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Abstract
This paper examines the hypothesis that expansion of overseas operations of Japanese manufacturing multinational enterprises (MNEs) reduces home employment. While the existing studies are mainly based on the industry level, this paper presents the evidence using 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, the findings suggest that overseas operations have somewhat helped to maintaining the level of home employment in Japanese manufacturing during the period under study. However, the results are sensitive to the estimation method used and whether the estimation is based on the panel data set is balanced or unbalanced.

Key Words: Multinational Enterprises, FDI, Labour demand, hollowing out of manufacturing, Japan
JEL Classification: F14, F16, J31

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1 Introduction

This paper undertakes firm-level analysis of the effects of the expanded overseas operations of Japanese manufacturing multinational enterprises (MNEs) on home (domestic) employment. An econometric analysis estimates the labour demand equation for home employment by allowing for the effects of foreign affiliates employment and outputs. In addition, industry aggregation and geographic locations of foreign affiliates are both controlled in order to control for the specific regional and characteristics of overseas operation of MNEs.

The controversy over the possible adverse effects of overseas production by MNEs on home employment first arose in the US in the late 1960s and it 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 possible substitution of home employment of MNEs with increased overseas production is known as the 'exporting jobs' 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' (*sangō kudouka*) 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.

In spite of the policy importance, only a few systematic empirical studies are available and they are based on readily-available FDI data at the industry level (Fukao 1995; Fukao and Amano 1998; Fukao and Yuan 2001). There is virtually no evidence of how Japanese MNEs adjust home employment in response to changes in the production capacity of foreign affiliates at the firm-level. 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 1997a, 1997b; Braconier and Ekholm 2000; Fors and Kokko 2000; Desai et al. 2005; Harrison and McMillan 2006).[1] This paper aims to fill this gap. The analysis explores panel data set compiled from the unpublished returns to

[1] This could be partly due to the stringent Japanese government policy on access to the original returns of firm-level information, which has been eased to some extent in recent years. However, the access to the original METI survey database is still limited to protect private firm information.

two firm-level surveys, *the Basic Survey of Business Structure and Activity* and *the Basic Survey of Overseas Japanese Business Activity*, collected by Japan Ministry of the Economy, Trade and Industry (METI) over the period 1991-2002. [2]

The next section describes the data used in this chapter. This is followed by section 3 discussing patterns and trends of home and overseas operations of MNEs. Section 4 undertakes a survey of the existing empirical evidence for the relationship between the overseas and domestic operations of MNEs. Section 5 depicts the empirical framework before explaining variable construction and the estimation methodology. Section 6 interprets the results and the final section concludes.

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

In principle, there is little guidance from the theory of MNEs on the effects of their overseas operations 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 market overseas (*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).

Different types of MNEs can also complicate the net effect of overseas operations (Caves 1996). In general, the theory postulates two types of MNEs, depending on the investment motivation: *vertical* or *horizontal.* Vertical type of MNEs vertically separates the integrated production process between parent MNEs and their foreign affiliates. This type is usually motivated to take advantage of the existence of international factor prices differentials between the home and host country. Under

[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. 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).

operations of vertical MNEs, overseas and domestic employment can be substitutes, since some domestic operations are relocated to overseas operations. However, it is equally possible the domestic operation is expanded due to vertical specialisation.

The horizontal type of MNE overseas operation is motivated by the objective of expanding overall sales. In this sense, expanded overseas operations may have little effect on the scale of the domestic operation of MNEs. However, it is equally possible that the domestic operations of these MNEs might be facilitated by 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.

A large amount of the 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 1997a, 1997b; Hanson et al. 2003; Desai et al. 2005; Harrison and McMillan 2006). These studies make use of firm-level survey data, conducted by the Bureau of Economics Analysis (BEA), The US Department of Commerce. 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.[4] The survey format includes information on the classification of industry, sales, trade in goods and services, employment, wages, assets, expenditure for plant and equipment, and R&D expenditure.

Among such researchers, Kravis and Lipsey (1988) and Lipsey (1995) make initial attempts to examine the impact of foreign production on the home employment of US MNEs. A higher level of foreign affiliate production in developing countries is

[3] Complex integration is another type of MNEs (UNCTAD 1998, 2002; Yeaple 2003). This type shares certain features of both the vertical and horizontal type. Any MNE might set up integrated production to serve a foreign country market, and might also choose to operating another host foreign country for the purpose of assembling their products. They establish foreign affiliates to conserve 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 MNE.

[4] The survey began in 1929, but its scope was limited to one question – the value of foreign commercial assets controlled by US companies (See Mataloni (1995) for more detail).

found to be associated with lower home employment for a given level of home production.

Brainard and Riker (1997a) develop a more systematic analysis and estimate the foreign affiliate cross-wage elasticities of parent firms' labour demand for the period 1983-1992. They find evidence of a substitution relationship between foreign and domestic employment, although the degree of substitution is low. On the other hand, a strong substitution relationship was found among the various foreign affiliates of MNEs, operating in developing countries. The evidence indicates any employment substitution effect predominantly takes place between the foreign affiliates of MNEs operating in overseas locations rather than between parents and their foreign affiliates. If anything, parent firms adjusted employment very little in response to changes in foreign affiliate wages.

Hanson et al. (2003) find expansion in the sales of foreign affiliates of US MNEs raise the 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 main finding is that the relationship between the parent and its foreign affiliates appears to depend on the skilled/unskilled labour costs of foreign affiliates. When the cost of skilled labour is lower in foreign affiliates, the demand for home labour appears to increase. This result suggests 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 decrease the demand for home employment.

Desai et al. (2005) find evidence of increased overseas operations of MNEs enhancing the scale of home operations. A 10 percent greater accumulation of foreign property plant and equipment is associated with a 2.2 percent increase in domestic net property plant and equipment. Similarly, a 10 percent rise in foreign employee compensation is associated with a 4 percent greater domestic employee compensation, and a 10 percent higher number of foreign employees with a 2.5 percent higher number of domestic employees. In sum, the results amply support the hypothesis that expanded operations of US MNEs' foreign affiliates have stimulated the domestic activity of US parent firms over the last two decades.

Harrison and McMillan (2006) explore the BEA data sets, but cast back the data series back to 1977. They find strong evidence 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 in employment both at home and in developed countries. In other words, any decline in employment of foreign affiliates in developed countries leads to some contraction in employment of the parent firm in the US. By and large, the finding of Harrison and McMillan (2006) is consistent with that of Brainard and Riker (1997a).

Of the available studies on Japanese MNEs, a disproportionately large number of studies have focussed on the relationship between expanded overseas production and exports of home countries in Japan (Fukao and Amano 1998; Lipsey et al. 1999; Head and Ries 2001; Kimura and Kiyota 2006). Fukao (1995) makes an early attempt to examine the possible impacts of foreign affiliate production on domestic employment. 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. They find that Japanese FDI in East Asia led to shedding around 600,000 workers in home country employment. They also find that market-oriented FDI in East Asia seemed to increase the amount of home country employment.

3 Construction of the Panel Data[5]

The data set was constructed by using the 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'.

[5] During work on this data set, I 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.

The starting point of the panel data is 1991 when the first METI Firm survey was conducted. The second survey was undertaken in 1994 and it has been conducted continuing from then. The most recent data for both METI surveys available for this paper are 2002 (note that 1992 and 1993 are missing since the METI Firm survey was not conducted in these two years). The panel data set only includes parent firms that have both more than 50 employees and capital of more than 30 million yen. The industry classification is available at 2-digit level of Japan Standard Industrial classification (JSIC) (see Appendix 3 for the industry classification). The panel set is unbalanced due to the 'entry/exit' of parent firms.

Creating the matched panel data 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. This necessarily removed information on any foreign affiliates whose industry classification is not manufacturing. It is possible this process somewhat underestimates the overseas operations of Japanese MNEs, since some parent manufacturing firms set up foreign affiliates in non-manufacturing industries. However, such downward bias is considered to be minimal. After limiting the data to the manufacturing sector, the consistent 3-digit level of the manufacturing industry classification was assigned to each parent. This is important because there were some changes in the 3-digit manufacturing industry classification over the time period 1991-2002.

Second, the two surveys was 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, a careful cross-checking was implemented by examining the name and the address of parent firms and the ownership structure. As a result, this procedure systematically combined information on the overseas operations of Japanese MNEs with domestic economic activity.

Third, following Hanson et al. (2003) and Harrison and McMillan (2006), sales weighted averages of foreign affiliate variables were constructed (see section 5.1 for the

construction of foreign affiliate variables).[6] This is essential to make the panel data estimation operational, because Japanese parent firms often own more than one foreign affiliate operating in multiple locations. For example, Toyota has foreign affiliates in Thailand as well as in England.

Lastly, about 1 percent of the data was excluded from the main dataset since some parent firms in the METI Firm survey had reported abnormally large or small values. Any parent firms were also dropped if at least one of the values of employment, sales, industry classification, and identification code was missing.

The pooled data are disaggregated into four regions of host countries, East Asia, North America, the EU, and South America. The main motivation of the regional disaggregation was to control for the level of the host country's stage of development, the geographic proximity to Japan, and the possible characteristics of foreign affiliate production. Foreign affiliates of Japanese MNEs operating in developing countries (East Asia and South America) are most likely to be the vertical type of MNEs, whereas those in developed countries (North America and the EU) are most likely motivated by horizontal MNEs. The postulated employment relationship between home and abroad critically depends on the location of foreign affiliates (Brainard and Riker 1997a; Harrison and McMillan 2006).

In addition to these considerations**,** the firm-level data are also aggregated up to the 3-digit industry level. While the firm-level investigation brings about more advantages, the industry-level also has several merits. First, the industry level data capture not only the within-firm employment changes, but also the across-firm employment changes. It is possible that some parent firms reduce home employment, whereas other parent firms expand foreign affiliate employment. The firm-level data do not track the across-firm employment substitutions (Harrison et al. 2007). Second, the estimated labour demand at industry level is likely to reflect changes in employment resulting from the entry and exit of firm to the industry (Roberts and Skoufias 1997). Third, the industry-level aggregation mitigates the potential problem of small

[6] 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 1997a). It would be particularly daunting to repeat the same home employment in the dependant variable.

employment changes that are relatively symmetrically distributed around the origins (see Figure 7.1). The industry-level data only show the net effects of employment changes between home and foreign affiliate employment.

One limitation of the panel set is that some parent firms disappear in one year in the data coverage and reappear in another presumably because of varying sample restrictions imposed. This means that the entry and exit of firms in this survey do not necessarily correspond to the standard definitions of origin and termination of firms (Nishimura et al. 2005). The matched panel data set also excludes small scale Japanese firms, which do not meet the sample selection criteria of the METI firm survey even if they do have foreign affiliates. However, their omissions do not affect the overall trends of MNEs' operations.

4 Patterns and Trends of the Home and Overseas Operations of MNEs

Home Operations

Selected key indicators of home operations of MNEs, using the METI Firm survey data for the period 1991-2002 are summarised in Table 1. Total domestic sales by Japanese parent firms rose from 128 trillion yen in 1991 to 136 trillion in 2002. Accordingly, the number of parents firms increased from 616 in 1991 to 1,114 firms in 2002. On the other hand, the employment figure contracted from about 2.2 million in 1991 to 2 million in 2002. This indicates that about 180 thousand jobs were shed in the home employment of MNEs over the period. However, this loss of home employment by MNEs parent firms could be considered relatively small, compared with the 3 million jobs lost in total Japanese manufacturing during the same period.

The share of parent firms of MNEs in total manufacturing accounted for an average of about 6.6 percent over the period 1991-2002. While this seems small, but these parent firms of MNEs contributed the majority of economic activity to total manufacturing over 1991-2002. In 2002 parent firms of MNEs accounted for close to 55 percent of aggregate manufacturing outputs and over 40 percent of aggregate manufacturing employment as well as more than half of aggregate capital stock. Almost half of manufacturing workers' compensation was also paid by MNEs. Not

surprisingly, parent firms conducted the major proportion of international trade, accounting for over 80 and 60 percent of exports and imports, respectively, and contributed over a 75 percent share of the research and development (R&D) expenditure in total manufacturing over the same period. These figures suggest that any effects on the operations of MNEs are likely to be deeply felt in the home economy.

The MNE dominance in domestic manufacturing is not unique to Japan. For example, MNEs in the US manufacturing accounted for over 60 percent of total manufacturing sales, over 70 percent of total exports, almost 60 percent of manufacturing employment, and 82 percent of domestic R&D expenditure during 1982-1999, although the number of US MNEs also looked small (Harrison and McMillan 2006). Similar figures are reported for Swedish MNEs (Fors and Kokko 2000).

Overseas Operations

Table 2 summarises the data on the key performance indicators of foreign affiliates of manufacturing MNEs over the period 1989-2002. The number of foreign affiliates steadily increased from 2,656 in 1989 to over 10,000 in 2000, but the following two years (2001 and 2002) saw some declines in the number of foreign affiliate. Similarly, sales of foreign affiliates have achieved a five-hold increase between 1989 and 2000, but they significantly dropped between 2001 and 2002. Employment of foreign affiliate continuously expanded since 1989, and it has reached close to 3 million in 2002. This indicates the number of workers employed in foreign affiliates is higher than that of workers employed by parent firms of MNEs (see Table 1). The data in Table 7.2 also indicates an increase in the size of foreign affiliates in terms of average employment and output over the period under study. On average, sales ratios both to Japan and other countries have also been increasing since 1989, while the local sales ratio has remained stable at around 65-70 percent over the period. There is also some indication of upgrading in the technological capacity of the foreign affiliates of Japanese MNEs. This is consistent with the finding from Odagiri and Yasuda (1996) that overseas R&D activity has been rising rapidly despite a slow beginning.

Foreign affiliates of Japanese MNEs are heavily concentrated in general machinery, electronics, information and communication, and transport equipment industries (Table 3). There is an increasing share of sales in the transport equipment industry, growing from about 30 percent in 1989 to 37 percent in 2002. The similar

expansion of sales can be seen for information and communication industry. While the electronics machinery industry has been one of the most important components in Japanese outward FDI, its sale share stagnated over the whole period. There was even a slight decline in the employment and sales share from 1989 to 2002.

Foreign affiliates of Japanese MNEs were overwhelmingly concentrated in East Asian countries in the period under review (Table 4). About 60 percent of the foreign affiliates of Japanese MNEs were located in East Asia in 2002, up from 49 percent in 1989, with corresponding employment share growth. Within East Asia, the rise of China as a destination for foreign affiliates is impressive. Only 3.6 percent of Japanese foreign affiliates were operating in China in 1989, but that figure had jumped sharply to over 19 percent by 2002. Accordingly, 1.8 percent of the employment share had grown to 22 percent in 2002. This geographical shift of overseas operation has facilitated the creation of international production network by Japanese MNEs in East Asia (Kimura and Ando 2005).

Foreign affiliates of Japanese MNEs began to turn away from North American and the EU over the years. For example, the employment share of foreign affiliates in the US fell from 24 percent in 1989 to 16.5 percent in 2002; 22.5 percent of the foreign affiliates of Japanese MNEs were located in the US in 1989, but by 2002 this had fallen to 17 percent. Other developed country regions such as the EU countries experienced a slight decline or no change in foreign affiliate and employment share. This shift in the location of overseas operations of Japanese manufacturing MNEs coincides with patterns of Japan's fragmentation trade, discussed in Chapter 3.

Interestingly, while there is strong evidence of increased concentration of the operations of foreign affiliates in East Asian countries over time, the geographical composition of overseas sales are still concentrated in the US. The share of foreign affiliate sales in East Asian countries remained at around 30 percent, although with a notable increase of sales share in the Chinese market. The sales share in North America also remained at virtually the same level between 1995 and 2002, at about 42 percent. For the EU, the share of foreign affiliate sales actually grew from 13.5 percent in 1989 to 16.5 percent in 2002, despite a decline in the share of employment and foreign affiliates.

5 The Analytical Framework

The baseline specification is based on a reduced form of labour demand function widely used in this strand of literature (Brainnard and Rikcer 1997; Hanson et al. 2003; Harrison and McMillan 2006).

$$\ln L_{iht} = \alpha_0 + \beta_1 \ln w_{iht} + \beta_2 \ln Q_{iht} + \beta_3 \ln r_{zht} + \beta_4 \ln R\&D_{iht} + \beta_5 \ln IMP_{zht} + \beta_6 \ln L_{jft} + \beta_7 \ln Q_{jft} + \beta_8 \ln GDP_{ft} + f_i + \varphi_z + \gamma_t + \varepsilon_{i,t} \quad (1)$$

where subscripts *i, h*, *z* and *t* denote parent firm, home country, industry and time. Subscripts *j* and *f* represent foreign affiliate and host country. A symbol *ln* means natural logarithm. The dependent variable (L_{iht}) is the quantity of home employment. The log-linear specification offers the direct interpretation of elasticity between factors (i.e., own-wage elasticity and cross-wage elasticity). The explanatory variables are listed below with the expected sign of each regression coefficient given in the bracket:

Estimating of labour demand (1) includes the indicators of foreign affiliate employment and output. The estimated coefficient on these variables should provide a direct test of the effect of overseas operations on home employment of MNEs. A complementary relationship between home and foreign affiliate employment is expected if the overseas operations of MNEs have scale effects. In this case, the positive sign is expected. On the other hand, the negative sign indicates that home and foreign affiliate employment are substitutes to each other. This means that the expanded overseas operation of MNEs has reduced the home operation of MNEs by shedding employment and shutting down the establishments. Estimation of equation (1) also allows to examine the nature of the relationship between the scale of output by MNEs' foreign affiliates and home employment.

The wage rate of home employment is expected to be negatively related to the number of home employment, given the downward sloping labour demand curve (Hamermesh 1993). The sign suggests that as the cost of home country workers rises, profit-maximizing firms substitute away from labour towards other production inputs.

Product demand shocks both at home and in host countries are included in the model (Brainard and Riker 1997a; Braconier and Ekholm 2000; Harrison and McMillan 2006). They are expressed by gross sales (denoted as *Q*), time-specific dummy and

GDP per capita of host countries. 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 the factor of production under the assumption of constant returns to scale (one of the four Hicks-Marshallian laws of factor demand). The inclusion of the output scale of parent firms is also treated as holding the size of parent firms constant when estimating the labour demand equation (Kravis and Lipsey 1988). Time-specific dummies are also included to capture pure random shocks to the labour demand equation common to all firms, but varying over time. Similarly, foreign demand is proxied by the sales output of foreign affiliates as well as the GDP per capita of host countries. The positive impact of the product market in foreign countries should also translate positively into an increase in home employment (the market expansion effect).

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

The level of technology is proxied by the intensity of R&D (denoted as *R&D*) and by unobserved firm- and industry-specific characteristics. The sign of *R&D* depends on the nature of technological progress. It can substitute for employment of parent firms since the introduction of technology (e.g., machinery equipment) might 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 for industry-wide technological shocks.

Another factor for influencing labour demand is the force of international competition. Tomiura (2004); Bernard et al. (2006); Ito (2005) confirm that manufacturing employment growth in developed country is negatively related to a rapid increase of imports from low-wage countries. To control for this effect, import

penetration (*IMP*) at the industry level is included in the model. The expected sign of *IMP* is negative, because the entrance of imports works against domestic manufacturing employment.

5.1 Variable Construction

The dependant variable is measured by the average number of regular employees. 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. 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.

Foreign Affiliate Variables

Following the standard procedure in the literature, for each parent firm (*i*) in year *t*, a weighted average of employment of all foreign affiliates for a given parent firm is computed as follow:

$$L_{i,j} = \sum_{j=1}^{m} wgt^{j,i} L_{j,f} \tag{2}$$

Subscript *i* refers to the individual parent firm, and *j* denotes the corresponding foreign affiliate at multiple locations. The weight (*wgt*) is the share of foreign affiliate *j* in the aggregate foreign affiliate sales of parent firm *i*. The (sales share) weighted averages of foreign sales and GDP per capita are computed in the same fashion. GDP per capita is taken from the World Bank Development Indicators. In the experimental stage, an alternative weighting scheme was attempted using the employment share, but obtained similar results. Therefore, the results reported below are based on the sales share of foreign affiliates.

Parent Firm Variables

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.[7] The home wage rate is computed by dividing the annual wages and salaries by the annual number of regular workers. Wages and salaries include bonus payments as well as non-wage compensations. The nominal wage series is deflated by the total Consumer Price Index (CPI) is also 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.[8]

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 adsorption, which is defined as (Outputs + Imports) – Exports. *IMP* is constructed at the 3-digit manufacturing industry level.

5.2 Estimation Method

Estimation of labour demand equation (1) takes into account for the presence of the firm-level and time-specific specific effects. Both the within-transformation and first-difference estimators of the fixed effect model are employed to sweep out the firms-specific effects and the estimations results are compared between two estimators.[9] The heteroscedasticity-robust standard errors clustering for each firm is used to compute the standard errors, which is also robust to serial correlation. 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 the firm-level data, as compared to the within-transformation estimator (Westbrook and Tybout 1993). However, the first-difference

[7] Complied from the online database at http://www.boj.or.jp/type/stat/dlong/price/cgpi/index.htm

[8] 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.

[9] 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, $\bar{x}_{i,t} = x_{i,t} - (T)^{-1} \sum_{t=1}^{T} x_{i,t}$ $i=1,....N$, where i and t represent individual firm and time, respectively. The difference estimator applies OLS on time-differenced data: $\Delta x_{i,t} = x_{i,t} - x_{i,t-j}$ $t=1,..j...T$.

might suffer from the potential selectivity bias because this estimator excludes firms not presenting in the period *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.

The most important estimation issue is the potential endogeneity problem for some explanatory variables in equation (1). MNEs 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 in a host country are the lagged employment output and wage rates of foreign affiliate, the percentage of the manufacturing labour force and the 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.[10]

There is also a concern for possible correlation between the output variable (Q) of parent firm and the error term in equation (1). 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). The time-dummies take care of such an unobserved economy-wide shock, while the industry-specific and firm-

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

specific effect accounts for unobserved technology shocks specific to industry-wise and individual firms, respectively.

Those fixed effects should take care of the bulk of the endogenity problem between output and the error term. However, it is still possible that the output variable 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 and the lagged intermediate inputs as well as lagged output. The first two variables are directly taken from the METI Firm survey. 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.[11] 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.

There is also a concern for the endogenous problem of home wages in estimating the condition labour demand equation (1). However, the firm-level data is less prone to this problem. This is, based on the reasonable assumption labour supply which a firm is facing is perfectly elastic, so that wages are exogenously determined (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, shifts in the labour supply schedule, measured by movement in wages, trace out the labour demand schedule. In this case, the position of the labour demand is purely controlled for by non-labour factor prices and output or product demand shocks. Additionally, labour demand elasticity estimated at firm level is more accurate than that obtained from industry-level data.

The sample selection is also an important estimation issue that should be addressed. As descried in section 3, the entry and exit of firm in the METI data is complicated by the disappearing and re-appearing of firm. In order to check the importance and nature of potential sensitivity bias, econometric estimations are

[11] See the footnote 71.

performed for two sets of the data. One sample allows entry/exit (and re-appearance) of parent firms at any time, hence, it is unbalanced panel data. The other data set is restricted to only 'surviving' parent firms observed for the entire period 1991-2002. Under the complicated nature of the entry/exit of firms, the standard sample selectivity correction using the Heckman (1979) two-step procedure is not considered.[12]

6 Results

Table 7a reports the estimations results of the labour demand equation (1) based on the unbalanced panel data set. Results based on the balanced panel set are reported in Table 7b for the purpose of comparison. Model 1 of Table 7 presents the estimation results based on OLS, and Model 2 performs the within-transformation of fixed effect model. Model 3 employs the first-difference and Model 4 with the first-difference IVs estimator. Table 8 presents the estimated results for the 3-digit of 59 manufacturing level data. Finally, Tables 9a to 9d present results for each of the four regions - East Asia, North America, the EU and South America. Time dummies and industry-specific dummies are included for all regressions performed except for OLS (Model 1), but the results are suppressed for brevity.

Table 7a contains some evidence of a positive complementary relationship between foreign affiliate employment and outputs and home employment within Japanese manufacturing MNEs for the period 1991-2002, but the magnitude of the estimated coefficient is very small. Model 2 (within-transformation) suggests a 10 percent increase of foreign affiliate employment leads to a 0.13 percent increase of home employment. Foreign affiliate output variable also indicates the statistically significant positive effect on home employment, although the magnitude of the estimated coefficient on this variable is also small. Additionally, foreign demand shocks, captured by GDP per capita, have no causal statistical relationship with change in home employment (Model 2, Table 7a).

The first-difference estimator (Model 3) in Table 7a also suggests a positive impact of expanded foreign affiliate sales on home employment, but not foreign affiliate employment. The IVs procedure in Model 4 in Table 7a improves the results for foreign affiliate employment, but the correction of endogeneity for foreign affiliate sales

[12] This procedure amounts to estimating a probit model of firm's survival at the current period by using information from the previous period (See Harrison and McMillan 2006 for an application).

loses the statistical significance of this variable. The overidentifying test statistics 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 word, the selected instruments are indeed valid instruments with no direct correlation with the error term in equation (4). The first stage of regression also finds a strong correlation between the selected instruments and the endogenous variables (the results are suppressed for brevity).

The OLS result in Model 1 indicates a positive complementary relationship between foreign affiliates and home employment and the negative impact of foreign affiliate output on home employment (Model 1, Table 7a). The evidence also indicates a positive impact of foreign market demand shock on home employment. However, comparing the estimation results between OLS (Model 1) and the fixed effects estimation in Model 2 and 3 points to the importance of controlling for the firm-fixed effects. The OLS results without considering the firm-fixed effects largely overestimated the statistical significance of labour demand variables.

Table 7b reports the same set of regression results, but the sample is restricted to the balanced panel data for 1991-2002. The estimation results are somewhat different from the unbalanced panel data. The expanded overseas operations in terms of employment and output have virtually no impact on demand for home employment of parent firms which exist the entire period of 1991-2002. The only exception is that estimated coefficient of foreign affiliate employment by first-difference IVs estimator in Model 4 in Table 7.9b indicates a positive effect on home employment at a 5 percent of statistical level. These contrasting findings between balanced and unbalanced panel data might offer two interpretations. First, the estimation results obtained in the unbalanced panel data might be driven by the sample selection biases introduced by parent firms' appearing and disappearing in the sample. Second, the surviving parent firms in the balanced panel data set well adjust to changes in overseas operations without changing the scale of the home operations.

Table 8 reports results for 59 manufacturing industries at three-digit level over the period 1991-2002. While the magnitudes of the estimated coefficient for most of variables have increased to some degree as compared to the firm-level data, the general

findings do not change from Table 7b. The estimated coefficients of foreign affiliate employment and their sales have no impact on change in home employment, apart from the OLS procedure.

Table 9 presents results for each region by dividing total foreign affiliates into 4 different regions of East Asia (Table 9a), North America (Table 9b), the EU (Table 9c) and South America (Table 9d). Employment and sales of foreign affiliate operating in East Asia are found to have no impacts on home employment, despite the rapidly grown overseas operation in the region for the past 15 years. This suggests international fragmentation of production in East Asia have no implication for the home employment adjustments. In North American (Table 9b), foreign affiliate operations do not have any impact on change in home employment, despite their long history of foreign affiliate operations. By contrast, the increased foreign affiliate outputs in the EU countries (Table 9c) show small positive effects on home employment with a 5-percent of significant level (Model 2 and 3). In other words, the expansion of sales in the EU has scale effects on home employment in Japan.

In sum, there is no clear-cut evidence of 'exporting jobs', despite the concerns expressed in the public debates. Instead, there are some findings to suggest that the expanded overseas operations have actually helped to maintain the level of home employment, but it depends on the estimation method used and whether the panel data is balanced or unbalanced.

Other determinants of labour demand by parent firms can be summarised as follows. Wage elasticity of labour demand consistently has the expected negative sign. This indicates any increase in the wage rates results in a decrease in hiring more home employment. The own-wage elasticity is consistently reported in the range of -0.1 to -0.5. The range is comfortably consistent with the finding in Hamermesh (1993) that the own wage elasticity of labour demand usually varies from -0.3 to -0.6 on average. The output elasticity is significant both in the within-transformation and the first-difference estimators (Model 2 and 3 in Table 7a). However, this result changes once correcting for the endogeneity problem in Model 4. In contrast, the output elasticity is found to be positive and statistically very significant in the industry level panel regression with and without the IV correction (Table 8).

The estimated coefficient of *r* (the user cost of capital) shows mixed results, making it impossible to infer whether capital and home employment are substitute for or complementary to each other. While the estimated coefficient for R&D intensity shows some significance in explaining change in home employment in the unbalanced panel data (Table 7a), the statistical significance is lost when the analysis moves into the balanced panel set (Table 7b). This could mean the entry and exit of parent firms is highly correlated with their observable technological level. Import penetration is hardly ever significant. Apart from the industry level regression in Table 7.8, the signs of import penetration overwhelmingly show an unexpected positive sign. This finding contrasts with the US study where there is a robust negative relationship to change in parent employment with the degree of import penetration (Harrison and McMillan 2006; Bernard et al. 2006).

Overall, this chapter found that the expanded overseas operations of Japanese manufacturing MNEs have no adverse effects on home employment, in contrast to the 'exporting job' concerns. Relating to the finding of the previous chapter, international fragmentation of production has had only the effects of changing the skills structure of employment, but few effects on the amount of employment in Japanese manufacturing. By and large, there is no strong indication that overseas operations expand at the cost of workers in Japanese manufacturing over the period 1991-2002.

7 Concluding Remarks

This paper has examined the hypothesis that expansion of overseas operations of Japanese manufacturing MNEs reduces home employment within the MNEs' operations. A standard labour demand equation is estimated by allowing the effects of foreign affiliates employment and sales on home employment. In addition, industry aggregation and geographic locations of foreign affiliates are both controlled in order to control for the specific regional and characteristics of MNEs. The empirical exercise is based on the newly constructed panel data set, covering information for both home and foreign affiliates' operations within matched manufacturing Japanese MNEs for the period 1991-2002.

Despite concerns expressed about the adverse effects of FDI, the evidence does not support the view that overseas operations expand at the cost of home employment in Japan. On the contrary, the findings suggest that overseas operations have somewhat

helped to maintaining the level of home employment in Japanese manufacturing. However, the results are sensitive to the estimation method used and whether the estimation is based on the panel data set is balanced or unbalanced.

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Table 1 Selected indicators of parents firms of Japanese manufacturing MNEs, 1991-2002

Year	Number of:	Sales of:	Employment of:	Share in total Japanese manufacturing of:							
	MNE parent firms			Number of MNEs	Output of MNEs	Employment of MNEs	Workers earnings of MNEs	Capital stock of MNEs	Exports of MNEs	Imports of MNEs	R&D of MNEs
	Unit	Trillion of yen	in 1,000	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
1991	616	128.8	2245	4.5	48.2	37.2	43.9	47.1	-	-	73.5
1994	863	124.2	2275	6.3	49.6	38.3	45.2	49.3	86.2	60.6	74.6
1995	782	128.5	2267	5.4	49.0	38.0	44.6	48.7	80.8	60.7	75.7
1996	902	143.2	2328	6.3	51.7	39.4	46.5	50.5	82.5	58.5	77.2
1997	950	142.7	2292	6.7	52.8	40.1	47.6	51.9	82.5	60.3	77.8
1998	914	131.4	2188	6.5	52.0	39.2	46.7	50.4	82.8	60.9	77.8
1999	989	138.6	2261	7.1	54.4	41.1	48.6	52.4	84.8	62.2	79.0
2000	926	144.8	2215	7.6	57.2	44.0	51.9	55.7	86.5	69.1	81.2
2001	984	139.3	2121	7.3	55.8	41.4	49.5	53.5	83.2	65.0	78.4
2002	1144	136.8	2066	8.7	54.6	42.1	50.8	52.9	86.1	64.8	80.6
Average	907.0	135.8	2225.8	6.6	52.5	40.1	47.5	51.2	83.9	62.5	77.6

Source: Based on the METI database, which is explained in section 2 and Appendix 1.
Note: *See the definition of MNEs in main text. The survey data are not available for year 1992 and 1993.*

Table 2 Key indicators of foreign affiliates of Japanese manufacturing MNEs, 1989-2002

Year	Number of	Employment of:	Sales of:	Average sales	Average employment	Average wage rates	Average labour productivity	Average R&D intensity	Average local sales ratio	Average sales ratio to Japan	Average sales ratio to other countries	Average purchase ratio from local	Average purchase ratio from Japan	Average purchase ratio from other country
	foreign affiliate of manufacturing MNEs													
	Unit	in 1000	trillions of yen	billons of yen	Unit	Millions of yen	output per worker	%	%	%	%	%	%	%
1989	2656	914	22.4	8.4	344.1	2.7	24.5	1.2	74.8	17.9	18.2	52.9	44.9	13.4
1990	3407	1242	26.2	7.7	364.4	-	21.1	-	69.5	15.3	17.7	48.9	41.2	11.1
1991	3535	1261	25.4	7.7	369.6	-	20.8	-	67.0	17.8	18.7	50.3	40.9	12.5
1992	3040	986	25.1	9.0	371.0	3.0	24.3	3.7	75.1	25.0	27.3	55.1	49.9	22.9
1993	4548	1516	29.2	6.9	357.0	-	19.4	-	65.8	18.1	17.3	50.9	38.8	11.4
1994	7992	1972	85.2	11.7	267.4	3.1	43.6	0.6	68.7	15.6	15.8	41.0	43.0	16.3
1995	7345	1986	87.1	13.2	310.6	4.2	42.6	1.0	74.5	29.3	30.5	58.8	53.7	21.1
1996	7626	2258	106.7	15.2	296.6	3.7	51.2	3.0	70.8	21.8	24.6	48.8	44.4	25.9
1997	9279	2540	110.8	13.0	274.5	4.2	47.4	1.1	68.7	22.7	22.9	47.1	45.5	23.7
1998	9069	2339	109.6	13.3	294.3	4.1	45.2	1.1	71.6	24.6	34.0	51.3	47.6	32.1
1999	9828	2812	102.9	11.7	289.8	3.6	40.2	1.2	72.2	23.6	25.1	50.7	46.9	25.8
2000	10549	3049	112.8	12.3	289.9	4.1	42.4	4.2	70.7	21.8	23.2	49.6	46.0	23.3
2001	7068	2645	64.2	10.4	398.8	3.7	26.1	3.3	68.6	28.5	37.9	58.2	43.4	32.8
2002	8006	2844	64.9	9.8	410.3	3.4	24.0	1.7	66.4	25.4	24.9	56.2	39.2	20.0
Level change	5350	1930	42.5	1.41	66.2	0.7	-0.5	0.5	-8.4	7.5	6.7	3.3	-5.7	6.6
% change	201.4	211.2	189.7	16.7	19.2	25.9	-2.0	41.7	-11.2	41.9	36.8	6.2	-12.7	49.3

Source: Based on the METI dataset, which is explained in section 2 and Appendix 1.

Note: Average labour productivity is measured by output per worker. R&D intensity refers to the ratio of R&D expenditures to output. Worker compensation and R&D expenditures for 1990, 1991, and 1993 are not contained in the original return to the METI Foreign Affiliate survey. The METI Foreign Affiliate survey is available from 1989.

Table 3 Industry distributions of foreign affiliates of Japanese manufacturing MNEs (%), 1989-2002

	Firm			Employment			Sales		
	1989	1995	2002	1989	1995	2002	1989	1995	2002
Textile	6.9	8.5	6.0	7.8	8.2	5.5	2.1	1.9	1.3
Chemicals	13.6	13.6	14.4	7.7	7.5	6.3	8.9	9.3	10.2
Primary metals	6.5	6.4	5.4	7.5	5.8	3.9	6.7	5.8	3.9
Metal goods	3.2	3.0	2.9	1.2	1.2	1.2	0.7	0.5	0.5
General machinery	11.0	10.6	10.6	6.3	6.4	5.5	9.7	6.3	5.5
Electronics machinery	7.2	6.3	7.0	8.8	6.8	7.3	5.6	4.6	4.6
Information and communication	15.6	16.9	16.3	23.2	26.2	27.1	21.3	28.5	24.2
Transport equipment	12.1	12.1	15.9	17.8	19.9	23.7	30.5	28.6	36.7
Scientific equipment	3.8	3.4	3.6	2.6	2.4	3.1	1.9	1.7	2.2
Other mfg	20.1	19.4	17.9	17.3	15.7	16.3	12.8	12.6	10.9
Total manufacturing	100	100	100	100	100	100	100	100	100
Unit	Number of Firms			Employment in 1,000			Sales in billions of yen		
	5834	8637	8014	1485	2618	3251	32816	50591	72295

Source: Based on the METI dataset, which is explained in section 2 and Appendix 1.

Table 4 *Geographical distribution of foreign affiliates of Japanese MNEs (%) 1989-2002*

	Number of:			Employment of:			Sales of:		
	foreign affiliates of manufacturing MNEs								
	1989	*1995*	*2002*	*1989*	*1995*	*2002*	*1989*	*1995*	*2002*
East Asia	49.2	56.8	59.0	48.5	58.8	64.6	30.4	33.0	32.6
China	3.6	16.4	19.3	1.8	12.7	22.2	0.4	2.1	6.1
South Asia	1.5	1.2	1.7	2.2	2.0	1.9	0.8	0.8	1.1
Oceania	3.3	2.9	2.4	3.1	1.5	1.0	4.5	2.4	2.4
North America	24.7	20.2	18.4	25.3	20.5	17.3	46.0	41.9	41.9
US	22.5	18.6	17.2	23.8	19.4	16.5	43.2	39.7	38.9
South America	6.4	4.7	3.7	10.2	6.1	3.7	3.5	4.3	3.4
The EU	12.7	12.0	11.6	8.9	9.7	8.5	13.5	16.0	16.5
Eastern & Central Europe	0.6	0.8	1.1	0.3	0.4	0.8	0.4	0.7	0.9
Africa	0.7	0.4	0.4	0.6	0.1	0.5	0.2	0.1	0.4
World	100	100	100	100	100	100	100	100	100
Unit	6197	9042	8265	1533	2603	3285	35886	52429	73886
		unit			in 1,000		billions of yen		

Source: Based on the METI database, which is explained in section 2 and Appendix 1.

Table 5 *Summary statistics of selected variables used in regressions for unbalanced panel data*

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
L (foreign)	Log Foreign Affiliates Employment	8058	4.90	1.57	0.32	-4.91	10.53
Q (foreign)	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 6 *Correlation Matrix*

	w	*K*	*Q*	*R&D*	*IMP*	*L (foreign)*	*Sales*	*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			
L (foreign)	0.16	-0.06	0.49	0.10	0.13	1		
Sales	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 7.2 and Appendix 7.1.

Table 7 Labour demand by parent firms of MNEs, 1991-2002

(a) Results from Unbalanced panel data

	Dependent variable = log (home employment)			
	Model 1 OLS	Model 2 Within-transformation	Model 3 First-difference	Model 4 First-difference, IVs
Log Wage rate	-0.257	-0.117	-0.123	-0.119
	(0.047)***	(0.019)***	(0.015)***	(0.016)***
Log Capital prices	1.013	0.367	0.086	0.101
	(0.227)***	(0.137)***	(0.103)	(0.136)
Log Output	0.689	0.135	0.043	0.065
	(0.014)***	(0.022)***	(0.014)***	(0.064)
Log R&D intensity	0.154	0.022	0.009	0.009
	(0.013)***	(0.005)***	(0.003)***	(0.005)*
Log Import penetration	-0.033	0.001	0.007	0.009
	(0.013)***	(0.006)	(0.003)*	(0.004)**
Log Foreign Affiliates Employment	0.088	0.013	0.004	0.027
	(0.014)***	(0.005)**	(0.003)	(0.014)**
Log Foreign Affiliates Sales	-0.051	0.011	0.006	-0.009
	(0.015)***	(0.005)**	(0.003)**	(0.008)
Log GDP per-capita of host country	0.081	0.002	-0.004	0.005
	(0.013)***	(0.005)	(0.003)	(0.005)
Constant	-2.657	4.161	-0.048	-0.084
	(1.046)**	(0.650)***	(0.045)	(0.052)
Observations	6170	6170	4289	3691
The number of parent firm	1290	1290	1023	952
Adjusted R-squared	0.86	0.30	0.07	-
F-Statistics	473.77***	170.11***	9.06***	7.43***

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 4 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 7 (continued)
(b) Results from balanced panel data

	Dependent variable = log (home employment)			
	Model 1 OLS	Model 2 Within-transformation	Model 3 First-difference	Model 4 First-difference, IVs
Log Wage rate	-0.539	-0.098	-0.132	-0.07
	(0.104)***	(0.035)***	(0.027)***	(0.028)**
Log Capital prices	0.769	-0.004	-0.160	-0.064
	(0.480)	(0.255)	(0.164)	(0.225)
Log Output	0.687	0.102	0.026	0.162
	(0.035)***	(0.040)**	(0.016)	(0.105)
Log R&D intensity	0.195	0.018	-0.001	0.005
	(0.032)***	(0.011)	(0.004)	(0.007)
Log Import penetration	-0.027	0.010	0.006	0.017
	(0.030)	(0.012)	(0.006)	(0.008)**
Log Foreign Affiliates Employment	0.088	0.012	0.004	0.049
	(0.031)***	(0.010)	(0.006)	(0.019)**
Log Foreign Affiliates Sales	-0.040	0.014	0.005	-0.005
	(0.040)	(0.012)	(0.008)	(0.028)
Log GDP per-capita of host country	0.107	-0.011	-0.004	0.012
	(0.030)***	(0.013)	(0.004)	(0.010)
Constant	-2.461	7.076	0.037	0.057
	-2.096	(1.193)***	(0.034)	(0.043)
Observations	1459	1459	1254	1070
The number of parent firms	178	178	177	168
Adjusted R-squared	0.90	0.38	0.08	-
F-statistics	165.72***	15.15***	4.63***	4.25***

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

	Dependent variable = log (home employment)			
	Model 1 OLS	Model 2 Within-transformation	Model 3 First-difference	Model 4 First-difference, IVs
Log Wage rate	-0.422	-0.351	0.065	0.055
	(0.209)**	(0.238)	(0.114)	(0.122)
Log Capital prices	-0.286	0.182	-0.061	-0.127
	(0.736)	(0.477)	(0.470)	(0.491)
Log Output	0.556	0.549	0.685	0.717
	(0.048)***	(0.053)***	(0.036)***	(0.070)***
Log R&D intensity	0.096	0.060	0.05	0.046
	(0.051)*	(0.038)	(0.031)	(0.028)
Log Import penetration	-0.025	-0.045	-0.020	-0.020
	(0.028)	(0.021)**	(0.023)	(0.022)
Log Foreign Affiliates Employment	0.191	0.032	0.014	0.077
	(0.043)***	(0.046)	(0.038)	(0.105)
Log Foreign Affiliates Sales	-0.012	0.066	0.034	0.007
	(0.055)	(0.036)*	(0.022)	(0.054)
Log GDP per-capita of host country	0.269	0.064	0.067	0.052
	(0.049)***	(0.039)	(0.032)**	(0.039)
Constant	0.928	1.930	0.018	-0.005
	(3.407)	(2.270)	(0.018)	(0.033)
Observations	459	459	388	387
Adjusted R-squared	0.95	0.79	0.81	-
F-Statistics	330.76***	31.97***	76.60***	30.39***

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. The instrumental variables for output, foreign affiliates output and employment used in estimating Model 4 are discussed in the main text.

Table 9 Labour demand by parent firms of MNEs by region, 1991-2002

(a) - East Asia

	Dependent variable = log (home employment)			
	Model 1 OLS	Model 2 Within-transformation	Model 3 First-difference	Model 4 First-difference, IVs
Log Wage rate	-0.258	-0.123	-0.128	-0.125
	(0.048)***	(0.021)***	(0.017)***	(0.020)***
Log Capital prices	1.043	0.303	0.043	0.125
	(0.243)***	(0.147)**	(0.100)	(0.147)
Log Output	0.737	0.121	0.036	0.111
	(0.012)***	(0.025)***	(0.015)**	(0.070)
Log R&D intensity	0.173	0.029	0.011	0.015
	(0.013)***	(0.006)***	(0.004)***	(0.006)**
Log Import penetration	-0.026	0.000	0.002	0.006
	(0.014)*	(0.006)	(0.003)	(0.004)
Log Foreign Affiliates Employment	0.046	0.006	0.001	0.021
	(0.014)***	(0.005)	(0.003)	(0.011)**
Log Foreign Affiliates Sales	-0.061	0.003	0.002	-0.009
	(0.015)***	(0.004)	(0.003)	(0.008)
Log GDP per-capita of host country	0.004	-0.006	-0.002	0.000
	-0.011	(0.005)	(0.003)	(0.005)
Constant	-2.076	5.615	-0.004	-0.011
	(1.145)*	(0.732)***	(0.009)	(0.010)
Observations	4947	4947	3426	2898
The number of parent firm	1058	1058	829	767
Adjusted R-squared	0.88	0.32	0.07	-
F-statistics	458.61***	839.02***	8.66***	7.14***

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 9 (continued)
(b) - North America

	Dependent variable = log (home employment)			
	Model 1 OLS	Model 2 Within-transformation	Model 3 First-difference	Model 4 First-difference, IVs
Log Wage rate	-0.276	-0.121	-0.121	-0.102
	(0.062)***	(0.022)***	(0.018)***	(0.021)***
Log Capital prices	0.425	0.200	0.082	0.058
	(0.312)	(0.173)	(0.170)	(0.214)
Log Output	0.688	0.100	0.031	0.063
	(0.019)***	(0.026)***	(0.015)**	(0.068)
Log R&D intensity	0.16	0.015	0.004	0.004
	(0.020)***	(0.007)**	(0.003)	(0.005)
Log Import penetration	-0.014	0.002	0.002	0.003
	(0.017)	(0.007)	(0.004)	(0.005)
Log Foreign Affiliates Employment	0.097	0.008	0.004	0.001
	(0.017)***	(0.007)	(0.005)	(0.020)
Log Foreign Affiliates Sales	-0.052	0.020	0.005	-0.002
	(0.021)**	(0.008)**	(0.005)	(0.015)
Log GDP per-capita of host country	-0.044	-0.048	-0.018	-0.002
	(0.031)	(0.020)**	(0.010)*	(0.044)
Constant	1.295	6.176	-0.004	-0.011
	(1.416)	(0.852)***	(0.009)	(0.013)
Observations	3996	3996	2785	2198
The number of parent firm	812	812	662	589
Adjusted R-squared	0.84	0.25	0.11	-
F-Statistics	252.06***	386.67***	6.09***	4.06***

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 .9 (continued)
(c) – The EU

	Dependent variable = log (home employment)			
	Model 1 OLS	Model 2 Within-transformation	Model 3 First-difference	Model 4 First-difference, IVs
Log Wage rate	-0.201	-0.128	-0.126	-0.103
	(0.061)***	(0.027)***	(0.022)***	(0.024)***
Log Capital prices	1.155	0.180	0.087	0.045
	(0.349)***	(0.216)	(0.189)	(0.272)
Log Output	0.695	0.089	0.018	0.025
	(0.026)***	(0.032)***	(0.020)	(0.085)
Log R&D intensity	0.21	0.012	0.004	0.003
	(0.023)***	(0.008)	(0.005)	(0.007)
Log Import penetration	-0.013	0.005	0.006	0.01
	(0.020)	(0.008)	(0.005)	(0.007)
Log Foreign Affiliates Employment	0.074	0.005	0.002	0.032
	(0.017)***	(0.006)	(0.004)	(0.018)*
Log Foreign Affiliates Sales	-0.039	0.029	0.016	-0.011
	(0.028)	(0.015)**	(0.008)**	(0.027)
Log GDP per-capita of host country	-0.04	-0.063	-0.04	-0.02
	(0.038)	(0.030)**	(0.017)**	(0.053)
Constant	-1.606	6.61	0.001	0.002
	(1.620)	(1.107)***	(0.011)	(0.009)
Observations	2432	2432	1715	1271
The number of parent firm	493	493	399	342
Adjusted R-squared	0.86	0.29	0.07	-
F-statistics	233.09***	2876.28***	3.85***	2.05**

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 9 (continued)
(d) – South America

	Dependent variable = log (home employment)			
	Model 1 OLS	Model 2 Within-transformation	Model 3 First-difference	Model 4 First-difference, IVs
Log Wage rate	-0.482	-0.242	-0.253	-0.176
	(0.132)***	(0.066)***	(0.072)***	(0.103)*
Log Capital prices	0.677	0.842	0.239	-0.171
	(0.724)	(0.352)**	(0.261)	(0.505)
Log Output	0.731	0.205	0.067	0.190
	(0.044)***	(0.077)***	(0.075)	-0.209
Log R&D intensity	0.156	0.003	0.000	0.001
	(0.032)***	(0.015)	(0.007)	(0.009)
Log Import penetration	-0.021	0.036	0.003	0.010
	(0.043)	(0.013)***	(0.010)	(0.012)
Log Foreign Affiliates Employment	0.023	0.009	0.009	-0.002
	(0.032)	(0.012)	(0.008)	(0.030)
Log Foreign Affiliates Sales	0.045	0.047	0.008	0.016
	(0.043)	(0.019)**	(0.008)	(0.028)
Log GDP per-capita of host country	-0.122	(0.069)	-0.014	-0.017
	(0.081)	(0.035)*	(0.019)	(0.069)
Constant	-0.344	2.738	0.03	-0.038
	(3.385)	(1.819)	(0.012)***	(0.043)
Observations	764	764	546	320
The number of parent firm	154	154	129	96
Adjusted R-squared	0.88	0.46	0.16	-
F-statistics	108.16***	128.83***	2.83***	2.14**

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.

Appendix 1 METI Surveys

METI Firm Survey (the Basic Survey of Business Structure and Activity):
This survey, 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. This survey also covers limited information about the operation of foreign affiliates such as the number of affiliates, employment and value of sales, if the parent firm engages in FDI. 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 [13] and hence the response ratio is very high (around 90 percent).

The well know limitation of the METI Firm survey is that the entry and exit of firms in this survey does not necessarily correspond to the standard definitions of origin and termination of firms due to the sample selection criteria (Nishimura et al. 2005).

METI Foreign Affiliates survey (the Basic Survey of Overseas Japanese Business Activity*)*

The METI Foreign Affiliates survey is designed to trace the scale and functions of foreign affiliates of Japanese MNEs operating 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 affiliate is assigned its own unique code as well as the parent firm identifier. This makes it possible to link between the METI Firm survey and the METI Foreign Affiliate survey.

[13] This means firms failing to return the survey to the METI face heavy fines.

The METI Foreign Affiliate survey 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. The METI Foreign Affiliates survey also reports limited information about the operations of parent firms, such as sales, purchases, employment, and capital.

While the METI Foreign Affiliates 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).[14] 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 (Ramstetter 1996). 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).[15] 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.

[14] An alternative data source is available from a private publishing company, Toyo Keizai. However, Ramstetter (1996) concluded the data from Toyo Keizai have even more serious coverage and quality problems for the sample collection and variables.
[15] See also http://www.rieti.go.jp/jp/database/d02.html#01.

Appendix Table 1 List of two-digit Japan Statistical Industry Classification (JSIC)

JSIC Code	Industry Description
05-10	Foods
11-14	textiles (silk, spinning, fabrics and other textiles, apparel and accessories)
15-16	Clothing
17-18	Lumber and wood products
19	Furniture and fixtures
20-21	Pulp and papers
22-24	Publishing and printing
25-33	Chemical and allied products
34-35	Rubber products
36	Leather products and fur skins
37-39	Ceramic, stone and clay products
40-41	Iron and steel
42-43	Non-ferrous metals and products
44-46	Fabricated metal products
47	General machinery equipment
50-56	Electrical machinery
57-58	Transport equipment
59-62	Precision machinery and equipment
63-64	Other manufacturing

Note: This industry classification refers to Matsuura and Kiyota (2004).