms, making it difficult to interpret the estimated results (Brainard and Riker 1997).

also dropped if at least one of the values of employment, sales, industry classification, and identification code was missing.

The constructed panel data are also separated into four regional groups of host countries; East Asia, North America, the EU, and South America. The main motivation for the regional separation was to control for the level of the host country's stage of development, the geographic proximity to Japan, and other region-specific characteristics of foreign affiliates' production. Foreign affiliates of Japanese MNEs operating in developing countries (East Asia and South America) are more likely to be the vertical type of MNEs, whereas those in developed countries (North America and the EU) are more likely motivated by horizontal MNEs. Hence, the postulated employment relationship between home and abroad critically depends on the location of foreign affiliates (see Section 2 for the review). In addition to these considerations**,** the firm-level data are also aggregated up to the industry level.

4 The Empirical Formulation

The regression analysis is based on a reduced form of labour demand equation widely used in this strand of literature (see Navaretti and Venables 2004 for a survey). Following Hamermesh (1993), the standard labour demand can simply be written as follows:

(1) $$\ln L_{iht} = \alpha + \beta_1 \ln w_{iht} + \beta_2 \ln Q_{iht} + \beta_3 \ln r_{zht}$$

where subscripts *i, h*, and *t* denote parent firm, home country, and time. The dependent variable (L) is the quantity of home employment; *w, Q*, and *r* represent own wage rate, output, and the price of capital; α proxies the unobserved features such as the parent's level of technology and firm-specific capital. *ln* indicates natural logarithm. Hence, the log-linear specification offers the direct interpretation of elasticity between factors, holding the output constant (i.e., own-wage elasticity and cross-factor elasticity).

The labour demand equation (1) is expanded to incorporate variable capturing overseas operations of foreign affiliate of MNEs (denoted as *MNE*) and other relevant variables influencing the demand of labour by parent firms. The estimated coefficient of *MNE* should provide a direct test of the effect of overseas

operations on home employment of parent firms (The variable construction of *MNE* is detailed in Section 4.1). The 'exporting job' hypothesis suggests the negative coefficient on MNE. On the other hand, the positive coefficient indicates the scale effects dominate the substitution effects of overseas operations on home employment.

The own wage rate of home employment is expected to be negatively related with home employment, given a downward sloping labour demand curve (Hamermesh 1993). This would suggest that as the cost of home country workers rises, profit-maximizing firms substitute other production inputs.

Product demand shocks both at home and in host countries are included in the model (Brainard and Riker 1997; Braconier and Ekholm 2000; Harrison and McMillan 2006). These variables are expressed by (home) output (Q), time-specific dummy (γ_t) and GDP per capita of host countries (*GDPP*). Any shocks to product demand are likely to move labour demand in the same direction (Hasan et al. 2007). Positive shocks on product demand are likely to raise the demand for home employment under the assumption of constant returns to scale.

The inclusion of the output scale of parent firms (Q) also controls for the size of parent firms constant when estimating the labour demand equation (Kravis and Lipsey 1988). Time-specific dummies (γ_t) capture pure random shocks to the labour demand equation common to all firms, but varying over time. Similarly, foreign demand is proxied by GDP per capita of host countries. The positive impact of the product market in host countries should translate positively into an increase in home employment (the market expansion effect), while the negative demand shocks depress home employment.

Labour demand for given a level of output also depends on the cost of capital service (r). The sign of cross-factor price indicates the nature of relationship between labour and capital. A positive sign is expected if they are substitutes, and a negative sign if complementary.

The level of technology is proxied by the intensity of R&D (denoted as *R&D*) as well as by unobserved firm- and industry-specific characteristics

(f and φ). The sign of *R&D* depends on the nature of technological progress. It can substitute for employment of parent firms since the new technology may require fewer operational workers. At the same time, technological progress increases demand for skilled workers, engineers and IT related personnel. Therefore, *a priori,* the expected sign for *R&D* is ambiguous. The unobserved heterogeneity across firms can arise from differences in organisation, the aging of capital equipment, the extent of unionization, the quality of output produced, or the quality of management inputs. Failing to take them into account might lead to permanent observable differences in output, employment and wages (Westbrook and Tybout 1993). Additionally, industry-specific effects take into account industry-wide unobserved technological shocks.

Another factor influencing labour demand is the force of international competition. Tomiura (2004), Bernard et al. (2006) and Ito (2005) confirm that manufacturing employment growth in developed countries is negatively related to a rapid increase of imports from low-wage countries. To control for this effect, import penetration (*IMP*) is included in the model. The expected sign of *IMP* is negative. However, a rapid increase of components imports within manufacturing imports, as documented in Fukao et al. (2003) and Yamashita (2007), may raise the demand for home employment. Hence, the estimates sign of *IMP* could go either way.

Based on the discussion above, the econometrics specification takes the following form:

$$(2) \qquad \ln L_{iht} = \alpha_0 + \beta_1 \ln w_{iht} + \beta_2 \ln Q_{iht} + \beta_3 \ln r_{zht} + \beta_4 \ln R\&D_{iht} + \beta_5 \ln IMP_{zht} + \beta_6 \ln MNE_{jft} + \beta_7 GDPP_{ft} + f_i + \varphi_z + \gamma_t + \varepsilon_{i,t}$$

where subscripts z, j and *f* represent industry, foreign affiliate and host country. The explanatory variables are listed below with the expected sign of each regression coefficient given in the bracket:

w	Home wages rate (-)
Q	Gross output (+);
r	The user cost of capital (+ or -);
R&D	Research and development intensity (+ or -);
IMP	Import penetration (+ or -);
MNE	Employment or outputs of foreign affiliates (+ or -);
PGDPP	Host-country GDP per capita (+);
f	Firm-specific fixed effect;

φ	Industry-specific fixed effect;
γ	Time-specific fixed effect;
ε	Random error term representing other omitted influences.

4.1 Variable Construction

We use two different measures of *MNE*: employment and output of foreign affiliates (MNE^Q and MNE^L). They are expressed as the weighted average as the weight being the share of worldwide employment and outputs of foreign affiliates. More specifically, the following formula is applied to compute MNE^Q and MNE^L :

(3)` $$MNE^L_{i,j} = \sum_{j=1}^{m} wgt^{j,i} L_{j,f}$$

(3)`` $$MNE^Q_{i,j} = \sum_{j=1}^{m} wgt^{j,i} Q_{j,f}$$

The weight (*wgt*) is the share of foreign affiliate *j* in the wourldwide (aggregate) foreign affiliate sales of the corresponding parent firm *i*. [8] GDP per capita of host country is computed in a similar fashion.[9]

Other Variables

The dependant variable (*L*) is measured by the average number of regular employees.[10] Unfortunately, the skill composition of home employment is not available in the original METI data. Hence, there is no distinction made between skilled or unskilled labour.

Output (*Q*) is the reported total sales by parent firms. The nominal gross outputs are deflated by Wholesale Price Index (WPI) at industry level taken from the Bank of Japan.[11] The home wage rate is computed by dividing the annual wages and salaries by the annual number of regular workers. Wages and salaries

[8] In the experimental stage, an alternative weighting scheme was attempted using the employment share, but results were similar. Therefore, the results reported below are based on the sales share of foreign affiliates.
[9] GDP per capita is taken from the World Bank Development Indicators.
[10] The METI Firm survey only collects information on the number of workers, not on hours worked. While fluctuations in hours per worker are crucial for understanding short-run labour demand, in the long run variation the number of workers is the primary adjustment method (Hamermesh 1993; Roberts and Skoufias 1997). Therefore, a focus on employment, rather than hours worked, is consistent with the objective of explaining long-run labour demand differences at the firm-level.
[11] http://www.boj.or.jp/type/stat/dlong/price/cgpi/index.htm

include bonus payments as well as non-wage compensations. The nominal wage series is deflated by the total Consumer Price Index (CPI) taken from the Bank of Japan. The user cost of capital (r) is proxied by wholesales index of investment goods obtained from the same online database of the Bank of Japan.[12]

The remaining variables for parent firms are obtained directly from the METI survey. R&D expenditure refers to average values of R&D expenditure spent on knowledge creation and technological upgrading activity by firms, excluding R&D activities done by other firms. R&D intensity is then computed by taking the share of R&D expenditure of the total sales of parent firms. The import penetration ratio (*IMP*) is computed taking the ratio of imports to apparent domestic absorption, which is defined as (Outputs + Imports) – Exports, and is constructed at the 3-digit industry level.

4.2 Estimation Method

The most important estimation issue is the endogeneity problem for some explanatory variables in Equation (2). MNEs might make a decision on the overseas and domestic operations in terms of employment and outputs simultaneously rather than independently. Therefore, the common factor, which is excluded from the model, could influence either the positive or negative correlation of the OLS regression in the conditional labour demand equation (Desai et al. 2005). In this regard, a generalised method of moments (GMM) instrumental variable (IV) procedure is employed (Griliches and Hausman 1986; Arellano and Bond 1991). This procedure essentially applies instrumental variables to the first-differenced data using the moment conditions. It is often shown in the literature that the lagged values of the potentially endogenous variables in level are potentially useful instruments for the time-differenced variables (Griliches and Hausman 1986; Hasan et al. 2007).

Instrument variables for employment and output of foreign affiliates (*MNE*) in a host country are the lagged employment output and wage rates of a foreign affiliate, the percentage of the manufacturing labour force and the

[12] They are available for the following industries, textile products, iron and steel, non-ferrous metals, metal products, general machinery, electrical machinery, transport equipment, precision instruments, and other manufacturing industry products.

percentage of national income spent on education. The last two exogenous variables are considered to determine the supply side of labour in the host country, and should only affect home labour market outcomes through their impact on the choice of employment in host country. These variables are taken from online version of the World Bank Development Indicators for each host country.[13]

There is also concern about possible correlation between the output variable (Q) of parent firm and the error term in equation (2). The use of time-dummies, industry- and firm-specific fixed effects to some extent alleviates the potential endogeneity problem (Roberts and Skoufias 1997; Hasan et al. 2007). However, it is still possible that the output variable (Q) is correlated with some parts of the error term which are not covered by the fixed effects. In this case, the instrument variables (IV) approach is employed to deal with this potential endogeneity problem on domestic output. Instruments include the lagged capital stock, the lagged intermediate inputs and lagged output (see the Appendix for the definitions of these variables).

There might be also concern about the endogeneity problem of home wages in estimating the conditional labour demand Equation (2). However, the firm-level data is less prone to this problem, because wages are exogenously determined with perfect elastic labour supply (Griliches and Hausman 1986; Hamermesh 1993; Roberts and Skoufias 1997; Slaughter 2001). Both labour supply and demand depend on wages observed. However, when labour supply is perfectly elastic, the position of the labour demand is determined solely by non-labour factor prices and output or product demand shock (Hamermesh 1993).

Both the within-transformation and first-difference estimators of the fixed effect model are employed to eliminate the firms-specific effects and the estimations results are compared between two estimator.[14] The heteroscedasticity-robust standard errors clustering for each firm is used to

[13] http://devdata.worldbank.org/dataonline/

[14] The within-transformation estimator performs OLS on variables expressed in terms of deviations from the firm-specific means: for any variable x_{it}, the within transformed variable can be written as follow, $\ddot{x}_{i,t} = x_{i,t} - (T)^{-1} \sum_{t=1}^{T} x_{i,t}$ $i=1,....N$, where i and t represent individual firm and time, respectively. The difference estimator applies OLS on time-differenced data: $\Delta x_{i,t} = x_{i,t} - x_{i,t-j}$ $t=1,..j...T$.

compute the standard errors. The OLS estimator is also performed to provide a benchmark comparison for results based on the other estimators.

The first-difference estimator provides the better treatment for the endogenity problem, which is common to firm-level data, compared with the within- transformation estimator (Westbrook and Tybout 1993). However, the first-difference method may suffer from the potential selectivity bias because it excludes firms not present in both periods *t* and *t-1*. It is also known that the first-difference estimator can exacerbate the bias due to measurement errors by reducing the amount of systematic variations in the data (Griliches and Hausman 1986). Therefore, the first-difference and within-transformation estimators are treated as complementary estimation procedures.

5 Results

Summary statistics and the correlation matrix are presented in Table 1 and 2 to facilitate the interpretations of the key results. Table 3 reports the main regression results for the labour demand equation (2). Model 1 and 2 report the estimation results based on OLS, and Model 3 and 4 by within-transformation, Model 5 and 6 by first-difference, and Model 7 and 8 by instruments variable (IV) approach. Table 4 presents the estimated results for the manufacturing level data. Finally, Tables 5a to 5d present results for each of the four regions - East Asia, North America, the EU and South America.

Table 3 contains some evidence of a positive complementary relationship between overseas operations (*MNE*) and home employment, but the magnitude of the estimated coefficient is very small. Model 3 (within-transformation) suggests a 10 percent increase of foreign affiliate employment leads to a 0.18 percent increase of home employment. MNE^{Q} also indicates a statistically significant positive effect on home employment with the similar magnitude (Model 4). Further, foreign demand shocks, captured by GDP per capita, have no statistical relationship with change in home employment, apart from OLS results.

The first-difference estimator (Model 5 and 6) in Table 3 also suggests a complementary relationship between overseas operations and home employment. However, the magnitude of the estimated coefficients for MNE^{Q} and MNE^{L} is

significantly lower than reported for Model (3) and (4). The IV procedure in Model 7 and 8 improves the results for foreign affiliate employment, but the correction of endogeneity for foreign affiliate sales loses the statistical significance of this variable.[15]

The OLS result in Model (1) in Table 3 indicates a positive complementary relationship between foreign affiliates and home employment and the negative impact of foreign affiliate output on home employment. The evidence also indicates a positive impact of foreign market demand shock (*GDPP*) on home employment. However, comparing the estimation results between OLS and the alternative fixed-effect models points to the importance of controlling for the firm-fixed effects. The OLS results that did not account for firm-fixed effects largely overestimate the statistical significance of labour demand variables.

Table 4 reports results for the industry-level data. While the magnitudes of the estimated coefficient for overseas operations have increased to some degree as compared to the firm-level data, their statistical significances have been lower, apart from OLS result. Interestingly, foreign demand shocks (*GDPP*) have the positive and statistically significant effects on the level of home employment at industry level.

Table 5a to 5d presents results for each region, East Asia (Table 5a), North America (Table 5b), the EU (Table 5c) and South America (Table 5d). Even though Japanese MNEs have been actively operation in East Asia since the mid-1980s, its expansion in terms of employment and sales do not seem to negatively affect the level of home employment. In fact, foreign operations in East Asia seem to have little impacts on home employment.[16] In North America, foreign affiliates employment and sales have a positive impact (Model 3 and 4, Table 5b).

[15] The overidentifying test statistic for instruments amount to 3.69, which does not reject the null hypothesis that all instruments are uncorrelated with the error term at 5-percent significant level ($\chi^2_{q=4}$ =9.49). In other words, the selected instruments are valid instruments with no direct correlation with the error term in equation (2). The first stage regression also finds a strong correlation between the selected instruments and the endogenous variables (the results are suppressed for brevity).

[16] However, the increased international production in East Asian countries have changed the skill composition of home employment in Japanese manufacturing (Head and Ries 2002; Yamashita 2007; Ahn et al. 2008).

However, the findings are sensitive to the estimation method. The similar inferences can be made for the EU (Table 5c).

Overall, there is no clear-cut evidence of 'exporting jobs' by Japanese MNEs, despite the concerns expressed in the public debates. In fact, there is some weak evidence to suggest that expanded overseas operations may have actually helped to maintain the level of home employment.

Other determinants of labour demand by parent firms can be summarised as follows. Wage elasticity of labour demand consistently has the expected negative sign, indicating a downward sloping of labour demand. The own-wage elasticity is consistently reported in the range of -0.1 to -0.2. The output elasticity is statistically significant both in the within-transformation and the first-difference estimators (Model 3-6). However, this result changes once corrected for the endogeneity problem in Model 7 and 8. In contrast, the output elasticity is found to be positive and statistically highly significant in the industry level panel regression with and without the IV correction (Table 4).

The estimated coefficient of *r* (the user cost of capital) shows mixed results, making it impossible to infer whether capital and home employment are substitutes for or complementary to each other. Interestingly, there is a strong effect of R&D intensity of foreign affiliates in East Asian on home employment. The similar results are obtained for North America (Table 5b), but the results are sensitive to the estimation method used. Apart from the industry level regression in Table 4, the sing of *IMP* overwhelmingly shows a positive sign, although it is not statistically significant.

6 Concluding Remarks

This paper has examined the argument that expansion of overseas operations of Japanese manufacturing MNEs reduces their home employment. A standard labour demand equation of parent firms was estimated based on the newly constructed panel data set, covering information for both home and foreign affiliates' operations. In addition, industry aggregation and geographic locations of foreign affiliates were both accounted for in order to control for the specific regional and characteristics of MNEs.

Despite concerns expressed about the adverse effects of outward FDI on the home economy, the evidence does not support the view that overseas operations expand at the cost of home employment in Japan. On the contrary, the findings provide some weak evidence that overseas operations may have actually helped to maintain the level of home employment in Japanese manufacturing during the period under study.

References

Ahn, S., K. Fukao and K. Ito (2008). "Outsourcing in East Asia and its impact of the Japanese and South Korean Labour markets." Presented at the Ninth Global Development Network Conference Research Workshop: Emerging trends and Patterns of Trade and Investment in Asia, Brisbane, Australia, February 2008.

Ando, M. and F. Kimura (2005). The formation of international production and distribution networks in East Asia, in. T. Ito and A. Rose (eds.). *International Trade, NBER-East Asia Seminar on Economics*. Chicago, University of Chicago Press. **14:** 177-213.

Arellano, M. and S. Bond (1991). "Some test of specification for panel data: Monte carlo evidence and an application to employment equation." *Review of Economic Studies* **58**(2): 277-297.

Athukorala, P. (2005). "Product fragmentation and trade patterns in East Asia." *Asian Economic Papers* **4**(3): 1-27.

Athukorala, P. (2007). *Multinational Enterprises in Asian Development*. Cheltenham, UK and Northampton, MA, USA, Edward Elgar.

Athukorala, P. and N. Yamashita (2006). "Production fragmentation and trade integration in a global context." *North American Journal of Economics and Finance* **17**(4): 233-256.

Athukorala, P. and N. Yamashita (2008). Patterns and determinants of production fragmentation in world manufacturing trade, in. F. Mauro, W. McKibbin and S. Dees (eds.). *Globalisation, Regionalism and Economic Interdependence*. Cambridge, MA, Cambridge University Press.

Belderbos, R. A. (1997). *Japanese Electronics Multinationals and Strategic Trade Policy*. Oxford, Oxford University Press.

Blomstrom, M., G. Fors and R. E. Lipsey (1997). "Foreign direct investment and employment: Home country experience in the United States and Sweden." *Economic Journal* **107**(445): 1787-1797.

Braconier, H. and K. Ekholm (2000). "Swedish multinationals and competition from high and low-wage locations." *Review of International Economics* **8**(3): 448-461.

Brainard, L. and D. Riker (1997). "Are US multinationals exporting US jobs?" *NBER Working Paper Series* No. 5958, Cambridge, MA, National Bureau of Economic Research.

Caves, R.E. (1996). *Multinational Enterprises and Economic Analysis*, 2nd edition, Cambridge, UK, Cambridge University Press.

Desai, M., F. Foley and J. Hines (2005). "Foreign direct investment and domestic economic activity." *NBER Working Paper Series* No.11717. Cambridge, MA, National Bureau of Economic Research.

Feenstra, R. C. (2004). *Advanced International Trade: Theory and Evidence*. Princeton, NJ, Princeton University Press.

Fors, G. and A. Kokko (2000). Home country effects of FDI: Foreign production and structural change in home country operations, in. M. Blomstrom and L. Goldberg (eds.). *Topics in Empirical International Economics: A Festschrift in Honour of Bob Lipsey*. Chicago, University of Chicago Press.

Fukao, K. (1995). "Outward direct investment and jobs in Japan." *The Monthly Journal of the Japan Institute of Labour* **37**(7): 2-12 (in Japanese).

Fukao, K. and T. Amano (1998). "Outward foreign direct investment and manufacturing hollowing-out." *The Keizai Kenkyu* **49**(3): 256-276 (in Japanese).

Fukao, K. and O. Saito (2006). "Japan's alternating phases of growth and outlook for the future." *Hi-Stat Discussion Paper Series* No.196, Tokyo, Institute of Economic Research, Hitotsubashi University.

Fukao, K. and T. Yuan (2001). "Japanese outward FDI and hollowing out." *RIETI Discussion Paper Series* No. 003, Tokyo, Research Institute of Economy, Trade and Industry.

Fukao, K. H. Ishido and K. Ito (2003). "Vertical intra-industry trade and foreign direct investment in East Asia." *Journal of the Japanese and International Economies* **17**(4): 468-506.

Griliches, Z. and J. Hausman (1986). "Errors in variables in panel data." *Journal of Econometrics* **31**(1): 93–118.

Hamermesh, D. S. (1993). *Labour Demand*. Princeton NJ, Princeton University Press.

Hanson, G. H., R. J. Mataloni and M. J. Slaughter (2001). "Expansion strategies of US multinational firms." in Susan M. Colins and Dani Rodrik (eds.). *Brookings Trade Forum 2001*. Washington, DC, Brookings Institution: 245-282.

Hanson, G. H., R. J. Mataloni and M. J. Slaughter (2005). "Vertical production networks in multinational firms." *Review of Economics and Statistics* **87**(4): 664 - 678.

Hanson, G. H., J. Raymond J. Mataloni and M. J. Slaughter (2003). "Expansion abroad and the domestic operations of US multinational firms." Available at http://mba.tuck.dartmouth.edu/pages/faculty/matthew.slaughter/.

Hansson, P. (2000). "Relative demand for skills in Swedish manufacturing: Technology or trade?" *Review of International Economics* **8**(3): 533-555.

Harrison, A. E. and M. S. McMillan (2006). "Outsouring jobs? Multinationals and US employment." *NBER Working Paper Series* No. 12372, Cambridge, MA, National Bureau of Economic Research.

Harrison, A. E., M. S. McMillan and C. Null (2007). "US multinational activity abroad and US jobs: Substitutions and complements?" *Industrial Relations* **46**(2): 347-365.

Hasan, R., D. Mitra and K. V. Ramaswamy (2007). "Trade reforms, labour regulations and labour demand elasticities: Empirical evidence from India." *Review of Economics and Statistics* **89**(3): 466-481.

Head, K. and J. Ries (2001). "Overseas investment and firm exports." *Review of International Economics* **9**(1): 108-122.

Heckman, J. J. (1979). "Sample selection bias as a specification error." *Econometrica* **47**(1): 153-161.

Helleiner, G. K. (1973). "Manufacturing exports from less developed countries and multinational firms." *Economic Journal* **83**(329): 21-47.

Helleiner, G. K. (1981). *Intra-firm Trade and the Developing Countries*. London, The Macmillan Press.

Hijzen , A., T. Inui and Y. Todo (2006). "The effects of multinational production on domestic performance: Evidence from Japanese firms." *RIETI Discussion paper Series* No. 006, Tokyo, Research Institute of Economy, Trade and Industry.

Ito, K. (2005). "Import competition from low and middle income countries and firms growth: An empirical analysis using the 'Basic Survey of Business Structure and Activity'." *RIETI Discussion Paper* No. 028, Tokyo, Research Institute of Economy, Trade and Industry.

Kimura, F. and M. Ando (2003). "Fragmentation and agglomeration matter: Japanese multinationals in Latin America and East Asia." *North American Journal of Economics and Finance* **14**(3): 287-317.

Kimura, F. and M. Ando (2005). "Two-dimensional fragmentation in East Asia: Conceptual framework and empirics." *International Review of Economics and Finance* **14**(3): 317-348.

Kimura, F. and K. Kiyota (2006). "Exports, FDI, and productivity: Dynamic evidence from Japanese firms." *Weltwirtschaftliches Archiv (Review of World Economics)* **142**(4): 695-719.

Kravis, I. B. and R. E. Lipsey (1988). "The Effect of multinational firms' foreign operations on their domestic employment." *NBER Working Paper Series* No. 2760, Cambridge, MA, National Bureau of Economic Research.

Lipsey, R. E. (1995). Outward direct investment and the US economy, in. M. Feldstein, J. R. Hines and G. Hubbard (eds.). *The Effects of Taxation on Multinational Corporations*. Chicago, University of Chicago Press**:** 7-33.

Lipsey, R. E. (1999). "Foreign production by US firms and patent firm employment." *NBER Working Paper Series* No.7357, Cambridge, MA, National Bureau of Economic Research.

Lipsey, R. E. (2003). Foreign direct investment and the operations of multinational firms: Concepts, history, and data, in. E. K. Choi and J. Harrigan (eds.). *Handbook of International Trade*, Malden, MA, USA and Oxford, UK, Basil Blackwell, **1**: 287-319.

Lipsey, R. E. and E. Ramstetter (2001). "Affiliate activity in Japanese and US multinationals and Japanese exports, 1986-1995." *NBER Working Paper Series* No. 8581. Cambridge, MA, National Bureau of Economic Research.

Mataloni, R. (1995). "A guide to BEA statistics on US multinational companies." *Survey of Current Business* **38**: 38-55.

Matsuura, T. (2004). "Estimation of economic activity of Japanese multinationals" *Keizai Kenkyu* **32**(4): 1-16 (in Japanese).

Matsuura, T. and K. Kiyota (2004). "On the construction and utilisation of panel data based on the 'Basic Survey of Business Structure and Activity': Application to economic analysis and the data management issue." *RIETI Policy Discussion Paper* No.004, Tokyo, Research Institute of Economy, Trade and Industry (in Japanese).

Navaretti, G. B. and A. J. Venables (2004). *Multinational Firms in the World Economy*. Princeton, Princeton Press.

Nishimura, K. G., T. Nakajima and K. Kiyota (2005). "Does the natural selection mechanism still work in severe recessions? Examination of the Japanese economy in the 1990s." *Journal of Economic Behaviour and Organization* **58**: 53-78.

Odagiri, H. and H. Yasuda (1996). "The determinants of overseas R&D by Japanese firms: An empirical study at the industry and company levels." *Research Policy* **25**(4): 1059-1079.

Ramstetter, E. D. (1996). "Estimating economic activity by Japanese transnational corporation: How to make sense of the data?" *Transnational Corporations* **5**(2): 107-43.

Roberts, M. J. and E. Skoufias (1997). "The long-run demand for skilled and unskilled labor in Colombian manufacturing industries." *Review of Economics and Statistics* **79**(2): 330-334.

Shimizutani, S. and Y. Todo (2007). "What determines overseas R&D activities? The case of Japanese multinational firms." *RIETI Discussion paper Series* No. 010, Tokyo, Research Institute of Economy, Trade and Industry.

Slaughter, M. J. (2000). "Production transfer within multinational enterprises and American wages." *Journal of International Economics* **50**(2): 449-472.
Slaughter, M. J. (2001). "International trade and labour-demand elasticities." *Journal of International Economics* **54**(1): 27-56.
Todo, Y. and S. Shimizutani (2008). "Overseas R&D activities and home productivity growth: Evidence from Japanese firm-level data." *Journal of Industrial Economics* (forthcoming).
UNIDO (United Nations Conference on Trade and Development) (1998). *World Investment Report: The Financial Crisis in Asia and Foreign Direct Investment: An Assessment*. Geneva, the United Nations.
UNIDO (United Nations Conference on Trade and Development) (2002). *World Investment Report: Translational Corporations and Export Competitiveness*. Geneva, the United Nations.
US Department of Commerce (various years). *Annual Survey of Manufactures*. Washington, DC, US Government Printing Office.
US Department of Commerce (various years). *US Direct Investment Abroad*, Washington, DC, United States Government Printing Office.
Westbrook, D. and J. Tybout (1993). "Estimating returns to scale with large, imperfect panels: An application to Chilean manufacturing industries." *The World Bank Economic Review* **7**(1): 85-112.
Wooldridge, J. M. (2000). *Introductory Econometrics: A Modern Approach*, South-Western Educational Publishing.
Yamashita, N. (2007). "The impact of production fragmentation on industry skill upgrading: New evidence from Japanese manufacturing" *Hi-Stat Discussion Paper Series* No.202, Tokyo, Institute of Economic Research, Hitotsubashi University.
Yeaple, S. R. (2003). "The complex integration strategies of multinationals and cross country dependencies in the structure of foreign direct investment." *Journal of International Economics* **60**(2): 293-314.

Table 1 Summary statistics of selected variables used in regression

Symbols of variables	Description	Obs.	Mean	Std. Dev.	Coeff. Var.	Min	Max
L	Log Parent firms employment	8432	6.81	1.36	0.20	3.91	11.32
W	Log Wage rate	8428	-2.84	0.33	-0.12	-5.65	-0.50
Q	Log Output	7837	5.36	1.71	0.32	-1.13	11.21
K	Log Capital price	8419	4.57	0.06	0.01	4.35	4.65
R&D	Log R&D intensity	7179	-3.99	1.31	-0.33	-10.81	-0.46
IMP	Log Import penetration	7853	-3.56	1.03	-0.29	-11.11	-0.66
MNE^L	Log Foreign Affiliates Employment	8058	4.90	1.57	0.32	-4.91	10.53
MNE^Q	Log Foreign Affiliates Sales	8110	3.19	1.84	0.58	-9.48	10.41
GDPP	Log GDP per capita of host countries	7849	9.22	1.31	0.14	0.71	10.45

Table 2 Correlation Matrix

	w	*K*	*Q*	*R&D*	*IMP*	MNE^L	MNE^Q	*GDPP*
W	1							
K	-0.06	1						
Q	0.41	-0.01	1					
R&D	0.26	-0.13	0.23	1				
IMP	-0.06	-0.24	0.04	0.08	1			
MNE^L	0.16	-0.06	0.49	0.10	0.13	1		
MNE^Q	0.32	-0.08	0.71	0.26	0.16	0.66	1	
GDPP	0.16	0.02	0.26	0.20	0.01	-0.06	0.42	1

Source: Based on the METI database, which is explained in section 3 and Appendix 1.

Table 3 Labour demand by parent firms of MNEs, 1991-2002

	Dependent var.=log (home employment)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS		Within-transformation (WT)		1st diff.		1st diff. -IVS	
COEFFICIENT								
Log Wage rate	-0.266***	-0.286***	-0.116***	-0.117***	-0.123***	-0.123***	-0.120***	-0.121***
	(0.048)	(0.049)	(0.019)	(0.019)	(0.015)	(0.015)	(0.017)	(0.016)
Log Capital prices	1.040***	1.098***	0.365***	0.375***	0.081	0.087	0.106	0.106
	(0.228)	(0.227)	(0.137)	(0.137)	(0.103)	(0.103)	(0.134)	(0.136)
Log Output	0.669***	0.692***	0.138***	0.136***	0.045***	0.043***	0.062	0.064
	(0.013)	(0.014)	(0.022)	(0.022)	(0.014)	(0.014)	(0.064)	(0.064)
Log R&D intensity	0.151***	0.151***	0.022***	0.022***	0.009***	0.009***	0.009*	0.009*
	(0.013)	(0.013)	(0.005)	(0.005)	(0.003)	(0.003)	(0.005)	(0.005)
Log Import penetration	-0.040***	-0.030**	0.001	0.001	0.007**	0.007**	0.008**	0.008**
	(0.013)	(0.014)	(0.006)	(0.006)	(0.003)	(0.003)	(0.004)	(0.004)
Log MNE Employment	**0.059*** **		**0.018*** **		**0.006***		**0.022***	
	(0.011)		**(0.005)**		**(0.003)**		**(0.013)**	
Log MNE Sales		**0.014**		**0.016*** **		**0.007*** **		**0.003**
		(0.011)		**(0.004)**		**(0.003)**		**(0.008)**
Log GDPP	0.055***	0.034***	0.007	-0.002	-0.001	-0.004	0.001	-0.001
	(0.011)	(0.011)	(0.005)	(0.005)	(0.003)	(0.003)	(0.004)	(0.005)
Constant	-2.513**	-2.548**	4.296***	4.187***	-0.047	-0.055	-0.085*	-0.084*
	(1.053)	(1.048)	(0.662)	(0.654)	(0.046)	(0.045)	(0.051)	(0.050)
Observations	6170	6220	6170	6220	4289	4335	3691	3700
Adjusted R-squared	0.855	0.852	0.296	0.292	0.0917	0.0921	0.0807	0.0876
RMSE	0.496	0.503	0.114	0.114	0.102	0.101	0.102	0.102
# of parent firms	1290	1294	1290	1294	1023	1026	952	953

Note: Time- and industry-dummy variables (three-digit level) are included for all estimations, but the results are suppressed here. Standard errors based on White's heteroscadasticity correction clustered by individual firm are given in brackets, with statistical significance (two-tailed test) denoted as: *** 1per cent, ** 5 per cent, and * 10 per cent. The instruments variables for output, foreign affiliates output and employment used in estimating Model 7 and 8 are discussed in the main text. The overidentifying test statistic for instruments used is 3.69, which does not reject the null hypothesis that all instruments are uncorrelated with the error term at 5-percent significant level ($\chi^2_{q=4}$=9.49).

Table 4 Labour demand by parent firms of MNEs at three-digit level, 1991-2002

	Dependent var.=log (home employment)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS		Within-transformation		1st diff.		1st diff. -IVS	
COEFFICIENT								
Log Wage rate	-0.433**	-0.801***	-0.344	-0.361	0.059	0.052	0.041	0.044
	(0.201)	(0.240)	(0.233)	(0.241)	(0.114)	(0.115)	(0.118)	(0.119)
Log Capital prices	-0.293	-0.114	0.106	0.235	-0.563	-0.522	-0.522	-0.415
	(0.737)	(0.649)	(0.516)	(0.457)	(0.740)	(0.731)	(0.717)	(0.682)
Log Output	0.549***	0.536***	0.586***	0.560***	0.704***	0.697***	0.756***	0.781***
	(0.039)	(0.057)	(0.058)	(0.050)	(0.040)	(0.040)	(0.049)	(0.050)
Log R&D intensity	0.095*	0.141*	0.067*	0.062	0.063**	0.061**	0.061**	0.068**
	(0.053)	(0.075)	(0.039)	(0.037)	(0.029)	(0.030)	(0.030)	(0.028)
Log Import penetration	-0.028	-0.053	-0.042*	-0.044**	-0.025	-0.026	-0.024	-0.021
	(0.026)	(0.045)	(0.022)	(0.021)	(0.027)	(0.027)	(0.027)	(0.028)
Log MNE Employment	0.187***		0.053		0.025		0.026	
	(0.041)		(0.041)		(0.036)		(0.063)	
Log MNE Sales		0.136***		0.076**		0.033*		-0.022
		(0.045)		(0.031)		(0.018)		(0.045)
Log GDPP	0.267***	0.280***	0.077**	0.061	0.080**	0.072**	0.058	0.066*
	(0.046)	(0.054)	(0.037)	(0.039)	(0.032)	(0.031)	(0.038)	(0.037)
Constant	0.956	-0.340	2.112	1.795	0.046**	0.047**	-0.001	0.045
	(3.411)	(2.962)	(2.432)	(2.230)	(0.022)	(0.022)	(0.028)	(0.044)
Observations	459	459	459	459	388	388	387	387
Adjusted R-squared	0.954	0.943	0.780	0.783	0.786	0.787	0.749	0.746
RMSE	0.330	0.369	0.169	0.168	0.174	0.174	0.175	0.177
# of industry	56	56	56	56	54	54	54	54

Note: Time-dummy variables are included for all estimations, but the results are suppressed here. Standard errors based on White's heteroscadasticity correction clustered by individual firm are given in brackets, with statistical significance (two-tailed test) denoted as: *** 1per cent, ** 5 per cent, and * 10 per cent.

Table 5 Labour demand by parent firms of MNEs by region, 1991-2002

(a) - East Asia

	Dependent var.=log (home employment)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS		Within-transformation (WT)		1st diff.		1st diff.-IVS	
COEFFICIENT								
Log Wage rate	-0.267***	-0.275***	-0.122***	-0.123***	-0.128***	-0.128***	-0.126***	-0.127***
	(0.049)	(0.049)	(0.021)	(0.021)	(0.017)	(0.017)	(0.020)	(0.020)
Log Capital prices	1.081***	1.050***	0.302**	0.297**	0.042	0.044	0.131	0.123
	(0.247)	(0.244)	(0.147)	(0.147)	(0.100)	(0.100)	(0.146)	(0.145)
Log Output	0.714***	0.727***	0.122***	0.121***	0.037**	0.037**	0.114	0.113
	(0.011)	(0.012)	(0.025)	(0.025)	(0.015)	(0.015)	(0.070)	(0.070)
Log R&D intensity	0.170***	0.167***	0.028***	0.028***	0.011***	0.011***	0.016***	0.016**
	(0.013)	(0.013)	(0.006)	(0.006)	(0.004)	(0.004)	(0.006)	(0.006)
Log Import penetration	-0.032**	-0.027*	-0.000	0.000	0.002	0.002	0.005	0.005
	(0.015)	(0.015)	(0.006)	(0.006)	(0.003)	(0.003)	(0.004)	(0.004)
Log MNE Employment	0.007		0.008**		0.002		0.012*	
	(0.008)		(0.004)		(0.002)		(0.006)	
Log MNE Sales		-0.020**		0.006**		0.003		0.002
		(0.009)		(0.003)		(0.002)		(0.005)
Log GDPP	-0.027***	-0.007	-0.004	-0.006	-0.001	-0.002	-0.004	0.000
	(0.009)	(0.011)	(0.004)	(0.005)	(0.003)	(0.003)	(0.005)	(0.005)
Constant	-1.902	-1.943*	5.594***	5.633***	-0.004	-0.005	-0.012	-0.020*
	(1.161)	(1.153)	(0.731)	(0.731)	(0.009)	(0.010)	(0.009)	(0.010)
Observations	4947	4986	4947	4986	3426	3464	2898	2907
Adjusted R-squared	0.874	0.875	0.324	0.320	0.0986	0.100	0.0730	0.0775
RMSE	0.475	0.475	0.109	0.109	0.0994	0.0991	0.102	0.101
# of parent firms	1058	1061	1058	1061	829	834	767	768

Note: Time- and industry-dummy variables (three-digit level) are included for all estimations, but the results are suppressed here. Standard errors based on White's heteroscadasticity correction clustered by individual firm are given in brackets, with statistical significance (two-tailed test) denoted as: *** 1per cent, ** 5 per cent, and * 10 per cent. The instrumental variables for output, foreign affiliates output and employment used in estimating Model 4 are discussed in the main text.

Table 5 (continued)
(b) - North America

	Dependent var.=log (home employment)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS		Within-transformation (WT)		1st diff.		1st diff.-IVS	
COEFFICIENT								
Log Wage rate	-0.286***	-0.313***	-0.119***	-0.121***	-0.120***	-0.120***	-0.104***	-0.102***
	(0.063)	(0.064)	(0.022)	(0.021)	(0.018)	(0.017)	(0.022)	(0.021)
Log Capital prices	0.486	0.729**	0.185	0.184	0.079	0.075	0.043	0.068
	(0.309)	(0.301)	(0.173)	(0.174)	(0.170)	(0.171)	(0.213)	(0.214)
Log Output	0.664***	0.685***	0.105***	0.101***	0.032**	0.031**	0.049	0.068
	(0.017)	(0.019)	(0.026)	(0.026)	(0.015)	(0.015)	(0.071)	(0.067)
Log R&D intensity	0.154***	0.158***	0.016**	0.015**	0.004	0.004	0.004	0.005
	(0.020)	(0.020)	(0.007)	(0.007)	(0.003)	(0.003)	(0.006)	(0.005)
Log Import penetration	-0.022	-0.015	0.001	0.002	0.002	0.002	0.003	0.004
	(0.017)	(0.018)	(0.007)	(0.007)	(0.004)	(0.004)	(0.005)	(0.005)
Log MNE Employment	0.068***		0.014*		0.005		-0.003	
	(0.012)		(0.008)		(0.005)		(0.023)	
Log MNE Sales		0.031**		0.023***		0.006		0.003
		(0.015)		(0.008)		(0.004)		(0.015)
Log GDPP	-0.090***	-0.031	-0.018	-0.037**	-0.010	-0.014	-0.000	-0.008
	(0.025)	(0.031)	(0.013)	(0.017)	(0.007)	(0.009)	(0.030)	(0.029)
Constant	1.480	-0.128	5.953***	6.019***	-0.003	-0.004	-0.012	-0.016
	(1.421)	(1.396)	(0.837)	(0.840)	(0.009)	(0.009)	(0.015)	(0.013)
Observations	3996	4049	3996	4049	2785	2840	2198	2203
Adjusted R-squared	0.841	0.837	0.247	0.252	0.0836	0.0816	0.0651	0.0584
RMSE	0.503	0.511	0.108	0.108	0.0943	0.0947	0.0934	0.0937
# of parent firms	812	815	812	815	662	665	589	590

Note: Time- and industry-dummy variables (three-digit level) are included for all estimations, but the results are suppressed here. Standard errors based on White's heteroscadasticity correction clustered by individual firm are given in brackets, with statistical significance (two-tailed test) denoted as: *** 1per cent, ** 5 per cent, and * 10 per cent.

Table 5 (continued)
(c) – The EU

	Dependent var.=log (home employment)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS		Within-transformation (WT)		1st diff.		1st diff.-IVS	
COEFFICIENT								
Log Wage rate	-0.206***	-0.219***	-0.128***	-0.117***	-0.125***	-0.130***	-0.104***	-0.104***
	(0.062)	(0.064)	(0.027)	(0.027)	(0.022)	(0.022)	(0.023)	(0.023)
Log Capital prices	1.199***	1.428***	0.142	0.238	0.067	0.063	0.068	-0.037
	(0.347)	(0.357)	(0.215)	(0.213)	(0.192)	(0.185)	(0.264)	(0.260)
Log Output	0.672***	0.689***	0.097***	0.100***	0.023	0.014	0.030	-0.002
	(0.018)	(0.026)	(0.033)	(0.032)	(0.021)	(0.020)	(0.087)	(0.087)
Log R&D intensity	0.208***	0.212***	0.012	0.012	0.004	0.007	0.003	0.004
	(0.023)	(0.024)	(0.008)	(0.007)	(0.005)	(0.005)	(0.007)	(0.007)
Log Import penetration	-0.021	-0.019	0.005	0.006	0.006	0.007	0.010	0.012
	(0.020)	(0.022)	(0.008)	(0.008)	(0.005)	(0.005)	(0.007)	(0.007)
Log MNE Employment	0.059***		0.011		0.005		0.031	
	(0.013)		(0.007)		(0.004)		(0.019)	
Log MNE Sales		0.023		0.030**		0.021**		0.006
		(0.023)		(0.015)		(0.009)		(0.028)
Log GDPP	-0.087***	-0.041	-0.018	-0.061**	-0.013*	-0.045***	-0.040*	-0.013
	(0.024)	(0.039)	(0.012)	(0.029)	(0.008)	(0.017)	(0.023)	(0.052)
Constant	-1.358	-2.830*	6.376***	6.279***	0.003	-0.060	0.002	0.002
	(1.613)	(1.654)	(1.117)	(1.099)	(0.012)	(0.065)	(0.008)	(0.009)
Observations	2432	2473	2432	2473	1715	1761	1271	1285
Adjusted R-squared	0.862	0.857	0.277	0.285	0.0814	0.0883	0.0412	0.0660
RMSE	0.466	0.475	0.106	0.106	0.0956	0.0978	0.0946	0.0948
# of parent firms	493	495	493	495	399	400	342	345

Note: Time- and industry-dummy variables (three-digit level) are included for all estimations, but the results are suppressed here. Standard errors based on White's heteroscadasticity correction clustered by individual firm are given in brackets, with statistical significance (two-tailed test) denoted as: *** 1per cent, ** 5 per cent, and * 10 per cent.

Table 5 (continued)
(d) – South America

	Dependent var.=log (home employment)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS		Within-transformation (WT)		1st diff.		1st diff.-IVS	
COEFFICIENT								
Log Wage rate	-0.470***	-0.488***	-0.241***	-0.244***	-0.252***	-0.253***	-0.174*	-0.177*
	(0.130)	(0.133)	(0.066)	(0.066)	(0.072)	(0.069)	(0.102)	(0.102)
Log Capital prices	0.744	0.739	0.821**	0.764**	0.226	0.223	-0.233	-0.177
	(0.719)	(0.715)	(0.347)	(0.349)	(0.261)	(0.250)	(0.495)	(0.462)
Log Output	0.761***	0.731***	0.223***	0.196***	0.071	0.057	0.191	0.178
	(0.030)	(0.043)	(0.079)	(0.075)	(0.074)	(0.072)	(0.213)	(0.194)
Log R&D intensity	0.157***	0.154***	0.003	0.003	-0.000	-0.001	-0.001	-0.001
	(0.033)	(0.031)	(0.015)	(0.015)	(0.007)	(0.007)	(0.009)	(0.009)
Log Import penetration	-0.015	-0.019	0.039***	0.039***	0.003	0.003	0.012	0.010
	(0.043)	(0.043)	(0.013)	(0.013)	(0.010)	(0.009)	(0.012)	(0.011)
Log MNE Employment	0.040		0.021*		0.010		-0.003	
	(0.032)		(0.013)		(0.008)		(0.030)	
Log MNE Sales		0.060		0.050***		0.010		0.018
		(0.041)		(0.019)		(0.009)		(0.027)
Log GDPP	-0.071	-0.110	-0.001	-0.064*	-0.001	-0.008	0.013	-0.023
	(0.054)	(0.076)	(0.018)	(0.034)	(0.013)	(0.017)	(0.044)	(0.050)
Constant	-1.179	-0.722	2.392	2.820	0.031***	0.031***	0.101	-0.039
	(3.291)	(3.337)	(1.782)	(1.808)	(0.012)	(0.012)	(0.130)	(0.040)
Observations	764	780	764	780	546	563	320	321
Adjusted R-squared	0.882	0.882	0.420	0.426	0.227	0.217	0.267	0.273
RMSE	0.467	0.465	0.108	0.107	0.0923	0.0929	0.0904	0.0899
# of parent firms	154	156	154	156	129	131	96	97

Note: Time- and industry-dummy variables (three-digit level) are included for all estimations, but the results are suppressed here. Standard errors based on White's heteroscadasticity correction clustered by individual firm are given in brackets, with statistical significance (two-tailed test) denoted as: *** 1per cent, ** 5 per cent, and * 10 per cent.

Appendix 1 METI Surveys

The Basic Survey of Business Structure and Activity:

This survey on Japanese firms, first conducted in 1991 has become an annual survey since 1994. It covers all firms in both manufacturing and non-manufacturing including mining, wholesale, agriculture, retail, and construction as well as the service sector that have both more than 50 employees and capital of more than 30 million yen. It collects sufficient information to quantify details on the domestic operations of Japanese firms, including total sales, total purchases, employment, workers' compensation, fixed tangible and non-tangible assets, capital, number of establishments, R&D expenditure, year of establishment, exports, and imports. Most key variables have been reported continuously since 1991 except for the years in 1992 and 1993. Transactions are recorded in millions of Japanese yen and measure the amounts paid or received by individual firms. All individual firms are assigned unique identifiers, making it possible to track operations of the same firms over time. The survey is mandatory by Japanese law and hence the response ratio is very high (around 90 percent).

The capital stock is measured by the book value of the stock of tangible assets, such as capital, machinery and property. The nominal capital stock is transformed into the real term using the wholesale prices index of machinery and equipment as a deflator. This deflator is obtained from the Bank of Japan. In the original METI Firm survey, there are no readily available data for the intermediate input expenditures. Hence, they are defined as the sum of the cost of goods sold and general administrative costs minus wage bills, the rate of depreciation as well as the rental costs.

The Basic Survey of Overseas Japanese Business Activity:

This survey covers economic activities of foreign affiliates oprating overseas. The survey are sent out to their parents firms located in Japan. There has been a relatively long history of conducting this survey commencing in 1971, a detailed survey every three years since 1981 and a standard one each year in other years. However, data are available by electronics means for this project only from 1989. Most importantly, each individual foreign affiliate is assigned its own unique code as well as the parent firm identifier.

The Basic Survey of Overseas Japanese Business Activity contains the main variables such as sales output distinguished by destinations such as local market, Japan or other countries, total purchase distinguished by sources, wages and salaries, employment, fixed tangible assets, capital, and R&D spending. However, not all have been reported consistently since 1989. For instance, wage and salaries only appear continuously from 1994, and fixed tangible assets are only available for years 1989, 1992, 1995, 1998, and 2001. This survey also reports limited information about the operations of parent firms, such as sales, purchases, employment, and capital.

While the survey has been a very useful and valuable data source for evaluating the overseas operations of Japanese MNEs, its quality has been questioned from time to time (Ramstetter 1996). These problems can be summarised as follows. Unlike the METI Firm survey, responding to this survey is not a mandatory requirement. This yields a wide fluctuation in sample coverage from year to year. The response rate varied from 33 percent in 1980 to 51 percent during 1983-1992, but has increased somewhat in more recent years. In 2005, the questionnaire was sent to 4,564 Japanese firms, and 3,176 completed and the corresponding return rate accounts for 69.6 percent. Information on foreign affiliates operating in developing host countries is far less satisfactory than from those operating in developed host countries.

There is also a wide variation in the reported coverage of variables from year to year, making it difficult to track the same variable over time (Matsuura 2004). However, the key variables, including sales, employment, and the year when foreign affiliates were established are available for each year. Other items, such as intermediate inputs expenditure and capital stock have not been reported on a consistent basis. In addition, the fluctuation in the survey response rate also significantly influences the stability of variables over time (Matsuura 2004). Some key variables, such as sales and employment, are found to follow a smooth time-series pattern, while variables such as workers compensation and R&D expenditure behave less consistently over time.