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Abstract

This paper investigates the how effective protection and firm ownership affected firm productivity in Vietnam during 2005-2010. In labour-intensive industries and industries with intermediate labour intensity, the level of effective protection in an industry had a significantly negative effect on firm productivity. Multinational enterprise (MNE) joint ventures (JVs) and state-owned enterprises (SOEs) had consistently higher productivity than private firms, with productivity usually being highest in JVs. Wholly-foreign MNEs (WOs) also had significantly higher productivity than private firms in 2005-2007, but lower productivity than JVs or SOEs, and in 2008-2010, WO-private differentials were insignificant. In capital-intensive industries, the pattern of productivity differentials (highest in JVs, followed by SOEs, WOs, and private firms) was similar in the earlier period, but not in the latter period or when all years were included in the sample. The level of effective protection also did not have a significant, independent effect on firm productivity in capital-intensive industries.

Key words: MNEs, trade policy, productivity, ownership mode
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1. Introduction

Multinational enterprises (MNEs) are key players in the process of global economic integration and production of MNEs has tended to grow faster than production of local firms in Vietnam and many other Asian economies (Ramstetter 2012). Theory suggests that to become an MNE, a firm must first own generally intangible assets related to production technology, management skills, and marketing networks (Caves 2007, Dunning and Lundan 2008, Markusen 1991). If MNEs do indeed possess these assets in relatively large amounts, they will tend to be more productive than non-MNEs in some respect.

Although theory suggests that foreign affiliates will have higher productivity than non-MNEs, previous empirical evidence is mixed. For example, analyses of large, heterogeneous samples of manufacturing plants in Mexico (Blomström 1986) and Indonesia (Takii 2004), or manufacturing firms in Vietnam (Athukorala and Tran 2012; Ramstetter and Phan 2013) found MNEs tended to have relatively high productivity. However, industry-level analyses for Indonesia and Vietnam suggested that MNE-local productivity differentials were insignificant when production function parameters were allowed to vary among industries. Moreover, evidence for manufacturing plants in Malaysia (Haji Ahmad 2010; Menon 1998; Oguchi et al. 2002) and Thailand (Ramstetter 2004) suggested small and generally insignificant differentials in productivity levels or growth, in large heterogeneous samples and/or at the industry level.

This paper makes two contributions. First, the paper examines how industry-level effective protection affected firm productivity and ownership-related productivity differentials. In small, open economies like Vietnam, which cannot affect world prices and depend on imports for many intermediate and capital goods, standard trade theory and related evidence suggests that higher

protection will increase costs and reduce firm productivity.[2] Because MNEs account for disproportionately large shares of exports and imports in Vietnam (and thus have relatively high trade propensities), protection-related productivity effects are likely to be larger in MNEs than in local firms, reducing MNE-local differentials.[3] In contrast, there is evidence that high protection may weaken productivity spillovers from MNEs in Vietnam (Truong et al. 2015). If this is the case, MNE-local productivity differentials may actually be larger in industries with high protection. To our knowledge, this paper provides some of the first empirical evidence about the effect of protection on MNE-local productivity differentials.

Second, because previous evidence for Vietnam is only available through 2006, and Vietnam joined the World Trade Organization (WTO) in January 2007 after instituting further, extensive trade and investment reforms in 2005-2006, it is important to evaluate the extent of productivity differentials among MNEs, SOEs, and local firms in more recent years. This paper analyses productivity in Vietnam's manufacturing firms during 2005-2010, both in large heterogeneous samples of all manufacturing firms and in smaller, more homogeneous industry groups distinguished by labour intensity. Vietnam is an interesting case study because policies have been designed to attract foreign MNEs after the *doi moi* reform in 1986, partially because it was believed that foreign MNEs could help improve productivity.

After a more detailed review of the literature (Section 2), data on ownership and productivity of Vietnamese manufacturing firms are reviewed (Section 3). The empirical model is then presented (Section 4) and empirical results analysed (Section 5), before concluding (Section 6).

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[2] For example, Athukorala and Chand (2000) find that U.S. MNEs created larger productivity gains in countries with relatively low protection. In a related study, Balasubramanyam *et al*. (1996) found that foreign direct investment led to larger increases in growth in export-promoting economies than in import-substituting ones.

[3] In 2005-2010, MNEs accounted for 53-58 percent of Vietnam's exports and 34-44 percent of imports, but only 20-24 percent of non-household GDP (General Statistics Office 2016b).

2. Literature review

As described in the introduction, foreign MNEs in developing economies are expected to be more productive than local firms or plants in developing economies like Vietnam, largely because MNEs possess relatively large amounts of firm-specific assets related to production technology, marketing networks, and management know-how than non-MNEs, and most local firms are non-MNEs. However, the empirical evidence on this point is mixed, especially for manufacturing plants in Malaysia and Thailand. Evidence from large samples of plants or firms in many manufacturing industries in Indonesia and Vietnam is more consistent with the hypothesis that MNEs have relatively high productivity, but evidence is much weaker when all production function coefficients are allowed to vary among more homogeneous industry groups.

Productivity differentials between foreign MNEs and local firms may be insignificant for at least four reasons. First, MNEs in Vietnam and other developing economies MNEs often engage in assembly, using relatively simple, standardized production technology. In such cases, production technology in MNE affiliates is often similar to technology in local firms. Moreover, even if MNEs do introduce new technologies, local firms are often able to imitate them quickly.

Second, MNE parents may be reluctant to allow minority-owned affiliates access to the MNE's intangible assets related to production technology because they fear leakage of corporate knowledge (Caves 2007). This is one reason researchers like Moran (2001) argue that affiliates which are closely integrated into the parent are likely to be more productive and beneficial to host economies than affiliates which are isolated from the parent network by ownership restrictions or import content requirements, for example. If this is true, wholly-owned MNEs (WOs) or other affiliates (e.g., over 90 percent) with large foreign ownership shares should have

better access to the MNE's firm-specific assets and be more productive than MNE joint ventures (JVs) with smaller foreign ownership shares, especially minority-foreign JVs.

However, empirical evidence regarding this issue is also unclear. For example, in large samples of Indonesian manufacturing plants, Takii (2004) found that majority-foreign MNEs had significantly higher productivity than minority-foreign plants or local plants, which had the lowest productivity. However, these differentials were not usually significant at the industry level. Similarly, Blomström and Sjöholm (1999) and Takii and Ramstetter (2005) found that productivity was often relatively low in MNE plants with relatively large foreign ownership shares in Indonesia. Other evidence for Thai plants (Ramstetter 2004) and Vietnamese firms (Nguyen et al. 2006) is similar. In contrast, Ramstetter and Phan (2013) found that wholly-owned MNEs (WOs) were generally more productive than MNE joint ventures (JVs) in Vietnam, but that there was substantial variation in results among industries and sub-periods.[4]

Third, productivity spillovers occur when MNE presence affects the productivity of local firms and operate through at least three major channels. Forward or backward linkages between MNEs and local firms constitute the first channel, though backward linkages are usually thought to be more important in this respect (Dunning and Lundan 2008). Labour mobility is a second channel, and can be especially important when relatively skilled workers move from MNEs to local firms or to start up new local firms (Chen 1983; Görg and Strobl 2005; Katz 1987; Kohpaiboon 2006a). Third, MNE presence often increases competition and encourages domestic firms to improve efficiency, often by imitating MNEs (Kokko 1994; Wang and Blomström 1992).

[4] Other studies for Belgium in 1990-1995 (De Backer and Sleuwaegen, 2003) and Romania in 1998-2003 (Javorcik and Spatareanu 2008) found that productivity in JVs improved faster than in WOs.

When these spillovers occur, local firm productivity improves, and productivity differentials between MNEs and local firms become smaller.

The theory of immiserisation (Bhagwati 1968, 1973; Brecher and Findlay 1983; Brecher and Alejandro 1977) and related empirical and policy literature (Athukorala and Chand 2000; Balasubramanyam et al. 1996; Moran 2001) also suggests that firm productivity and/or spillovers from MNEs are likely to be reduced when import protection is high. This is because protection distorts resource allocation and reduces motives for productivity improvement in all firms, including MNEs.[5] Studies of India (Kathuria (2002), Thailand (Kohpaiboon, 2003; 2006b), and Uruguay (Kokko et al. 2001) all provide evidence that spillovers from MNEs tended to be larger when protection was relatively low. For Vietnam, Truong et al. (2015) provide evidence that high effective rates of protection have negative effects on both local firm productivity and spillovers from MNEs.[6]

Fourth, productivity estimates are sensitive to specification, estimation technique, and data errors. Estimates for Vietnam are particularly vulnerable because data on intermediate expenditures are not collected at the firm level and must be estimated with substantial error for some firms (see details in Section 3). In contrast, evidence of positive and significant wage differentials between MNEs and local firms in Vietnamese manufacturing (Nguyen and Ramstetter 2015a, 2015b) is stronger than evidence of productivity differentials both in large heterogeneous samples and in more homogeneous industry-level samples. Similarly evidence of

[5] Empirical estimates of spillovers are notorious for large variation among host economies, industries, and time periods, as well as estimation methodologies. For example, in studies of Vietnam, Nguyen et al.(2006) find "little evidence of positive spillover effects at the firm level", but "no signs of negative spillover effect either". This result is generally consistent with more comprehensive results from Ramstetter and Phan (2013). On the other hand, Pham (2008) finds generally positive spillovers that were largest in Hanoi and Ho Chi Minh City, while Le and Pomfret (2011) find positive backward spillovers in manufacturing, but negative horizontal spillovers.

[6] These results also indicate that WOs generate negative productivity spillovers to local private firms, while JVs generate positive spillovers.

significant wage differentials is relatively strong for manufacturing plants in Indonesia (Lipsey and Sjöholm 2004; Ramstetter and Narjoko 2013), Malaysia (Ramstetter 2014), and Thailand (Matsuoka-Movshuk and Movshuk 2006; Ramstetter 2004). This evidence is important because variation in wages is closely related to variation in labour productivity, and may indicate that productivity estimates are less robust than earnings' estimates.

3. Productivity differentials and import protection in Vietnam

This study utilizes firm-level data underlying annual enterprise surveys conducted for 2005-2010 (General Statistics Office various years). The dataset includes all non-household firms with 10 or more employees and samples of smaller firms. Because we want to compare generally large MNEs with local firms, many of which are very small and cannot be meaningfully compared with MNEs, we exclude enterprises with less than 20 employees. We also exclude firms in the tobacco, printing and publishing, oil and coal, and recycling industries because they have few firms or MNEs and/or are subject to strict government regulation that isolates them from market forces. Because the firms do not report intermediate expenditures, they are estimated from on firm-level data on revenues from major products and corresponding, estimated input-output ratios by detailed (4- to 6-digit) industry. Value added estimates are imprecise because firm-level input-output ratios differ from industry averages and because all products of some diversified firms are not included.

The dataset included duplicate observations, which probably resulted from different plants of multi-plant firms reporting the same firm-level information. Records were defined as duplicates if firms reported the same values for seven variables: total workers, female workers, initial fixed assets, ending fixed assets, registered capital, turnover (=total revenue), and intermediate

expenditure. One firm was retained from each set of duplicates. Because lagged values of fixed assets and employment are required, 2004 data were processed similarly. Firms reporting non-positive employment, fixed assets, turnover, and/or value added were dropped, though most of these firms had less than 20 employees. The resulting dataset had 11,721 manufacturing firms in 2005 and 18,060 in 2010, creating an unbalanced panel of 43,333 observations for 2005-2010.

Primarily because many firms were small and/or estimates of intermediate consumption were unavailable or unrealistic, the panel's samples were substantially smaller than the totals reported in published compilations (e.g., 21,876 manufacturing firms in 2005 and 45,472 in 2010; General Statistics Office 2010, 2013, 2016a). Perhaps more importantly, the panel's coverage varied over time and among indicators. For example, sales of all sample firms increased from 571 trillion dong in 2005 to 818 trillion dong in 2007, but fell to 532 trillion dong in 2008, before increasing to 1,432 trillion dong in 2009 and 1,822 trillion dong in 2010 (Table 1). Similarly, employment of sample firms was much lower in 2008 (1.6 million) than in 2005-2007 (2.7-3.0 million) or 2009-2010 (3.7-3.9 million). Thus, ratios of panel firm sales and employment to published totals was lower in 2007 and especially in 2008 (69 and 34 percent, respectively, for sales and 72 and 40 percent, respectively, for employment) than in other years (73-79 percent for sales and 88-92 percent for employment).[7] Caution is thus necessary when interpreting time trends observed in the panel (Table 1), especially around 2008 when the panel's coverage was unusually low. In other words, the large declines observed in 2008 probably result primarily from changes in sample coverage, not from actual changes in firm sales or employment. On the other hand, the panel's coverage was rather comprehensive in other years.

[7] For 2005-2008, these panel samples are somewhat smaller (14-15 percent of sales, 4-5 percent of employment) than similar samples reported in Ramstetter and Phan (2013, p. 31), but display similar trends.

Table 1 here

Both published compilations (General Statistics Office 2010, 2013, 2016a) and the panel (Table 1) are consistent in indicating that shares of WOs and private firms in total firm sales and employment generally increased, while shares of SOEs and JVs (many of which involve an SOE partner) declined during this period. The increases in private and WO shares are related to policy changes, especially the promulgation of the Enterprise Law in 2000, several subsequent revisions to the law, as well as related laws and decrees. A unified Investment Law was finally promulgated in 2005. Removal of strong policy biases that penalized local private firms and favoured SOEs was the most important result of these policy changes.[8] It also became easier to establish WOs after they were allowed to become shareholding companies in 2003.

This paper analyses large heterogeneous samples of all manufacturing firms and three smaller, more homogeneous samples of industry groups classified by factor intensity.[9] WO sales were distributed relatively equally with the labour-intensive category being largest in 2005-2007 and the capital-intensive group being largest in 2008-2010 (Table 1). JV and SOE sales were concentrated in the intermediate intensity and capital-intensive groups. As a result, WOs accounted for about half of the sales and employment of all firms in labour-intensive industries, as well as one-third of sales and just under half of employment in capital-intensive industries. JV shares of sales were largest in capital-intensive industries (about one-fourth to one-third), but corresponding shares of employment were much smaller.

[8] Private firms had no clear, general, legal grounds for existence before 2000 (Van Arkadie and Mallon 2003)

[9] Labour-intensive industries are textiles, apparel, leather and footwear, wood products, non-electric machinery, precision machinery, and furniture & miscellaneous manufacturing. Capital-intensive industries are rubber & plastics, basic metals, electrical machinery, communication machinery, motor vehicles, and other transport machinery. Industries with intermediate intensity are food & beverages, paper products, chemicals, non-metallic mineral products, and metal products. We use a 2-digit classification of revision 3 of Vietnam's Standard Industrial Classification, which is very similar to the International Standard Industrial Classification.

Table 2 compares value added per worker, among ownership and industry groups. Consistent with previous evidence through 2006 (Ramstetter and Phan 2013, p. 34), JVs had the highest labour productivity in most years and industry groups, with particularly large differentials in the capital-intensive and intermediate groups through 2007. WOs also had relatively high labour productivity in the labour-intensive group through 2007 and intermediate group through 2008, but relatively low productivity in the capital-intensive group in all years. SOE-private differentials were also positive and relatively large in the labour-intensive and intermediate groups through 2008. In 2009-2010, most differentials declined substantially and the WO-private differential turned negative. The trend toward smaller differentials resulted from increases of labour productivity in private firms and may indicate the maturation of the private sector. On the other hand, the marked increase of SOE-private and JV-private differentials in the capital-intensive group is much more difficult to explain. The large, discrete changes in these differentials suggest that the sampling changes may have influenced the trends observed.

Table 2 here

In contrast to average labour productivity, average value added-fixed asset ratios tended to be relatively low in SOEs, WOs, and JVs, reflecting relatively high capital intensity in these groups (Table 3). WO-private differentials were consistently negative in all groups and years with one exception, labour-intensive industries in 2005. JV and SOE differentials were also negative in almost all years in the labour-intensive and intermediate groups, but consistently positive in the capital-intensive group. In other words, average capital productivity was consistently highest in private firms in the labour-intensive and intermediate groups, but generally lower in the capital-intensive group. As with labour productivity, average capital productivity in private firms

increased markedly in 2009 and 2010 in the labour-intensive and intermediate groups, but not in the capital-intensive group

Table 3 here

Tariffs are a key policy instrument Vietnam uses to restrict imports. The average, nominal tariff rate declined continuously from 13 percent in 2005 to 5.7 percent in 2010 and the mean rate for manufactures fell from 12 to 6.9 percent, respectively (CIEM 2010). Among manufactures, tariffs on apparel, footwear, ceramics, automobiles, and motorcycles remained relatively high in 2010. However, Vietnam's tariff structure in Vietnam is cascading, which means that tariffs are generally higher on final goods than on inputs. Correspondingly, nominal tariff rates do not reflect the resource allocation effects of tariffs, which are more accurately measured with effective rates of protection (ERPs, Table 4). During 2006-10, ERPs also declined, reflecting the gradual removal of many tariff barriers. Declines were particularly large in the labour-intensive textiles and apparel industries. In general, Vietnam appears to have maintained relatively high effective protection in industries in which it is usually thought to have a comparative advantage (e.g., textiles, apparel, leather, footwear and food processing).

Table 4 here

4. The model

Simple comparisons of average factor productivities in Tables 2 and 3 are partial and do not account for the influences of factor intensity and firm size. In order to provide a more comprehensive comparison, we follow the previous literature reviewed above and estimate total factor productivity (TFP) using translogarithmic (translog) production functions. The translog is

used because it allows both the marginal rate of technical substitution and economies of scale to vary with production levels. The constant in this equation is interpreted as TFP. Production (Y_{ij}) is measured as the log of value added in firm i operating in industry j. Capital and labor inputs are measured as the logs of fixed asset book values (K_{ij}) and the number of employees (L_{ij}), respectively. Real values of Y and K are calculated using deflators of industrial output defined at the 2-digit level of the Vietnam's standard industrial classification (VSIC). Value added, capital, and labour are standardized to minimize problems related to multicollinearity.

The MNE-private differential in TFP is measured as the coefficient on an intercept dummy identifying MNEs (MNE_{ij}). If the coefficient on MNE_{ij} is positive and significant, it means that MNEs had significantly higher TFP than private firms, after accounting for firms' scale and use of capital and labour. Because SOEs are also important and likely to have relatively high productivity according to previous studies, a dummy variable for SOEs (SOE_{ij}) is also included. The coefficient on this variable reflects the size and significance of SOE-private productivity differentials, while the constant measures TFP in private firms. Because ownership dummies are time-invariant for most firms, pooled ordinary least squares (OLS) or random effects' estimators are required to estimate productivity differentials.[10] Although both estimates yield qualitatively similar results, the analyses below focus on random effects estimates because Breusch and Pagan tests indicated that they were preferable to pooled OLS results (available from the authors) in all samples examined. Finally, a set of time dummies was included to capture changes in the economic environment over time.[11]

[10] If a fixed-effects estimator is used, coefficients on ownership dummies reflect the productivity effects of changes in ownership, not productivity differentials.
[11] Coefficients on time dummies are omitted from the results presented below but are available from the authors.

The level of effective protection in an industry (TP_j, percent) is included to capture the negative effects protection is likely to have on firm productivity. The possibility that high ERPs can affect MNE-private productivity differentials is considered by interacting TP_j with MNE_{ij}. The degree of competition in each industry is also controlled for by including the four-firm concentration ratio ($CR4_j$=sales of the four largest firms to all firm sales in industry j in percent). The resulting model is:

$$Y_{ij} = \beta_o + \beta_1(MNE_{ij}) + \beta_2(SOE_{ij}) + \beta_3(TP_j) + \beta_4(MNE_{ij} \times TP_j) + \beta_5(CR4_j) + \beta_6 + \beta_7(L_{ij}) + \beta_8(L_{ij})^2 + \beta_9(K_{ij}) + \beta_{10}(K_{ij})^2 + \beta_{11}(L_{ij} \times K_{ij}) + \varepsilon_{ij} \quad (Eq.1)$$

Consistent with previous estimates for Vietnam, the MNE-private and SOE-private productivity differentials (β_1 and β_2) are generally expected to be positive. We also expect independent effect of trade protection (measured by β_3) to be negative. On the other hand, as explained in the introduction, the interaction of MNE ownership and trade protection (measured by β_4) has indeterminate effects. The effect of industry concentration (measured by β_5) is also unclear a priori.[12] Marginal factor productivities calculated from equation (1) are expected to be positive, consistent with basic production theory.

As discussed above, productivity may differ in WOs and JVs. To analyse related differences, including the possibility that interactions with ERPs also differ, the MNE dummy is replaced with two dummy variables identifying WOs and JVs (WO_{ij}, JV_{ij}) in an alternative specification:

[12] Evidence from Kamien and Schwartz (1982) and Kohpaiboon (2006b) suggests market concentration is positively correlated with firm productivity in developing countries but previous evidence for Vietnam suggests concentration was generally an insignificant determinant of firm productivity in 2001-2006 (Ramstetter and Phan 2013).

$$Y_{ij} = \gamma_0 + \gamma_1(WO_{ij}) + \gamma_2(JV_{ij}) + \gamma_3(SOE_{ij}) + \gamma_4(TP_j) + \gamma_5(WO_{ij} \times TP_j) + \gamma_6(JV_{ij} \times TP_j) + \gamma_7(CR4_j) + \gamma_8(L_{ij}) + \gamma_9(L_{IJ})^2 + \gamma_{10}(K_{ij}) + \gamma_{11}(K_{ij})^2 + \gamma_{12}(L_{ij} \times K_{ij}) + \varepsilon'_{ij} \quad (Eq.2)$$

The model is estimated for the whole sample period (2005-2010) and two sub-periods 2005-2007 and 2008-2010 because Vietnam joined the WTO in January 2007 and the growth of Vietnam's economy and manufacturing sector slowed in the latter period. Estimates are first performed in large heterogeneous samples of firms in all sample industries and then in subsamples of industry groups distinguished by factor intensity.

5. Results

When equations (1) and (2) are estimated large, heterogeneous samples of all firms, Wald tests indicate that differences between coefficients on WO_{ij} and JV_{ij} were statistically significant in all estimates (Table 5). Differences between interaction coefficients on $WO_{ij} \times TP_j$ and $JV_{ij} \times TP_j$ were statistically significant when all six years were included and in the latter period, but not in the earlier period. Thus, we focus on estimates of equation (2).

Table 5 here

Regardless of the specification, effective protection had a significantly negative effect on productivity in all firms during all periods (Table 5, left side). In contrast, concentration had inconsistent effects on productivity, similar to results for previous years (Ramstetter and Phan, 2013). Its effects were insignificant in the latter period, weakly significant and negative at the 10 percent level in the earlier period, and highly significant at 1 percent level but positive if all years are combined in the sample.

JV-private differentials were the largest ownership differentials in all periods and highly significant. WO-private differentials were positive, highly significant and second largest in 2005-2007. They were also highly significant in 2005-2010, but slightly smaller than SOE-private differentials, which were also positive and highly significant in all periods and second largest in the latter period as well. Results are thus broadly consistent with results from previous years, in suggesting that both MNEs and SOEs tended to have relatively high productivity, and that productivity was highest in JVs. The results are also consistent with previous studies in suggesting that productivity differentials varied substantially among relatively short sub-periods.

Coefficients on the MNE-ERP interaction variables were positive and significant for WOs when all years were included and in the latter period, but insignificant in the earlier period. For JVs, interaction coefficients were negative and significant in the earlier period, but insignificant in the latter period and when all years were included. Thus, if estimates are performed in large, heterogeneous samples, the effects of ERP levels on MNE-private productivity differentials vary among sub-periods for both WOs and JVs.[13]

Estimates for all sample manufacturing industries assume identical production technologies in sub-groups, for example, labour-intensive and capital-intensive industries and industries with intermediate intensity. However, Ramstetter and Phan (2013) found that many production function parameters varied markedly among seven industry groups in 2001-2006, suggesting that this assumption is unrealistic in Vietnamese manufacturing. Thus, we estimate equations (1) and (2) in three alternative subsamples distinguished by labour-intensity.

[13] Similarly, estimates of equation (1) indicate that the effects of the overall MNE-ERP interaction varied among sub-periods; it was significantly positive in 2005-2010, significantly negative in 2005-2007, and insignificant in 2008-2010.

Partially because they contained over two-thirds of the observations in the panel, results for labour-intensive industries resemble results for all industries in important respects (Table 5, right side). Wald tests indicate that equation (2) is generally preferable so we focus on those results. High ERPs again had a consistent, significant, and negative effect on productivity in all firms. In contrast, concentration's effect was inconsistent; insignificant in the two sub-periods, but significantly positive when all years were included. JV-private differentials were significantly positive in all three periods and JVs had the highest productivity in the earlier period and when all years were included in the sample. In these two periods, SOE-private differentials were also significant and the second largest. In the latter period, SOE-private differentials remained significant and were larger than JV-private differentials. WO-private differentials were insignificant in the latter period, but significantly positive in the earlier period and when all years were included. They were the smallest of all ownership-related differentials, but similar to SOE-private differentials in the earlier period.

On the other hand, interactions of ERP levels and MNE-private productivity differentials had insignificant effects, with two exceptions (Table 5). When all years were included, WO-private differentials were significantly larger in industries with high protection, but this effect was insignificant in the two sub-periods.[14] In contrast, JV-private differentials were significantly lower in industries with high protection in the earlier period, but this effect was insignificant in the latter period and when all years were included.

When estimated in smaller samples of industries with intermediate intensity, equation (1) was preferred when all years were included (Table 6, left side). Results indicate that MNE- and SOE-

[14] Estimates of equation (1) reveal a similar pattern, reflecting the fact that most MNEs are WOs.

private differentials were both significantly positive but that MNEs had the highest productivity. The independent effects of ERPs were significantly negative and concentration had a weakly significant (at 10%) and positive effect on productivity. However, the effects interacting ERPs and MNE ownership were insignificant.

However, when estimates were made for the two sub-periods, equation (2) was generally preferred (Table 6). JVs had the highest productivity in both sub-periods all samples, followed by WOs in the earlier period, but the WO-private differential was insignificant in the latter period. SOE-private differentials were consistently positive and significant, but smaller than both JV- and WO-private differentials when they were significant. High industry-level ERPs again led to significantly lower productivity in all firms, but interactions of ERPs and WO- or JV-private productivity differentials were never significant at standard levels. Concentration's effects were significantly negative in the earlier period but positive and weakly significant in the latter period.

Results for capital-intensive industries contrasted to other results by indicating that the independent effects of protection on firm productivity were insignificant in the latter period and when all years are included, though they were significantly negative in the early period (Table 6, right side). Wald tests indicate equation (2) was generally preferred, and the JV-private differentials were significantly positive and the largest in the earlier period and when all years were included. WO-private and SOE-private differentials were also significantly positive in the earlier period, with WOs having higher productivity. However, in the latter period, all ownership-related differentials were insignificant at the 5 percent level in the latter period, though WO-private differentials were negative an weakly significant at the 10 percent level. In addition, ERPs never significantly affected MNE-private productivity differentials and the effects of concentration were insignificant in all estimates.

6. Conclusion, policy implications, and the research agenda

This paper examined the effects of effective protection and ownership on firm productivity in Vietnam in 2005-2010. In large samples of firms in labour-intensive industries and smaller samples of firms in industries with intermediate intensity three consistent findings were obtained. First, the level effective protection in an industry usually had a significantly negative effect on productivity in all firms. Second, JVs and SOEs had higher productivity than private firms, with productivity being the highest in JVs with one exception, labour-intensive industries in the latter period. Third, WOs also had significantly higher productivity than private firms in 2005-2007, but WO-private differentials were insignificant in 2008-2010. When estimates were made for capital-intensive industries, the pattern of productivity differentials (highest in JVs, followed by SOEs, WOs, and lastly by private firms) was similar in the earlier period, but not in the latter period or when all years were included in the sample. Perhaps more importantly, the level of effective protection did not have a significant independent effect on firm productivity in capital intensive industries.

These results reinforce the findings of Ramstetter and Phan (2013) in suggesting that one must take industry heterogeneity very seriously when estimating production functions parameters because they are likely to differ markedly among industry groups. This is particularly the case when considering how effective protection is related to MNE-private productivity differentials. In labour-intensive industries, there was some indication that WO-private differentials were relatively large (when all years are included) in industries with high effective protection, while JV-private differentials were relatively small (in the earlier period). However, in capital-intensive industries and industries of intermediate intensity, MNE-private differentials were

never significantly affected by industry-level protection. Thus, effective protection's independent effect was strong and negative in labour-intensive industries and industries with intermediate intensity, but its effect on MNE-local productivity differentials was weak.

The most important policy inference emerging from this exercise is that all firms in Vietnam's labour-intensive industries and industries with intermediate intensity can improve productivity if effective protection is reduced. If one realizes that these groups contain most of Vietnam's exporting firms, and that Vietnam's exporters import a large portion of their inputs and capital goods, this finding makes perfect sense. Thus, although multilateral agreements involving such as the Trans-Pacific Partnership are not likely to be implemented, Vietnam's policy makers should recognize that firms operating in Vietnam could benefit from lower protection. On the other hand, in the post-WTO (latter) period firms in capital-intensive industries do not share such characteristics and would not have benefitted as much from lower effective protection.

Finally, it must be emphasized that these results need to be interpreted with caution and further research is warranted to clarify the relationships examined. First and foremost, it would be helpful to examine aspects of firm performance other than productivity. This is particularly warranted in the Vietnamese case because intermediate expenditure estimates are approximate and subject to large errors. Other measures such as profitability and wages, for example, can be estimated directly from the firm-level data with much smaller error. Second, these and previous results have suggested that heterogeneity among industries and time periods is particularly important in Vietnam. Because the level of aggregation is still relatively high in the three subsamples used in this study, it might be interesting to examine similar issues in more disaggregated samples, though this would complicate the analysis of effective protection's

effects. Alternatively, one might want to group industries or firms by alternative criteria or periods. Extending the analysis past 2010 would also be highly desirable.

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Table 1 Total revenue and employee of firms by ownership and level of capital intensity

Owner, industry group	Total revenue (trillion dong)						Number of employees (thousands)					
	2005	2006	2007	2008	2009	2010	2005	2006	2007	2008	2009	2010
Private firms												
Manufacturing, sample industries	120	153	189	162	420	520	1178	1315	1125	684	1659	1774
Labour-intensive industries	23	25	31	22	80	69	604	671	555	343	757	816
Intermediate intensity	56	76	96	83	213	275	465	527	457	257	728	762
Capital intensive industries	41	53	62	56	127	176	110	116	114	84	173	196
Excluded industries	90	112	126	81	306	399	12	14	13	11	20	22
SOEs												
Manufacturing, sample industries	138	146	149	100	211	222	520	441	335	225	395	293
Labour-intensive industries	25	27	22	19	25	27	216	186	123	90	131	95
Intermediate intensity	79	83	85	56	118	134	222	175	138	86	164	130
Capital intensive industries	34	36	42	26	69	61	83	80	74	49	100	68
Excluded industries	22	22	21	21	47	111	35	33	27	25	33	30
Wholly-foreign MNEs												
Manufacturing, sample industries	202	275	324	175	576	812	961	1165	1156	607	1582	1780
Labour-intensive industries	80	115	118	47	186	250	706	835	830	418	1085	1212
Intermediate intensity	60	76	101	52	208	262	107	131	126	66	177	197
Capital intensive industries	63	85	104	76	182	301	148	199	200	123	320	372
Excluded industries	0	1	1	1	2	3	2	6	3	3	7	7
MNE joint ventures												
Manufacturing, sample industries	111	127	156	95	225	268	76	79	73	49	97	95
Labour-intensive industries	10	10	11	6	12	16	61	71	62	33	62	65
Intermediate intensity	45	54	63	48	91	104	40	40	41	25	49	47
Capital intensive industries	56	63	83	42	121	147	34	38	31	23	47	47
Excluded industries	2	3	4	3	7	9	1	1	1	1	1	0

Source: Authors' compilations from General Statistics Office (various years).

Table 2 Mean value added per worker of firms (million 1994 dong, % differentials)

Owner, industry group	2005	2006	2007	2008	2009	2010
Private firms (million 1994 dong)						
Manufacturing, sample industries	18.1	28.3	46.0	44.4	119.8	120.7
Labour-intensive industries	10.3	11.6	22.0	23.5	76.2	82.5
Intermediate capital industries	20.9	22.2	58.3	55.3	147.8	145.1
Capital intensive industries	49.6	51.4	139.7	98.8	59.3	69.9
SOEs-private differentials, %						
Manufacturing, sample industries	90.06	34.28	38.91	24.32	-1.75	11.52
Labour-intensive industries	84.47	66.38	24.09	32.77	18.50	5.21
Intermediate capital industries	82.78	77.93	45.97	35.44	-11.23	1.79
Capital intensive industries	20.56	55.25	-35.22	-35.43	128.67	180.11
WO-private differentials, %						
Manufacturing, sample industries	68.51	14.84	71.09	40.09	-66.28	-59.90
Labour-intensive industries	49.51	37.07	43.18	0.00	-66.80	-47.27
Intermediate capital industries	36.36	45.50	13.38	28.39	15.83	-1.72
Capital intensive industries	-30.04	-26.26	-40.66	-17.31	-30.02	-29.90
JV-private differentials, %						
Manufacturing, sample industries	369.06	244.88	366.09	137.84	23.87	11.76
Labour-intensive industries	104.85	73.28	86.36	37.87	-14.04	-50.67
Intermediate capital industries	388.52	364.41	255.23	162.57	12.79	-1.31
Capital intensive industries	183.27	266.15	229.92	31.07	279.26	248.35

Source: Authors' compilations from General Statistics Office (various years).

Table 3 Mean value added per fixed asset of firms (ratios, % differentials)

Owner, industry group	2005	2006	2007	2008	2009	2010
Private firms						
Manufacturing, sample industries	2.97	3.13	6.19	5.56	14.40	16.50
Labour-intensive industries	3.33	3.27	5.78	5.36	17.10	15.70
Intermediate capital industries	2.84	2.98	6.91	6.00	13.80	19.30
Capital intensive industries	0.92	0.83	1.73	1.48	1.17	1.36
SOEs-private differentials, %						
Manufacturing, sample industries	22.90	-28.75	-58.16	-56.47	-60.00	-64.91
Labour-intensive industries	-53.15	-43.43	-56.75	-45.52	-68.36	-63.69
Intermediate capital industries	100.70	-54.36	-61.51	-64.83	-61.30	-67.46
Capital intensive industries	163.04	602.41	50.87	33.11	538.46	224.26
WO-private differentials, %						
Manufacturing, sample industries	-24.58	-59.42	-59.61	-51.08	-82.22	-80.97
Labour-intensive industries	0.90	-52.60	-51.21	-29.66	-76.26	-66.05
Intermediate capital industries	-55.99	-55.70	-58.18	-59.83	-86.81	-84.97
Capital intensive industries	-58.70	-53.01	-48.55	-55.41	-56.41	-61.03
JV-private differentials, %						
Manufacturing, sample industries	-48.82	-41.21	-38.29	-35.61	-56.25	-79.09
Labour-intensive industries	-34.23	-37.00	-48.44	9.89	-58.89	-78.28
Intermediate capital industries	-60.56	-59.40	-57.02	-53.00	-58.70	-86.58
Capital intensive industries	91.30	201.20	287.86	225.00	433.33	272.06

Source: Authors' compilations from General Statistics Office (various years).

Table 4 Effective rate of protection in manufacturing

Industry group	2006	2007	2008	2009	2010
Labour-intensive industries	40.1	24.6	23.4	21.9	21.1
Textiles	61.8	17.9	18.3	18.6	18.8
Apparel	135.7	58.0	58.4	57.7	57.5
Leather and footwear	46.3	55.8	50.3	44.7	41.1
Wood and wood products	-2.3	-2.2	-2.6	-3.0	-2.9
Non-electric machinery	-5.7	-5.1	-4.8	-4.7	-4.8
Precision machinery	-2.9	-2.8	-2.9	-2.9	-2.8
Furniture, miscellaneous manufacturing	47.7	50.8	46.9	43.1	41.1
Intermediate capital intensity	18.7	18.1	16.9	15.7	14.9
Food and beverages	29.9	28.8	27.3	25.8	24.4
Paper and paper products	23.6	22.4	20.8	19.4	18.3
Chemicals	10.1	10.0	9.30	8.70	8.2
Non-metallic mineral products	29.5	28.4	26.0	23.6	23.0
Fabricated metals	0.60	0.90	1.20	0.8	0.8
Capital-intensive industries	16.5	16.2	15.0	13.9	12.8
Rubber and plastic products	35.3	35.1	32.2	29.3	26.7
Basic metals	-1.00	-0.70	-0.70	-0.60	-0.60
Electrical machinery	5.90	5.80	5.80	5.30	5.10
Communication machinery	3.90	3.20	1.60	1.00	0.20
Motor vehicles	34.1	32.9	30.8	28.9	26.9
Other transport machinery	20.9	21.2	20.3	19.3	18.3

Source: Authors' calculations from data in Vergano et al. (2010).

Table 5 Coefficients on main variables and key indicators from random effects estimates of productivity differential in all sample industries and labour-intensive industries

	All industries						Labour-intensive industries					
Variable, indicator	2005-10		2005-07		2008-10		2005-10		2005-07		2008-10	
Equation (1)												
MNE	0.124	a	0.234	a	0.045	c	0.087	a	0.181	a	0.047	
SOE	0.105	a	0.143	a	0.210	a	0.127	a	0.161	a	0.261	a
MNE*TP	0.015	a	-0.012	a	0.020		0.019	a	-0.003		0.014	
CR4	0.011	a	-0.006	c	0.008		0.007		-0.006		0.003	
TP	-0.049	a	-0.041	a	-0.110	a	-0.045	a	-0.036	a	-0.108	a
Observations	42,588		20,169		22,419		29,200		14,645		14,555	
R-squared	0.51		0.64		0.43		0.50		0.61		0.41	
Breusch&Pagan	11,407	a	7,093	a	8,642	a	8,521	a	5,032	a	1,693	a
Equation (2)												
WO	0.109	a	0.191	a	-0.004		0.065	a	0.153	a	0.004	
JV	0.302	a	0.408	a	0.339	a	0.202	a	0.304	a	0.246	a
SOE	0.107	a	0.144	a	0.210	a	0.127	a	0.161	a	0.260	a
WO*TP	0.019	a	-0.006		0.030		0.022	a	0.001		0.022	
JV*TP	-0.003		-0.011	a	-0.004		-0.001		-0.008	a	0.002	
CR4	0.011	a	-0.006	c	0.008		0.007	a	-0.006		0.003	
TP	-0.049	a	-0.042	a	-0.110	a	-0.045	a	-0.036	a	-0.108	a
Observations	42,588		20,169		22,419		29,200		14,645		14,555	
R-squared	0.52		0.64		0.44		0.50		0.61		0.41	
Breusch&Pagan	11,088	a	7,015		8,714		8,407	a	5,032	a	1,693	a
Wald, Ho: WO=JV	45.7	a	40.7	a	34.1	a	9.18	a	0.11		6.84	a
Wald, Ho: WO*TP=JV*TP	17.4	a	1.16		3.89	a	14.4	a	2.35	a	0.83	

Notes: a, b, and c indicate the coefficient or statistic is significant at the 1%, 5%, and 10% levels, respectively; for fuller results, please see Appendix Tables 4 and 5.

Table 6 Coefficients on main variables and key indicators from random effects estimates of productivity differential in industries with intermediate intensity and capital-intensive industries

	Intermediate intensity						Capital-intensive industries					
Variable, indicator	2005-10		2005-07		2008-10		2005-10		2005-07		2008-10	
Equation (1)												
MNE	0.134	a	0.169	a	0.093	c	0.037		0.314	a	-0.087	
SOE	0.072	b	0.072	b	0.175	a	0.012		0.111	b	0.083	
MNE*TP	0.008		-0.011		-0.013		0.029		-0.036		0.053	
CR4	0.015	c	-0.021	b	0.024	c	0.013		-0.003		-0.006	
TP	-0.042	b	-0.053	a	-0.098	b	-0.037		-0.055	b	-0.039	
Observations	8,089		3,536		4,553		5,299		1,988		3,311	
R-squared	0.43		0.58		0.37		0.44		0.60		0.38	
Breusch&Pagan	1,984	a	1,319	a	412	a	1,131	a	770	a	274	a
Equation (2)												
WO	0.109	a	0.108	a	0.028		-0.010		0.277	a	-0.119	c
JV	0.309	a	0.476	a	0.548	a	0.238	a	0.383	a	0.109	
SOE	0.075	b	0.074	b	0.174	a	0.017		0.117	a	0.090	
WO*TP	0.011		-0.002		0.012		0.028		-0.036		0.036	
JV*TP	-0.004		-0.015		-0.066		0.015		0.005		0.058	
CR4	0.014	c	-0.021	b	0.024	c	0.013		-0.003		-0.006	
TP	-0.042	b	-0.054	a	-0.098	b	-0.036		-0.055	b	-0.035	
Observations	8,089		3,536		4,553		5,299		1,988		3,311	
R-squared	0.43		0.59		0.37		0.45		0.60		0.39	
Breusch&Pagan	1,854	a	1,271	a	398	a	1,063	a	757	a	254	a
Wald, Ho: WO=JV	0.85		23.6	a	17.4	a	12.2	a	1.74	c	3.64	a
Wald, Ho: WO*TP=JV*TP	0.70		0.52		2.61	a	0.25		2.40	a	0.16	

Notes: a, b, and c indicate the coefficient or statistic is significant at the 1%, 5%, and 10% levels, respectively; for fuller results, please see Appendix Tables 6 and 7.

Appendix Table 1a: Total revenue of firms (trillion dong)

Private firms	2005	2006	2007	2008	2009	2010
Manufacturing, sample industries	120.5	153.5	189.5	161.9	420.1	519.8
Labour-intensive industries	23.3	25.2	30.8	22.4	79.6	69.4
Textiles	6.1	7.2	8.3	5.3	10.6	14.5
Apparel	5.4	5.8	7.5	5.2	15.1	23.9
Leather and footwear	4.3	4.2	6.8	7.3	11.8	15.9
Wood and wood products	0.4	0.4	0.3	0.4	0.6	0.6
Non-electric machinery	0.1	0.6	0.1	0.1	0.6	0.1
Precision machinery	6.0	6.1	6.7	3.8	39.7	12.4
Furniture, micellaneous manufacturing	1.0	1.0	1.2	0.2	1.2	2.0
Intermediate intensity	56.1	75.6	96.4	83.3	213.3	274.7
Food and beverage	7.9	11.2	11.6	8.8	22.8	33.0
Paper and paper products	10.9	14.9	14.3	7.9	36.2	36.0
Chemicals	9.4	13.2	17.4	15.9	35.8	51.1
Non-metallic mineral products	13.3	16.8	19.8	21.9	45.8	63.8
Fabricated metal products	14.5	19.5	33.3	28.8	72.7	90.8
Capital intensive industries	41.2	52.7	62.2	56.3	127.2	175.7
Rubber and plastics products	14.5	18.6	20.4	15.7	48.8	65.4
Basic metals	16.0	16.8	20.1	19.9	35.3	53.5
Office and computing machinery	5.6	10.4	13.0	11.0	20.2	29.2
Electrical machinery	1.2	1.6	1.1	0.7	2.2	4.1
Communication machinery	2.0	3.1	5.3	6.5	15.8	16.6
Motor vehicles	0.1	0.1	0.1	0.1	0.1	0.1
Other transport machinery	1.8	2.1	2.3	2.4	4.8	6.8
Excluded industries	90.3	111.5	126.2	81.4	306.1	399.4
Tobacco products	7.9	11.2	12.5	13.3	24.1	31.5
Publishing and printing products	73.1	89.6	103.0	59.3	260.0	336.0
Coke, refined petroleum products	9.2	10.5	10.3	8.7	21.4	31.7
Recycling	0.2	0.2	0.4	0.1	0.6	0.2

Appendix Table 1a: Total revenue of firms (trillion dong) (continued)

SOEs	2005	2006	2007	2008	2009	2010
Manufacturing, sample industries	138.4	146.2	149.2	100.4	211.5	222.0
Labour-intensive industries	25.5	26.7	22.2	18.8	24.5	27.0
Textiles	9.2	9.3	7.8	6.1	8.4	10.2
Apparel	7.7	8.1	8.1	6.6	6.7	8.6
Leather and footwear	1.6	1.4	1.0	1.0	1.4	0.9
Wood and wood products	2.4	1.8	1.5	0.6	1.6	2.5
Non-electric machinery	2.0	3.4	1.9	2.3	4.0	3.1
Precision machinery	0.1	0.1	0.1	0.1	0.1	0.1
Furniture, micellaneous manufacturing	2.5	2.6	1.9	2.1	2.4	1.7
Intermediate intensity	79.4	83.1	84.8	55.6	117.9	134.3
Food and beverage	34.3	34.0	35.5	22.0	38.9	45.3
Paper and paper products	4.6	3.4	4.4	0.5	4.3	4.4
Chemicals	17.6	19.8	21.1	18.2	31.2	32.1
Non-metallic mineral products	18.8	18.4	20.2	11.2	33.5	39.8
Fabricated metal products	4.1	7.6	3.6	3.8	10.0	12.7
Capital intensive industries	33.5	36.4	42.2	26.0	69.1	60.6
Rubber and plastics products	3.3	3.5	5.3	3.6	7.7	9.1
Basic metals	9.9	11.6	11.8	3.6	21.8	25.8
Office and computing machinery	0.0	0.0	0.0	0.0	0.0	0.0
Electrical machinery	5.3	6.9	7.5	6.4	9.2	11.5
Communication machinery	2.2	2.4	3.1	2.2	2.4	1.7
Motor vehicles	3.1	3.5	3.9	3.6	13.8	4.3
Other transport machinery	9.6	8.6	10.5	6.6	14.2	8.4
Excluded industries	21.9	21.9	20.6	20.9	46.5	111.1
Tobacco products	14.8	14.6	12.5	11.4	22.6	26.5
Publishing and printing products	7.1	7.3	8.0	9.5	10.8	10.6
Coke, refined petroleum products	0.0	0.0	0.1	0.0	13.1	74.0
Recycling						0.0

Appendix Table 1a: Total revenue of firms (trillion dong, continued)

WO	2005	2006	2007	2008	2009	2010
Manufacturing, sample industries	202.2	275.2	324.0	174.8	575.7	812.4
Labour-intensive industries	79.5	114.8	118.4	47.2	185.6	249.9
Textiles	14.6	38.6	24.2	5.3	40.0	54.2
Apparel	13.3	17.0	17.3	10.8	33.7	44.8
Leather and footwear	26.4	29.7	33.7	15.5	49.0	65.2
Wood and wood products	2.2	2.0	3.1	0.6	3.1	4.5
Non-electric machinery	5.6	3.9	9.0	4.2	11.9	19.2
Precision machinery	1.7	1.9	5.2	2.1	9.7	10.5
Furniture, micellaneous manufacturing	15.7	21.7	25.9	8.7	38.2	51.5
Intermediate intensity	59.6	75.6	101.4	51.7	207.9	262.0
Food and beverage	31.8	37.6	53.6	26.0	104.0	126.0
Paper and paper products	3.7	5.2	6.7	4.0	11.2	16.1
Chemicals	11.1	15.4	19.0	8.4	51.4	61.0
Non-metallic mineral products	4.2	4.4	4.9	3.3	9.3	10.4
Fabricated metal products	8.8	13.0	17.2	10.1	32.0	48.5
Capital intensive industries	63.1	84.8	104.2	75.8	182.2	300.5
Rubber and plastics products	9.3	15.1	16.9	10.7	32.2	46.3
Basic metals	3.2	4.4	7.8	6.1	13.1	31.9
Office and computing machinery	14.2	20.8	25.1	24.2	36.9	43.1
Electrical machinery	13.6	17.9	22.2	13.2	31.7	47.8
Communication machinery	7.9	11.3	10.3	8.5	29.8	77.8
Motor vehicles	6.3	8.7	10.6	7.8	17.8	23.9
Other transport machinery	8.5	6.5	11.3	5.3	20.7	29.7
Excluded industries	0.4	0.8	0.6	0.7	2.1	2.9
Tobacco products	0.0	0.0	0.0	0.0	0.0	0.0
Publishing and printing products	0.4	0.5	0.6	0.7	1.8	2.6
Coke, refined petroleum products	0.0	0.3	0.0	0.0	0.2	0.3
Recycling	0.0	0.0	0.0	0.0	0.0	0.0

Appendix Table 1a: Total revenue of firms (trillion dong, continued)

Joint-ventures	2005	2006	2007	2008	2009	2010
Manufacturing, sample industries	111.0	126.6	156.5	95.5	225.0	267.7
Labour-intensive industries	9.6	10.1	10.7	6.2	12.4	16.1
Textiles	1.6	1.7	2.2	1.7	1.8	3.0
Apparel	1.2	1.2	1.3	1.7	2.6	3.1
Leather and footwear	3.2	4.1	4.5	1.2	3.8	4.3
Wood and wood products	1.3	1.4	1.1	0.6	1.7	2.7
Non-electric machinery	1.0	0.4	0.2	0.3	0.8	1.1
Precision machinery	0.2	0.2	0.2	0.2	0.3	0.3
Furniture, micellaneous manufacturing	1.1	1.2	1.3	0.6	1.3	1.5
Intermediate intensity	45.2	53.6	62.9	47.6	91.5	104.2
Food and beverage	18.5	21.4	28.4	18.4	52.4	58.2
Paper and paper products	0.2	0.2	0.3	0.3	0.3	0.3
Chemicals	14.0	16.6	14.7	11.0	5.8	7.5
Non-metallic mineral products	7.9	9.7	11.3	11.9	23.2	25.0
Fabricated metal products	4.6	5.7	8.2	6.0	9.8	13.2
Capital intensive industries	56.2	62.9	82.8	41.6	121.2	147.4
Rubber and plastics products	2.4	1.7	4.6	1.5	5.8	7.9
Basic metals	6.4	5.9	8.8	6.9	12.4	16.4
Office and computing machinery	0.0	0.0	0.0	0.0	0.0	0.0
Electrical machinery	4.3	6.8	7.8	5.7	9.9	9.0
Communication machinery	8.2	8.8	10.3	8.9	10.3	11.2
Motor vehicles	15.0	13.3	17.9	5.6	26.6	34.6
Other transport machinery	19.9	26.4	33.4	13.0	56.2	68.3
Excluded industries	1.9	3.1	4.1	2.7	7.1	9.5
Tobacco products	0.7	1.6	2.5	0.2	4.1	5.7
Publishing and printing products	0.0	0.1	0.1	0.1	0.2	0.0
Coke, refined petroleum products	1.1	1.4	1.6	2.4	2.8	3.7
Recycling	0.0	0.0	0.0	0.0	0.0	0.0

Appendix table 1b Total employees of firms (thousands)

Private firms	2005	2006	2007	2008	2009	2010
Manufacturing	1177.8	1314.5	1125.5	683.6	1658.6	1774.4
Manufacturing, sample industries	1177.8	1314.5	1125.5	683.6	1658.6	1774.4
Labour-intensive industries	603.6	671.4	554.8	343.4	757.0	816.3
Textiles	61.2	72.6	52.5	29.6	79.8	84.2
Apparel	183.3	209.8	185.8	152.4	274.0	305.1
Leather and footwear	157.3	166.0	152.2	67.8	151.2	167.8
Wood and wood products	69.2	68.4	52.8	33.5	78.2	78.0
Non-electric machinery	21.0	20.7	20.4	17.5	29.4	30.0
Precision machinery	2.4	2.1	1.8	1.7	2.4	2.2
Furniture, micellaneous manufacturing	109.3	131.7	89.3	41.0	142.0	148.8
Intermediate intensity	464.6	527.0	456.9	256.7	728.2	762.0
Food and beverage	224.8	258.6	221.0	105.8	353.7	362.2
Paper and paper products	40.0	41.0	32.9	20.9	50.6	54.6
Chemicals	29.5	32.8	34.3	25.8	55.9	59.6
Non-metallic mineral products	118.9	136.0	113.4	63.2	183.5	199.1
Fabricated metal products	51.3	58.5	55.3	40.9	84.5	86.5
Capital intensive industries	109.6	116.2	113.8	83.6	173.4	196.2
Rubber and plastics products	51.8	50.1	46.4	38.1	70.7	81.8
Basic metals	14.8	18.4	18.5	12.5	34.1	36.1
Office and computing machinery	0.4	0.4	0.2	0.2	0.3	0.7
Electrical machinery	10.6	15.4	17.2	13.1	21.2	34.9
Communication machinery	3.9	5.6	3.3	2.4	4.8	5.8
Motor vehicles	7.4	7.9	8.0	5.4	11.8	12.9
Other transport machinery	20.8	18.3	20.1	11.9	30.5	24.1
Excluded industries	11.8	14.1	13.3	10.6	20.1	22.1
Tobacco products	0.2	0.1	0.2	0.1	0.1	0.1
Publishing and printing products	9.6	11.7	11.3	10.0	17.8	20.3
Coke, refined petroleum products	0.8	0.6	0.7	0.3	0.8	0.9
Recycling	1.2	1.6	1.1	0.3	1.4	0.8

Appendix table 1b: Total employees of firms (thousands, continued)

SOEs	2005	2006	2007	2008	2009	2010
Manufacturing	520.3	441.3	334.7	225.4	395.4	292.7
Manufacturing, sample industries						
Labour-intensive industries	215.9	185.6	123.0	90.0	130.8	95.0
Textiles	52.8	44.4	33.3	24.3	35.3	21.7
Apparel	86.7	70.4	53.8	34.0	47.3	44.8
Leather and footwear	38.9	30.4	13.5	11.4	17.4	8.8
Wood and wood products	14.2	12.2	8.6	2.5	7.7	7.9
Non-electric machinery	12.0	16.2	5.7	9.5	14.4	7.5
Precision machinery	0.3	0.3	0.3	1.1	1.1	0.2
Furniture, micellaneous manufacturing	10.9	11.6	7.8	7.3	7.6	4.2
Intermediate intensity	221.9	175.3	137.7	86.0	164.1	130.1
Food and beverage	94.5	73.8	47.0	27.8	43.8	41.1
Paper and paper products	13.8	7.5	8.8	1.7	8.5	6.8
Chemicals	31.4	31.2	26.6	19.7	29.2	22.8
Non-metallic mineral products	64.0	46.8	42.4	21.1	58.4	44.1
Fabricated metal products	18.1	16.1	12.9	15.7	24.1	15.4
Capital intensive industries	82.5	80.4	74.0	49.4	100.5	67.5
Rubber and plastics products	11.1	9.8	11.3	9.0	12.8	11.8
Basic metals	20.7	18.6	11.5	4.0	17.5	15.7
Office and computing machinery	0.0	0.0	0.0	0.0	0.0	0.0
Electrical machinery	12.3	9.8	8.1	6.6	8.7	6.7
Communication machinery	4.3	3.9	3.8	3.5	3.2	2.0
Motor vehicles	7.3	8.7	5.6	5.1	15.0	4.6
Other transport machinery	26.9	29.7	33.6	21.3	43.3	26.7
Excluded industries	35.1	32.8	27.3	25.1	33.0	29.5
Tobacco products	13.9	13.6	9.6	7.5	12.6	12.6
Publishing and printing products	21.2	19.1	17.6	17.6	19.2	14.9
Coke, refined petroleum products	0.0	0.1	0.1	0.0	1.2	1.7
Recycling		0.0	0.0	0.0	0.0	0.3

Appendix table 1b: Total employees of firms (thousands, continued)

WO	2005	2006	2007	2008	2009	2010
Manufacturing, sample industries	961.4	1164.9	1155.9	607.2	1581.7	1780.1
Labour-intensive industries	705.8	834.9	829.8	418.4	1085.2	1211.9
Textiles	48.3	55.7	51.8	19.4	65.8	68.0
Apparel	193.2	259.3	245.7	177.7	395.2	416.9
Leather and footwear	318.8	339.2	351.5	162.1	407.1	494.4
Wood and wood products	11.7	10.8	12.9	2.4	13.0	12.3
Non-electric machinery	9.7	8.4	12.5	7.1	16.7	21.6
Precision machinery	7.2	9.3	11.6	5.7	12.5	15.2
Furniture, micellaneous manufacturing	116.8	152.3	143.8	44.1	174.9	183.5
Intermediate intensity	107.3	131.0	125.9	66.0	176.9	196.6
Food and beverage	43.3	49.8	48.1	23.1	62.0	66.6
Paper and paper products	9.7	13.4	13.0	6.5	18.2	19.3
Chemicals	11.9	15.9	16.0	6.1	23.5	26.0
Non-metallic mineral products	13.1	14.1	12.5	7.4	16.3	15.2
Fabricated metal products	29.2	37.8	36.2	22.9	56.9	69.5
Capital intensive industries	148.4	198.9	200.3	122.8	319.6	371.6
Rubber and plastics products	35.0	51.2	48.3	30.1	73.1	83.0
Basic metals	3.0	3.6	3.9	1.7	7.5	7.0
Office and computing machinery	10.7	15.7	16.0	20.1	34.2	37.5
Electrical machinery	49.4	65.4	68.0	27.4	77.5	76.6
Communication machinery	20.1	24.4	29.1	27.2	73.7	107.9
Motor vehicles	13.5	19.8	16.9	6.5	23.4	27.2
Other transport machinery	16.7	18.8	18.0	9.7	30.2	32.6
Excluded industries	2.3	5.7	3.0	2.8	7.0	7.0
Tobacco products	0.0	0.0	0.0	0.0	0.0	0.0
Publishing and printing products	2.3	3.0	2.9	2.7	6.8	6.7
Coke, refined petroleum products	0.0	2.6	0.0	0.0	0.1	0.2
Recycling	0.0	0.1	0.0	0.0	0.0	0.1

Appendix table 1b: Total employees of firms (thousands, continued)

MNE Joint Ventures	2005	2006	2007	2008	2009	2010
Manufacturing, sample industries	75.6	79.0	72.6	48.6	96.6	95.1
Labour-intensive industries	60.8	70.7	62.3	32.6	62.4	65.0
Textiles	5.8	7.5	6.9	3.5	3.5	4.6
Apparel	19.9	17.3	13.7	16.0	23.3	26.2
Leather and footwear	23.1	32.8	32.4	8.0	25.5	25.4
Wood and wood products	3.6	2.6	1.8	0.6	2.1	2.0
Non-electric machinery	1.2	1.1	0.4	0.4	0.9	1.1
Precision machinery	0.9	0.6	0.7	0.6	0.7	0.8
Furniture, micellaneous manufacturing	6.4	8.9	6.4	3.4	6.2	5.0
Intermediate intensity	40.4	39.7	40.5	24.8	49.0	47.2
Food and beverage	19.8	19.3	20.4	10.1	27.4	27.2
Paper and paper products	0.4	0.5	0.5	0.4	0.4	0.4
Chemicals	6.1	5.8	4.1	2.6	4.0	3.8
Non-metallic mineral products	9.7	9.4	10.0	7.7	11.6	11.2
Fabricated metal products	4.5	4.7	5.6	4.0	5.6	4.6
Capital intensive industries	34.5	38.4	31.5	23.1	46.8	47.4
Rubber and plastics products	4.2	4.6	3.7	3.2	3.8	4.6
Basic metals	1.6	1.5	1.4	1.1	2.0	2.7
Office and computing machinery	0.0	0.0	0.0	0.0	0.0	0.0
Electrical machinery	3.3	3.8	4.1	4.1	5.8	5.2
Communication machinery	5.3	5.1	5.8	3.1	4.0	4.2
Motor vehicles	4.4	4.0	3.2	2.4	5.5	5.1
Other transport machinery	15.7	19.4	13.2	9.2	25.8	25.6
Excluded industries	0.7	0.9	0.6	0.7	0.7	0.5
Tobacco products	0.4	0.4	0.4	0.1	0.8	0.8
Publishing and printing products	0.3	0.5	0.3	0.4	0.4	0.1
Coke, refined petroleum products	0.4	0.4	0.4	0.3	0.4	0.4
Recycling	0.0	0.0	0.0	0.0	0.0	0.1

Appendix Table 2 Mean value added per worker of firms (million 1994 dong).

Private firms	2005	2006	2007	2008	2009	2010
Manufacturing, sample industries	18.1	28.3	46.0	44.4	119.8	120.7
Labour-intensive industries	10.3	11.6	22.0	23.5	76.2	82.5
Textiles	15.9	14.3	30.7	34.5	65.0	74.0
Apparel	6.1	7.7	11.3	13.7	41.5	46.7
Leather and footwear	6.6	10.3	14.6	15.5	73.6	48.5
Wood and wood products	9.9	11.8	29.3	23.3	154.7	176.4
Non-electric machinery	17.8	22.3	31.4	42.3	54.0	81.1
Precision machinery	17.6	18.0	25.1	31.5	30.5	15.8
Furniture, miscellaneous manufacturing	8.7	9.2	20.2	22.1	58.8	54.5
Intermediate intensity	20.9	22.2	58.3	55.3	147.8	145.1
Food and beverage	22.0	24.9	84.4	67.2	154.1	153.3
Paper and paper products	20.7	23.7	44.7	45.7	65.8	89.7
Chemicals	24.9	25.7	56.7	48.9	91.2	76.5
Non-metallic mineral products	20.3	18.9	37.9	37.7	220.3	205.8
Fabricated metal products	18.6	19.3	45.8	62.4	120.4	121.0
Capital intensive industries	49.6	51.4	139.7	98.8	59.3	69.9
Rubber and plastics products	32.4	31.9	57.6	58.2	74.6	119.2
Basic metals	35.0	43.6	107.4	119.0	123.0	118.0
Office and computing machinery	22.4	33.1	15.8	35.9	27.9	13.5
Electrical machinery	25.9	34.6	77.9	88.7	133.9	134.7
Communication machinery	17.1	13.3	32.0	17.2	20.9	100.8
Motor vehicles	16.2	26.3	50.8	67.2	330.9	207.1
Other transport machinery	14.5	18.6	29.2	56.4	500.9	250.0
Excluded industry						
Printing and publishing	16.5	16.2	20.7	25.8	38.1	64.7
Tobacco products	199.8	329.5	243.1	374.3	282.6	317.8
Oil and coal products	73.4	45.3	136.0	12.3	47.8	111.1
Recycling	8.1	7.0	37.3	24.2	143.8	120.2

Appendix Table 2 Mean value added per worker of firms (million 1994 dong, continued)

SOEs	2005	2006	2007	2008	2009	2010
Manufacturing, sample industries	34.4	38.0	63.9	55.2	117.7	134.6
Labour intensive industries	19.0	19.3	27.3	31.2	90.3	86.8
Textiles	18.7	22.2	34.7	49.8	293.5	45.5
Apparel	7.3	7.5	12.7	14.1	30.6	45.3
Leather and footwear	5.4	7.0	9.5	10.9	9.7	10.4
Wood and wood products	28.4	22.7	36.1	64.9	83.6	328.1
Non-electric machinery	17.3	27.7	31.0	33.4	133.3	119.9
Precision machinery	24.8	22.8	23.7	40.9	26.3	55.9
Furniture, miscellaneous manufacturing	18.3	17.0	38.8	28.9	106.0	100.0
Intermediate intensity	38.2	39.5	85.1	74.9	131.2	147.7
Food and beverage	31.2	35.0	93.4	86.2	165.9	191.4
Paper and paper products	22.2	24.5	59.9	29.6	75.2	73.4
Chemicals	58.6	55.2	92.3	70.7	98.8	111.5
Non-metallic mineral products	46.7	44.4	93.5	76.1	120.7	124.6
Fabricated metal products	23.6	32.6	36.4	59.5	105.3	137.2
Capital intensive industries	59.8	79.8	90.5	63.8	135.6	195.8
Rubber and plastics products	34.6	31.3	48.2	36.1	64.4	200.6
Basic metals	27.9	36.3	179.4	16.7	85.8	94.1
Electrical machinery	37.6	48.2	79.3	76.5	165.0	141.1
Communication machinery	52.1	46.0	71.2	38.1	485.7	552.8
Motor vehicles	26.6	31.9	52.8	48.3	210.5	65.4
Other transport machinery	53.0	101.9	55.9	61.7	66.0	252.7
Excluded industries						
Printing and publishing	26.0	23.3	30.2	29.8	48.9	67.2
Tobacco products	226.6	237.0	276.3	239.4	228.8	265.2
Oil and coal products	42.2	19.6	33.0	34.8	105.0	7.1
Recycling						0.0

Appendix Table 2 Mean value added per worker of firms (million 1994 dong, continued)

Wholly foreign MNEs	2005	2006	2007	2008	2009	2010
Manufacturing, sample industries	30.5	32.5	78.7	62.2	40.4	48.4
Labour-intensive industries	15.4	15.9	31.5	23.5	25.3	43.5
Textiles	22.0	24.0	47.4	37.6	74.6	33.0
Apparel	9.8	8.4	12.6	13.1	11.3	12.1
Leather and footwear	14.2	16.9	28.2	16.5	14.6	17.6
Wood and wood products	16.0	17.0	55.0	35.7	22.1	25.9
Non-electric machinery	46.3	51.9	69.4	51.6	34.4	68.8
Precision machinery	24.0	25.7	36.6	65.2	34.5	24.9
Furniture, miscellaneous manufacturing	12.2	11.5	29.2	23.7	16.7	68.6
Intermediate intensity	28.5	32.3	66.1	71.0	171.2	142.6
Food and beverage	53.7	61.8	194.1	146.1	89.4	107.2
Paper and paper products	31.7	31.9	81.5	109.6	37.8	51.5
Chemicals	78.0	77.4	218.8	140.5	71.9	82.9
Non-metallic mineral products	68.7	52.3	94.7	86.5	75.4	79.5
Fabricated metal products	26.5	31.0	71.8	57.0	36.1	43.6
Capital intensive industries	34.7	37.9	82.9	81.7	41.5	49.0
Basic metals	65.3	78.7	341.8	510.9	95.2	93.6
Office and computing machinery	41.9	35.2	62.2	62.0	20.3	19.0
Electrical machinery	45.3	40.2	80.9	115.9	48.6	81.7
Communication machinery	26.6	40.2	44.1	46.5	32.5	39.9
Motor vehicles	40.0	47.8	54.2	62.9	51.6	45.7
Other transport machinery	23.6	24.4	46.4	60.9	35.7	35.6
Excluded industries						
Printing and publishing	15.3	17.1	40.9	29.1	24.3	302.4
Oil and coal products					40.2	0.1
Rubber and plastics products	31.9	34.3	87.5	51.8	35.4	42.1
Recycling		15.4	13.5	58.7	22.7	9.3

Appendix Table 2 Mean value added per worker of firms (million 1994 dong, continued).

MNE joint ventures	2005	2006	2007	2008	2009	2010
Manufacturing, sample industries	84.9	97.6	214.4	105.6	148.4	134.9
Labour-intensive industries	21.1	20.1	41.0	32.4	65.5	40.7
Textiles	29.2	21.3	54.5	42.4	24.4	33.1
Apparel	8.8	7.4	12.9	11.6	39.5	12.5
Leather and footwear	15.7	12.7	23.0	23.3	14.4	14.8
Wood and wood products	34.9	45.7	86.1	57.4	55.5	75.5
Non-electric machinery	39.7	30.8	34.8	41.7	39.1	52.7
Precision machinery	35.6	30.2	45.6	53.6	35.3	28.8
Furniture, miscellaneous manufacturing	11.1	14.0	49.6	39.0	209.2	72.4
Intermediate intensity	102.1	103.1	207.1	145.2	166.7	143.2
Food and beverage	65.2	73.4	165.7	116.6	102.1	141.1
Paper and paper products	48.4	52.3	57.0	66.2	64.1	52.0
Chemicals	160.5	164.7	395.4	127.7	349.8	148.8
Non-metallic mineral products	110.7	107.2	146.0	183.8	185.7	199.8
Fabricated metal products	106.3	99.1	192.9	170.9	105.8	107.0
Capital intensive industries	140.5	188.2	460.9	129.5	224.9	243.5
Rubber and plastics products	66.8	66.7	355.1	46.3	50.5	58.4
Basic metals	150.8	158.4	265.5	157.9	185.8	154.6
Electrical machinery	194.3	294.0	1330.9	137.8	209.2	345.4
Communication machinery	117.7	123.6	289.4	134.3	120.8	162.9
Motor vehicles	253.6	300.4	511.6	360.1	341.9	259.4
Other transport machinery	53.9	67.7	114.7	54.9	112.2	66.8
Excluded industries						
Printing and publishing	19.3	11.9	31.0	36.0	38.5	31.2
Tobacco products	1013.6	2581.8	1972.3	263.0	4408.8	5219.6
Oil and coal products	176.9	111.0	143.7	174.7	106.0	152.5
Recycling			27.6			

Appendix Table 3 Mean value added-fixed asset ratios of firms.

Private firms	2005	2006	2007	2008	2009	2010
Manufacturing, sample industries	2.97	3.13	6.19	5.56	14.4	16.5
Labour-intensive industries	3.33	3.27	5.78	5.36	17.1	15.7
Textiles	2.38	3.46	5.96	3.86	14.5	15.8
Apparel	3.99	3.74	4.88	4.77	8.63	16.4
Leather and footwear	3.30	3.13	5.61	5.08	41.0	11.1
Wood and wood products	3.58	2.40	5.45	5.03	32.45	21.4
Non-electric machinery	2.13	4.24	7.06	4.27	6.13	4.30
Precision machinery	3.45	3.92	3.97	9.38	9.21	4.01
Furniture, miscellaneous manufacturing	2.91	2.99	6.88	6.49	8.72	15.9
Intermediate intensity	2.84	2.98	6.91	6.00	13.8	19.3
Food and beverage	3.13	3.27	8.46	7.89	10.0	17.8
Paper and paper products	2.10	2.26	6.37	6.76	8.37	9.34
Chemicals	3.94	4.98	5.03	4.05	8.47	5.09
Non-metallic mineral products	1.64	1.85	2.98	2.59	18.2	14.2
Fabricated metal products	3.79	3.22	9.60	6.05	16.3	34.5
Capital intensive industries	0.92	0.83	1.73	1.48	1.17	1.36
Rubber and plastics products	2.39	3.53	3.79	3.58	5.29	6.63
Basic metals	2.07	3.31	6.82	5.92	5.74	6.19
Office and computing machinery	0.79	0.79	8.83	3.00	27.7	11.9
Electrical machinery	2.92	3.06	3.78	4.09	9.59	12.4
Communication machinery	7.38	5.00	7.94	6.49	9.00	15.6
Motor vehicles	1.46	2.17	3.35	5.99	19.4	10.1
Other transport machinery	2.41	2.24	3.56	5.06	11.6	17.5
Excluded industries						
Printing and publishing	4.14	2.77	3.79	7.10	8.47	7.96
Tobacco products	7.83	14.3	42.4	314.5	9.61	16.9
Oil and coal products	2.20	5.19	4.95	1.28	4.13	5.92
Recycling	0.47	0.75	1.57	6.84	5.66	10.4

Appendix Table 3 Mean value added-fixed asset ratios of firms (continued)

SOEs	2005	2006	2007	2008	2009	2010
Manufacturing, sample industries	3.65	2.23	2.59	2.42	5.76	5.79
Labour-intensive industries	1.56	1.85	2.50	2.92	5.41	5.70
Textiles	0.65	2.19	1.56	2.26	1.67	0.86
Apparel	1.46	1.40	2.01	3.12	3.52	3.26
Leather and footwear	1.63	2.51	6.68	21.9	35.0	5.50
Wood and wood products	1.82	1.11	2.46	3.65	12.8	21.3
Non-electric machinery	1.36	2.28	1.94	1.50	8.51	3.77
Precision machinery	0.78	0.69	0.89	0.30	0.27	0.43
Furniture, miscellaneous manufacturing	1.69	1.35	2.30	1.82	5.60	3.45
Intermediate intensity	5.70	1.36	2.66	2.11	5.34	6.28
Food and beverage	1.53	1.25	4.06	2.46	6.30	6.39
Paper and paper products	0.59	0.55	2.42	1.16	1.62	2.50
Chemicals	5.36	2.77	3.24	2.93	3.18	6.58
Non-metallic mineral products	1.52	1.22	1.75	2.13	35.7	35.7
Fabricated metal products	45.6	1.54	1.62	1.23	3.89	3.58
Capital intensive industries	2.42	5.83	2.61	1.97	7.47	4.41
Rubber and plastics products	0.85	0.86	1.68	0.77	2.24	3.02
Basic metals	0.88	0.60	1.94	0.36	3.22	4.70
Electrical machinery	2.06	1.92	2.55	2.65	43.3	3.58
Communication machinery	2.91	3.33	5.37	2.21	2.20	6.73
Motor vehicles	2.69	1.31	2.87	2.57	3.15	1.30
Other transport machinery	2.05	13.8	1.56	1.50	1.26	1.84
Excluded industries						
Printing and publishing	2.17	2.61	3.26	2.50	4.11	4.86
Tobacco products	7.20	7.42	6.43	4.13	5.70	7.11
Oil and coal products		0.05	0.09		0.07	0.01

Appendix Table 3 Mean value added-fixed asset ratios of firms (continued)

Wholly-foreign MNEs	2005	2006	2007	2008	2009	2010
Manufacturing, sample industries	2.24	1.27	2.50	2.72	2.56	3.14
Labour-intensive industries	3.36	1.55	2.82	3.77	4.06	5.33
Textiles	0.52	0.64	1.09	1.04	0.85	2.09
Apparel	7.11	1.80	3.03	4.84	4.73	4.97
Leather and footwear	1.94	2.17	3.60	5.01	3.19	3.64
Wood and wood products	2.27	1.46	3.49	5.90	8.74	1.47
Non-electric machinery	1.41	1.36	4.10	1.23	1.92	2.36
Precision machinery	1.34	0.68	1.25	1.55	1.65	1.15
Furniture, miscellaneous manufacturing	2.09	1.51	3.07	3.00	3.10	6.38
Intermediate intensity	1.25	1.32	2.89	2.41	1.82	2.90
Food and beverage	1.42	1.69	3.97	4.76	2.86	3.78
Paper and paper products	0.88	0.96	2.65	3.49	1.04	1.23
Chemicals	1.46	1.17	3.10	1.67	1.84	2.53
Non-metallic mineral products	2.74	2.53	5.08	1.23	3.27	2.64
Fabricated metal products	0.57	0.88	1.33	1.41	1.16	2.95
Capital intensive industries	0.38	0.39	0.89	0.66	0.51	0.53
Rubber and plastics products	0.69	0.60	1.86	1.35	1.10	1.24
Basic metals	0.75	0.46	2.45	2.11	0.74	1.92
Office and computing machinery	0.41	0.19	0.79	0.59	0.24	0.29
Electrical machinery	2.04	1.88	2.29	3.04	2.23	2.13
Communication machinery	1.12	1.10	1.95	0.90	1.20	1.21
Motor vehicles	0.85	0.81	1.15	0.95	0.85	0.95
Other transport machinery	0.47	0.42	1.01	0.99	0.78	0.79
Excluded industries						
Printing and publishing	4.41	2.98	1.26	7.75	10.3	37.1
Oil and coal products					2.46	0.01
Recycling		0.51	0.29	1.19	0.65	0.40

Appendix Table 3 Mean value added-fixed asset ratios of firms (continued)

MNE joint ventures	2005	2006	2007	2008	2009	2010
Manufacturing, sample industries	1.52	1.84	3.82	3.58	6.30	3.45
Labour-intensive industries	2.19	2.06	2.98	5.89	7.03	3.41
Textiles	0.88	1.15	1.28	1.77	0.84	1.21
Apparel	1.90	1.47	2.59	4.03	3.89	3.05
Leather and footwear	2.75	3.02	5.10	5.69	2.56	4.54
Wood and wood products	3.10	1.72	2.62	2.02	2.55	4.45
Non-electric machinery	1.33	3.76	2.66	3.65	2.57	2.23
Precision machinery	0.88	1.14	1.35	1.73	1.63	1.46
Furniture, miscellaneous manufacturing	3.70	2.47	4.95	25.7	44.5	5.73
Intermediate capital intensity	1.12	1.21	2.97	2.82	5.70	2.59
Food and beverage	1.13	1.20	3.04	1.89	2.10	2.10
Paper and paper products	1.18	1.77	2.69	31.1	10.1	1.75
Chemicals	1.52	1.46	3.67	2.99	25.4	2.31
Non-metallic mineral products	1.11	1.11	1.65	2.63	1.60	1.78
Fabricated metal products	0.86	1.18	3.87	2.41	3.23	3.33
Capital-intensive industries	1.76	2.50	6.71	4.81	6.24	5.06
Rubber and plastics products	0.71	0.63	8.93	1.70	1.14	1.91
Basic metals	1.77	2.06	4.29	4.27	3.50	3.25
Electrical machinery	1.00	1.17	2.99	1.53	1.14	1.75
Communication machinery	4.71	10.0	16.50	14.3	6.48	16.5
Motor vehicles	1.36	1.46	4.26	2.61	2.46	2.86
Other transport machinery	1.23	1.31	2.41	1.79	21.1	8.71
Excluded industries						
Printing and publishing	0.27	0.70	0.98	0.35	0.33	0.66
Tobacco products	5.58	5.56	2.80	19.8	5.04	6.18
Oil and coal products	1.20	1.59	2.04	1.14	1.08	1.76
Recycling			0.33			

Appendix Table 4 Random effects estimates of productivity differential in sample manufacturing firms

	2005-2010		2005-2007		2008-2010	
	(Eq.1)	(Eq.2)	(Eq.1)	(Eq.2)	(Eq.1)	(Eq.2)
MNE	0.124		0.234		0.045	
	(8.25)***		(13.3)***		(1.81)*	
WO		0.092		0.191		-0.004
		(5.85)***		(10.2)***		(-0.18)
JV		0.302		0.408		0.339
		(9.96)***		(12.6)***		(6.00)***
SOE	0.105	0.107	0.143	0.144	0.210	0.210
	(6.51)***	(6.61)***	(9.01)***	(9.06)***	(6.93)***	(6.94)***
MNE*TP	0.015		-0.012		0.020	
	(3.24)***		(-2.79)***		(1.40)	
WO*TP		0.019		-0.006		0.030
		(4.05)***		(-1.37)		(2.09)**
JV*TP		-0.003		-0.011		-0.004
		(-0.92)		(-3.77)***		(-0.35)
CR4	0.011	0.011	-0.006	-0.006	0.008	0.008
	(3.45)***	(3.43)***	(-1.76)*	(-1.75)*	(1.56)	(1.54)
TP	-0.049	-0.049	-0.041	-0.042	-0.110	-0.110
	(-11.0)***	(-11.0)***	(-10.7)***	(-10.7)***	(-9.08)***	(-9.09)***
L (lag)	0.297	0.294	0.205	0.200	0.367	0.366
	(11.2)***	(11.1)***	(6.99)***	(6.85)***	(9.44)***	(9.42)***
L^2 (lag)	-0.026	-0.021	0.087	0.090	-0.192	-0.184
	(-0.75)	(-0.61)	(2.20)**	(2.28)**	(-3.49)***	(-3.36)***
K (lag)	0.027	0.030	-0.055	-0.050	0.006	0.010
	(1.27)	(1.39)	(-2.22)**	(-2.02)**	(0.19)	(0.33)
K^2 (lag)	0.189	0.188	0.360	0.351	0.131	0.133
	(7.11)***	(7.07)***	(11.6)***	(11.3)***	(3.16)***	(3.22)***
K×L(lag)	0.069	0.066	0.033	0.037	0.252	0.241
	(1.56)	(1.49)	(0.65)	(0.73)	(3.53)***	(3.38)***
_cons	-0.139	-0.139	-0.100	-0.099	0.080	0.083
	(-18.5)***	(-18.4)***	(-14.0)***	(-13.9)***	(8.65)***	(9.01)***
# of obs.	42588	42588	20169	20169	22419	22419
# of group	18112	18112	9779	9779	14702	14702
R-square	0.51	0.52	0.64	0.64	0.43	0.44
F-statistics	15983.8***	16078.5***	15850.0***	15958.9***	8642.2***	8714.2***
Rho	0.78	0.78	0.85	0.84	0.81	0.81
Breusch&Pagan test	11407.2***	11088.0***	7093.2***	7015.8***	2335.7***	2278.2***
Wald test Ho: WO=JV		45.7***		40.7***		34.1***
Wald test Ho: WO × TP = JV×TP		17.4***		1.16		3.89***

Parentheses show t-statistics; ***,**,* indicate significant at 1%, 5%, and 10%, respectively.

Appendix Table 5 Random effect estimates of productivity differentials in labour-intensive industries

	2005-10		2005-07		2008-10	
	(Eq.1)	(Eq.2)	(Eq.1)	(Eq.2)	(Eq.1)	(Eq.2)
MNE	0.087		0.181		0.047	
	(4.34)***		(8.07)***		(1.27)	
WO		0.065		0.153		0.004
		(3.08)***		(6.34)***		(0.12)
JV		0.202		0.304		0.246
		(4.70)***		(6.79)***		(2.88)***
SOE	0.127	0.127	0.161	0.161	0.261	0.260
	(6.35)***	(6.37)***	(8.29)***	(8.28)***	(6.91)***	(6.89)***
MNE×TP	0.019		-0.003		0.014	
	(3.70)***		(-0.76)		(0.80)	
WO×TP		0.022		0.001		0.022
		(4.23)***		(0.27)		(1.23)
JV×TP		-0.001		-0.008		0.002
		(-0.14)		(-2.61)***		(0.16)
CR4	0.007	0.007	-0.006	-0.006	0.003	0.003
	(1.94)*	(1.94)*	(-1.51)	(-1.49)	(0.47)	(0.46)
TP	-0.045	-0.045	-0.036	-0.036	-0.108	-0.108
	(-9.96)***	(-9.96)***	(-8.97)***	(-8.98)***	(-8.58)***	(-8.60)***
L (lag)	0.241	0.239	0.151	0.149	0.305	0.303
	(7.86)***	(7.79)***	(4.53)***	(4.47)***	(6.52)***	(6.48)***
L^2 (lag)	0.055	0.057	0.168	0.168	-0.081	-0.079
	(1.22)	(1.26)	(3.48)***	(3.49)***	(-1.08)	(-1.06)
K (lag)	0.011	0.011	-0.029	-0.030	0.016	0.012
	(0.40)	(0.39)	(-0.92)	(-0.95)	(0.35)	(0.26)
K^2 (lag)	0.237	0.236	0.348	0.347	0.144	0.148
	(5.27)***	(5.25)***	(7.17)***	(7.15)***	(1.87)*	(1.93)*
K×L(lag)	0.022	0.024	-0.018	-0.015	0.193	0.194
	(0.35)	(0.37)	(-0.27)	(-0.22)	(1.72)*	(1.73)*
_cons	-0.181	-0.181	-0.143	-0.142	0.040	0.044
	(-19.8)***	(-19.8)***	(-16.2)***	(-16.1)***	(3.19)***	(3.46)***
# of obs.	29200	29200	14645	14645	14555	14555
# of group	12400	12400	7235	7235	9522	9522
R-square	0.5	0.5	0.61	0.61	0.41	0.41
F-statistic	10669.2***	10687.5***	9950.0***	9970.8***	5489.6***	5514.9***
rho	0.75	0.75	0.84	0.84	0.79	0.79
Breusch& Pagan test	8520.8***	8406.9***	5031.7***	5001.6***	1692.9***	1674.4***
Wald test Ho: WO=JV		9.18***		0.11		6.84***
Wald test Ho: WO × TP = JV×TP		14.4***		2.35***		0.83

Parentheses show t-statistics; ***,**,* indicate significant at 1%, 5%, and 10%, respectively.

Appendix Table 6 Random effects estimates of productivity differentials in industries with intermediate capital intensity

	2005- 2010		2005-07		2008-10	
	(Eq.1)	(Eq.2)	(Eq.1)	(Eq.2)	(Eq.1)	(Eq.2)
MNE	0.134		0.169		0.093	
	(3.98)***		(4.64)***		(1.75)*	
WO		0.109		0.108		0.028
		(3.12)***		(2.82)***		(0.52)
JV		0.309		0.476		0.548
		(4.46)***		(6.49)***		(4.50)***
SOE	0.072	0.075	0.072	0.074	0.175	0.174
	(2.20)**	(2.29)**	(2.27)**	(2.31)**	(2.86)***	(2.85)***
MNE×TP	0.008		-0.011		-0.013	
	(0.51)		(-0.74)		(-0.34)	
WO×TP		0.011		-0.002		0.012
		(0.73)		(-0.17)		(0.31)
JV×TP		-0.004		-0.015		-0.066
		(-0.30)		(-1.22)		(-1.87)*
CR4	0.015	0.014	-0.021	-0.021	0.024	0.024
	(1.94)*	(1.89)*	(-2.54)**	(-2.56)**	(1.95)*	(1.92)*
TP	-0.042	-0.042	-0.053	-0.054	-0.098	-0.098
	(-2.36)**	(-2.36)**	(-3.38)***	(-3.42)***	(-2.58)**	(-2.57)**
L (lag)	0.616	0.614	0.451	0.445	0.665	0.670
	(8.58)***	(8.55)***	(5.29)***	(5.24)***	(6.40)***	(6.46)***
L^2 (lag)	-0.019	-0.021	0.329	0.334	-0.402	-0.409
	(-0.18)	(-0.19)	(2.67)***	(2.72)***	(-2.07)**	(-2.11)**
K (lag)	-0.258	-0.254	-0.303	-0.300	-0.209	-0.218
	(-3.10)***	(-3.05)***	(-3.28)***	(-3.26)***	(-1.45)	(-1.51)
K^2 (lag)	0.602	0.593	0.808	0.804	0.303	0.313
	(5.10)***	(5.02)***	(6.56)***	(6.54)***	(1.62)	(1.67)*
K×L(lag)	-0.443	-0.434	-0.657	-0.654	0.095	0.097
	(-2.38)**	(-2.32)**	(-3.28)***	(-3.27)***	(0.30)	(0.31)
_cons	0.012	0.012	0.119	0.121	0.197	0.198
	(0.61)	(0.60)	(5.80)***	(5.91)***	(6.90)***	(6.97)***
# of obs	8089	8089	3536	3536	4553	4553
# of group	3308	3308	1630	1630	2962	2962
R-square	0.43	0.43	0.58	0.59	0.37	0.37
F-statistics	2261.1***	2279.6***	2235.6***	2300.9***	1176.9***	1207.0***
rho	0.81	0.81	0.84	0.83	0.84	0.84
Breusch&Pagan test	1984.1***	1854.2***	1318.6***	1270.6***	411.9***	397.7***
Wald test Ho: WO=JV		0.85		23.6***		17.4***
Wald test Ho: WO×TP = JV×TP		0.70		0.52		2.61***

Parentheses show t-statistics; ***,**,* indicate significant at 1%, 5%, and 10%, respectively.

Appendix Table 7 Random effect estimates of productivity differentials in capital-intensive industries

	2005-10		2005-07		2008-10	
	(Eq.1)	(Eq.2)	(Eq.1)	(Eq.2)	(Eq.1)	(Eq.2)
MNE	0.037		0.314		-0.087	
	(0.90)		(5.85)***		(-1.40)	
WO		-0.010		0.277		-0.119
		(-0.25)		(4.78)***		(-1.85)*
JV		0.238		0.383		0.109
		(3.32)***		(4.82)***		(0.90)
SOE	0.012	0.017	0.111	0.117	0.083	0.090
	(0.25)	(0.37)	(2.18)**	(2.28)**	(0.98)	(1.07)
MNE×TP	0.029		-0.036		0.053	
	(1.15)		(-1.42)		(1.00)	
WO×TP		0.028		-0.036		0.036
		(1.13)		(-1.43)		(0.69)
JV×TP		0.015		0.005		0.058
		(0.90)		(0.32)		(1.62)
CR4	0.013	0.013	-0.003	-0.003	-0.006	-0.006
	(1.31)	(1.27)	(-0.31)	(-0.33)	(-0.40)	(-0.43)
TP	-0.037	-0.036	-0.055	-0.055	-0.039	-0.035
	(-1.27)	(-1.26)	(-2.07)**	(-2.08)**	(-0.64)	(-0.58)
L (lag)	0.447	0.448	0.283	0.286	0.536	0.541
	(4.63)***	(4.64)***	(2.28)**	(2.31)**	(3.92)***	(3.97)***
L^2 (lag)	0.294	0.288	0.239	0.236	-0.065	-0.095
	(2.40)**	(2.36)**	(1.52)	(1.50)	(-0.34)	(-0.49)
K (lag)	-0.080	-0.068	-0.305	-0.282	-0.521	-0.485
	(-0.88)	(-0.75)	(-2.76)***	(-2.55)**	(-3.51)***	(-3.27)***
K^2 (lag)	0.415	0.403	0.459	0.439	0.534	0.490
	(3.86)***	(3.75)***	(3.83)***	(3.65)***	(3.11)***	(2.85)***
K×L(lag)	-0.480	-0.476	-0.109	-0.111	-0.032	-0.002
	(-2.79)***	(-2.78)***	(-0.49)	(-0.50)	(-0.11)	(-0.01)
_cons	0.216	0.218	0.265	0.266	0.526	0.526
	(6.21)***	(6.29)***	(6.95)***	(7.01)***	(10.8)***	(10.8)***
# of observations	5299	5299	1988	1988	3311	3311
# of group	2404	2404	914	914	2218	2218
R-square	0.44	0.45	0.60	0.60	0.38	0.39
F-statistics	1526.2***	1562.3***	1321.0***	1341.9***	1042.5***	1077.8***
Rho	0.83	0.83	0.86	0.86	0.86	0.86
Breusch & Pagan test	1130.9***	1062.8***	769.6***	757.2***	274.3***	254.3***
Wald test Ho: WO=JV		12.2***		1.74*		3.64***
Wald test Ho: WO × TP = JV×TP		0.25		2.40***		0.16

Parentheses show t-statistics; ***,**,* indicate significant at 1%, 5%, and 10%, respectively.