Comparisons of Foreign Multinationals and Local Firms in Asian Manufacturing Over Time

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Abstract

This paper first shows that shares of foreign multinational corporations (MNCs) in the manufacturing sectors of five Asian host economies (Hong Kong, Indonesia, Malaysia, Singapore, and Taiwan) were generally large in terms of exports, small in terms of employment, and moderate in terms of production. Correspondingly, the average product of labor and export propensities were often significantly higher in foreign MNCs than in local firms. In addition, foreign MNCs tended to be relatively large and to have relatively high average capital productivity, capital intensity, skilled-labor intensity, R&D intensity, profit rates, and import propensities, but relatively low shares of labor compensation in value added, and these differences were also statistically significant in many cases. Differences between wholly- or heavily-foreign plants and foreign plants with lower foreign ownership shares were also significant in many cases and generally in the same direction as the differences between MNCs and local plants noted above. Differences among MNCs by foreign source were generally small and insignificant in Hong Kong. In Singapore, European and U.S. firms tended to be larger and characterized by relatively high average labor productivity, capital intensity, profitability, and export propensities, but relatively low shares of labor compensation in value added compared to Japanese and Other Asian firms.

Comparisons of Foreign Multinationals and Local Firms in Asian Manufacturing Over Time

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1. Introduction

Since the rapid increases in inward (and outward) foreign direct investment (FDI) that began in Asia in the late 1980s, the roles of foreign multinational corporations (MNCs) have attracted increasing attention among economists, businessmen, and policy makers. Unfortunately, many studies of trends in activities of MNCs over time are severely limited because the data used are often very poor indicators of economic performance in MNCs (e.g., data on actual FDI flows compiled in the balance of payments). Indeed, some of the data are so misleading (e.g., data on approved or reported FDI) that it is hard to understand why governments continue to publish such data or why responsible researchers continue to use them. Due in large part to the lack of reliable data, there are even fewer studies that attempt to test whether observed differences between foreign MNCs and local firms, or among groups of foreign MNCs, are in some sense statistically significant in a time series context.

This study tries to take a small step toward filling this gap in the literature by analyzing trends in the shares of foreign MNCs in selected Asian host economies, and then performing simple tests to see whether observed differences between foreign MNCs and local firms, or among groups of foreign MNCs, are statistically significant in a time series context. Due primarily to data constraints and the desire to cover as many host economies as possible, the focus is limited to aggregate manufacturing in five Asian economies,

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[1]This paper is an updated, revised, and corrected version of a paper presented at the Sixth Convention of the East Asian Economic Association (Kitakyushu, Japan, 4-5 September 1998). That version also appeared as the first version of this ICSEAD (International Centre for the Study of East Asian Development) Working Paper 98-18 in November 1998. The paper is also related to Ramstetter (1994b) and more detailed studies of Malaysia and Singapore (Ramstetter 1995, 1996). Accordingly, I wish to thank those who offered assistance with and comments on those papers, particularly Laurel A. Adams, Hal Hill, Denise Eby Konan, Robert E. Lipsey, Linda Low, Atsushi Murakami, Yumiko Okamoto, and Mitsuru Toida. I also wish to extend my special gratitude for comments from an anonymous referee for the *Asian Economic Journal* that pointed out an important error in the previous version of this paper. All remaining errors and all opinions expressed in this paper are the sole responsibility of the author.

Hong Kong, Indonesia, Malaysia, Singapore, and Taiwan. The paper proceeds in six steps. First, the theoretical rationale for examining differences between foreign MNCs and local firms, as well as for examining differences among groups of MNCs (e.g. distinguished by foreign ownership share or by foreign source) is briefly reviewed (section 2). Second, trends in the shares of foreign MNCs in employment, production, and exports of the host economies studied are examined (section 3). Third, to the extent that data availability permits, five types of economic characteristics (size, factor productivity, factor intensity, functional income distribution, and trade propensities) are compared between foreign MNCs and local firms in the five economies (section 4). Fourth, in the economies where data are available (Hong Kong, Indonesia, and Singapore), the economic characteristics are compared among groups of foreign MNCs distinguished by foreign ownership share. Fifth, again in the economies where data are available (Hong Kong and Singapore), the economic characteristics are compared among groups of foreign MNCs distinguished by foreign source (section 6). Finally, important results are summarized (section 7).

2. Theoretical and Methodological Issues

There is a very simple and powerful theoretical logic suggesting that MNCs will differ from non-MNC s in important respects. Namely, compared to non-MNCs, foreign MNCs are often asserted to possess relatively large amounts of proprietary, knowledge-based, generally intangible assets related to production technology, marketing, and management. Indeed, some theoreticians (e.g., Dunning 1993) go so far as to suggest that the possession of these ownership-based advantages is a necessary condition for a firm to become a MNC. Although there is an extensive debate over this theoretical point, the general empirical agreement that MNCs tend to possess relatively large amounts of production-technology-related intangible assets, as well as relatively large amounts of marketing-related intangible assets, is the point of importance in this context.[2]

The possession of such assets is important because it first suggests that MNCs will tend to be more efficient than non-MNCs. This greater efficiency may be reflected in a number of ways, for example, larger

[2]On the theoretical point, Buckley and Casson (1991), Casson (1987), Rugman (1980, 1985), for example, argue that the possession of such ownership advantages is a sufficient, but not necessary, condition for a firm to become a multinational. For reviews of both the theoretical and empirical literature see, for example, Caves (1996), Dunning (1993), and Markusen (1991).

firm or plant size, higher factor productivity (and thus higher factor returns), and/or higher capital or technology intensity, in MNCs. Second, marketing-related assets in MNCs are often concentrated in international marketing, implying that MNCs may be more able to exploit opportunities in foreign markets than non-MNCs, and will therefore be more dependent on exports and/or imports than non-MNCs. Third, foreign MNCs are also likely to be larger than non-MNCs in the host economies studied here because MNCs are generally large firms that operate on a worldwide or region-wide basis and because most foreign MNCs come from home economies where average firm or plant size is likely to be relatively large compared to the host economies studied here.

Since foreign firms investing in the economies studied are by definition MNCs and, at least until relatively recently, there have been relatively few local MNCs in these economies, comparisons of foreign MN Cs and local firms in these economies may generally be considered comparisons of MNCs and non-MNCs. Accordingly, section 4 examines differences between foreign MNCs and local firms under the assumption that this is essentially a comparison of MNCs and non-MNCs. It should be noted, however, that outward FDI has grown rapidly from Hong Kong, Singapore, and Taiwan in the last decade and that comparisons of foreign MNCs and local firms in these economies are not strictly comparisons of MNCs and non-MNCs. For example, it may be that differences between foreign MNCs and local firms in these economies have diminished somewhat in recent years, precisely because an increasing number of local firms have become MNCs and developed many of the intangible assets that foreign MNCs are thought to possess. Moreover, given that the hypothesized differences between MNCs and non-MNCs are among the most important theoretical principles underlying this study, the failure to distinguish local MNCs and local non-MNCs, in addition to foreign MNCs, is clearly a major limitation that mandates particular caution when interpreting results for Hong Kong, Singapore, and Taiwan after the mid-1980s.

A second set of issues examined here is the extent to which characteristics of MNCs differ depending on foreign ownership shares. In this respect, it is often suggested that MNC parents are not likely to allow foreign affiliates access to their knowledge-based, intangible assets (e.g., technology-related assets such as patents, as well as marketing-related assets such as international trade networks) unless the MNC parent can control how those assets are used.[3] The reason for this is that, if foreign affiliates use these assets in a manner inconsistent with parent goals (e.g., selling technology to third parties or trying to sell in markets where they

[3]For related literature, see, Chao and Yu (1996), Dunning (1993, ch 7-9, 11), Caves (1996, ch. 3, 7, 9).

compete with the parent), then the MNC as a whole may be less profitable or competitive. On the other hand, an important way in which parents can help foreign affiliates (and the MNC as a whole) become profitable is to share the pool of intangible assets. Moreover, even if control matters, high foreign ownership shares are not the only means through which the parent can exercise control. Thus, a priori, it is not clear (1) how much parents will seek to limit the access of foreign affiliates to intangible assets developed by the MNC, (2) to what extent such limits will be correlated with foreign ownership shares, or (3) what effects these limits might have on affiliate performance. In addition, there is relatively little empirical evidence on this point. Correspondingly, as a step toward clarifying this issue, section 5 examines differences among 3 categories of foreign MNCs, minority-foreign MNCs, majority-foreign MNCs, and heavily- or wholly-foreign MNCs.[4]

Perhaps an even more complicated issue is whether there are observable differences among groups of MNCs when distinguished by foreign source. One of the first researchers to offer hypotheses in this regard was Kojima (e.g., 1978, 1990), who argued that Japanese MNCs were more trade oriented than U.S. and European MNCs. Although the empirical evidence does not appear to support this particular hypothesis (e.g., Hill and Johns 1985; evidence for Singapore from this paper), Kojima's arguments are interesting in part because his theoretical arguments focus on differences in MNCs from less capital-abundant and more capital-abundant economies (e.g., Japan and the United States in the early 1970s). If such an approach is valid it might also suggest that there are systematic differences between MNCs from the so-called newly industrialized economies (e.g., Hong Kong, Singapore, and Taiwan) and MNCs from more advanced industrialized economies (e.g., Europe, Japan, the United States) in recent years. Interestingly, numerous studies of MNCs from developing economies (e.g., Lall 1983; United Nations-ESCAP/UNCTC 1988; Kumar 1995) appear to be implicitly based on a similar logic. In addition, the general impression that Japanese MNCs may be different from other MNCs

[4]In this respect, it is important to note that many Asian economies have limited foreign ownership shares during the last few decades and offered incentive packages which relax foreign ownership restrictions if the foreign MNC meets certain performance requirements (e.g., invests a sufficiently large amount, employs a large number of workers, exports a large percentage of output). In such cases it is a very tricky issue to sort out whether observed differences among groups of MNCs are due to intrinsic differences in firm behavior or due to policy distortions. A good example of this is the strong correlation between foreign ownership shares and export propensities observed in cross sections for Thailand in 1990 and Indonesia in 1990, 1992, and 1994, and in time series for Singapore (see Ramstetter 1994a, 1998b, 1998c, evidence from this paper). On the one hand, Thailand and Indonesia have had policies of loosening foreign ownership restrictions for firms that export large shares of output, suggesting that the differences observed may due to policy distortions. On the other hand, Singapore has never had such a policy and the fact that a seemingly consistent result obtains across economies suggests that the pattern may be a result of systematic behavior by MNCs.

persists in the literature (e.g., Encarnation 1993; Encarnation and Mason 1993) and there is empirical evidence that Japanese MNCs in the United States do differ in important respects from other foreign MNCs in the United States (Howenstine and Shannon 1996; Zeile 1998). Another important strand of the literature does not limit its focus to MNCs but focuses more on the more general differences between the behavior of Japanese firms and U.S. and/or European firms (e.g., Aoki 1988, 1990). Accordingly, section 6 below tries to ascertain whether there are differences among four major groups of MNCs, U.S. MNCs, European MNCs, Japanese MNCs, and other Asian MNCs.

In view of the foregoing discussion, the primary purpose of this study is to investigate the nature of differences between foreign MNCs and local firms, as well as differences among between groups of foreign MNCs distinguished by foreign ownership share or by foreign source. To this end, variables falling into five categories of economic characteristics are examined as follows:

1. Firm or plant size
1a. Employees per firm or Employees per plant
1b. Value added per firm or Value added per plant
2. Factor productivity
2a. Average product of labor
2b. Compensation per employee
2c. Average product of capital
3. Factor intensity
3a. Fixed assets per employee
3b. Non-production workers/all employees or Salaried workers/all employees
3c. R&D Expenditures/sales
4. Functional income distribution
4a. Compensation/value added
4b. Profits/sales
5. Trade propensities
5a. Exports/sales
5b. Imports/sales

The mean of each available variable is calculated for the two groups being compared, and then a t-statistic is calculated to test the hypothesis that difference between these two means is zero.[5] This procedure is a useful

[5]For example, if one allows for the fact that sample variances often differ between MNCs and non-MNCs, while recognizing that sample size is equal for MNCs and non-MNCs, then the following is the appropriate t-statistic to test the hypothesis that the difference between the means for these two groups of firms is zero (Sachs 1984, p. 270):
t=(MEAN(Xm)-MEAN(Xn))/SQRT((VAR(Xm)+VAR(Xn))/N)
where MEAN=mean operator, N=number of observations, SQRT=square root operator, VAR=sample variance operator, Xm=value of variable X for MNCs in year t, Xn=value of variable X for non-MNCs in year t. This t-statistic then has degrees of freedom, (=DF):
DF=N-1+((2N-2)/((VAR(X1)/VAR(X2))+(VAR(X2)/VAR(X1)))
Note that the t-statistic I used in previous studies was incorrect and biased toward zero compared to this correct statistic. I am grateful to an anonymous referee for pointing out this error.

first step in identifying the direction and size of mean differences between two groups of firms, and how consistent those differences are in a time series context. However, the methodology has one very important drawback. Namely, it does not allow one to account for other factors that might be relevant to explaining observed differences. For example, if one observes that foreign MNCs have a higher average product of labor than local firms, that difference may simply be due a combination of higher labor productivity in firms with higher capital intensity and higher capital intensity in foreign MNCs. In other words, the difference in labor productivity between foreign MNCs and local firms might disappear if differences in capital intensity could be accounted for. Continuing with the same example, a preferable alternative would be to build and estimate a model of production that accounts for these and other influences that are known to affect labor productivity, and then test for differences between foreign MNCs and local firms in that context. Unfortunately, given the short length of the time series available and the high probability of unit roots in a number of the relevant series, the results of estimating such models in the annual time series that are available would be highly unreliable.[6]

Another problem encountered in the analysis below has to do with the focus on aggregate manufacturing. The high degree of aggregation is beneficial in that it facilitates the widest possible coverage of host economies as more disaggregated data are not available for Malaysia and Singapore, and often unavailable for Hong Kong and Taiwan, depending on the industry. However, the high degree of aggregation means that, for example, relatively high labor productivity in foreign MNCs may simply be a result of the concentration of foreign MNCs in industries characterized by relatively high labor productivity. Thus, care must be taken to identify results that are related to the concentration of MNCs in specific industries.

3. Shares of Foreign Multinationals in Employment, Production, and Exports of Host Economies

Table 1 provides an overview of how large foreign MNCs are relative to the manufacturing sectors of the five economies studied. Before beginning the analysis, however, some characteristics of the data should be noted (see Appendix A for more details). Data for Hong Kong and Singapore are perhaps the most reliable

[6]For an example of modeling with the time series data used here see Ramstetter (1991). Note also that there are some large cross sectional data sets that allow for much more sophisticated and reliable model estimation for Indonesia (e.g., Hill 1988, pp. 107-117; Ramstetter 1998b) and Thailand (e.g., Khanthachai, et al., 1987; Ramstetter 1994a; Tambunlertchai and Ramstetter 1991).

here, as they usually come from consistent industrial censuses or surveys that have been tagged by ownership (data on exports in Hong Kong are the one exception, see Appendix A). Data for Malaysia are also internally consistent and thought to be relatively reliable. However, there are two distinct sources of data for Malaysia, financial surveys of relatively large limited companies and more comprehensive industrial censuses or surveys. Data for Indonesia also come from a single set of industry survey data tagged by ownership and are thus internally consistent in many respects. However, the Indonesian data are also known to vary in coverage over time, with coverage generally improving in more recent years. This mandates extreme caution when using these data in a time series context. The Taiwanese data are problematic for two reasons. First, as in Indonesia, the surveys of foreign firms that are the source of foreign MNC data apparently vary in coverage over time, suggesting that some of the changes observed are due to changes in survey coverage, not just changes in economic activity. Second, data for local firms are estimated by calculating the differences between economy-wide estimates and foreign MNC estimates. In other words, data for foreign MNCs and local firms do not come from a single source as in the other economies studied here, creating the possibility of internal inconsistencies in the data. A final problem in all countries is the lack of good deflators for fixed assets and exports. In this study the deflator for manufacturing GDP (or total GDP in Hong Kong) is used in all real calculations, though this is obviously a very imperfect solution. Despite difficulties with the data that are thought to be most severe in Taiwan and Indonesia, I still believe that these data are in general the best available indicators of trends in the economic activities of foreign MNCs in the manufacturing sectors of these economies.

As stressed in previous studies (e.g., Ramstetter 1998a), it is also important to note that trends in shares of foreign MNCs in host economy production often display markedly different trends over time than FDI-based indicators, and are in general much more stable over time. A related observation from Table 1 is that shares of foreign MNCs are generally more stable in terms of employment than in terms of value added or exports.[7] Table 1 also reveals that shares of MNCs in host economies tended to decline in from the mid-1970s to the mid-1980s and increase thereafter. Accordingly, the sample period, which extends from 1970 at the earliest to 1996 at the latest, has been divided into two subperiods, the early period through 1986 and the late period from 1987

[7]For example, in all years the ratio of the standard deviation to the mean was employment=0.15, value added=0.20, exports=0.16 in Hong Kong; employment=0.16, value added=0.18 in Malaysia-2; and employment=0.22, value added=0.23, exports=0.25 in Taiwan. Singapore is the notable exception in this respect with employment=0.052, value added=0.054, exports=0.013 (from Table 1).

forward. Interestingly, despite a well documented FDI boom in Asia in the late period (e.g., United Nations, various years), shares of foreign MNCs in host economies were often smaller in the mid-1990s than in the mid-1970s. Indeed, Singapore was the only economy where all shares were consistently higher in the mid-1990s than in the mid 1970s. There was also a wide variation in shares of foreign MNCs across host economies that is very difficult to explain. On the one hand, foreign MNCs clearly dominate manufacturing in Singapore, and have also dominated in Malaysia for a number of years in the sample. In contrast, despite being perhaps the most open economy to inward FDI in Asia, foreign MNC shares were generally much lower in Hong Kong than in the other economies studied here. The most important pattern in the context of this study is that MNCs tended to be largest relative to the host economy in terms of exports, second largest in terms of production, and smallest in terms of employment. This pattern is important because it suggests that foreign MNCs are generally characterized by relatively high production per worker and relatively high export propensities (i.e., export-production ratios).

4. Major Economic Differences between Foreign Multinationals and Local Firms

The paper now turns to a more detailed comparison of foreign MNCs and local firms.[8] For each variable and period considered, Table 2 presents (1) the percentage difference between the mean value of a variable for foreign MNCs and the mean value of the variable for local firms, (2) a t-statistic used to test the null hypothesis that the difference in absolute means between foreign MNCs and local firms is zero, and (3) the two-tailed significance level of this t-statistic. As in Table 1, calculations are done for three periods, all years in the sample, years through 1986, and years from 1987 forward.

One of the strongest and most consistent results obtained is that foreign MNCs were generally much larger than local firms in Hong Kong, Indonesia, Malaysia, and Singapore, and these differences were always highly significant statistically. This is true whether size is measured in terms of employees per firm or plant or in terms of real production per firm or plant. This result is also consistent with perceptions that MNCs are

[8]In this section, the term "local firms" is used refer both to local firms or to local plants. Note that most of the data utilized here are compiled and classified at the plant level (e.g., most data for Hong Kong, Indonesia, Malaysia's industrial censuses/surveys, Singapore). Only two of the data sets used (Malaysia's financial surveys of limited companies and Taiwan's surveys of foreign MNCs) were compiled and classified at the firm level.

generally big firms and that firms in major home economies (e.g., the United States, Japan, Europe) tend to be larger than in the host economies studied here.

Average labor productivity (measured as value added or net production per employee) was significantly higher in foreign MNCs in all countries except Malaysia.[9] In Malaysia, the results differ somewha t between the two sources. The limited company data, which include mainly larger firms, reveal no significant differences for the 1972-1986 or 1972-1989 periods, but negative and significant differences in the small sample for 1987-1989. The industrial survey data, which contain a more comprehensive sample of plants, indicate positive and significant differences for the period through 1986, but small and insignificant differences in the period after 1987. Thus, although the two data sets differ in important respects, they both show a marked decline in average labor productivity in foreign MNCs relative to local firms after 1987. As detailed in Ramstetter (1995), the decline of the labor productivity differential in Malaysia over time is thought to be related to the increasing concentration of foreign MNCs in the electric machinery industry, an industry characterized by relatively low labor productivity in Malaysia.

Differences in terms of compensation per employee were also positive, but smaller than differences in labor productivity in most samples, and observed differences were not statistically significant at the 5 percent level or better in Singapore and Taiwan, or in Malaysia after 1987. The relative lack of significant differences here is somewhat surprising because economic theory suggests that labor productivity and wages are highly correlated and there were numerous large and significant differences in labor productivity as noted above. Differences in average capital productivity (value added per unit of fixed assets) were positive and generally significant in Malaysia, though the industrial survey data suggest that the differences became much smaller and insignificant after 1987. In Singapore, differences in average capital productivity were small and insignificant.

As might be expected given combination of significantly higher average labor productivity and insignificant differences in average capital productivity, foreign MNCs were more capital intensive (i.e., they had higher fixed assets per employee) than local firms in Singapore, with observed differences being highly significant. In contrast, foreign MNCs in Malaysia were characterized by significantly lower capital intensity after 1987, again probably reflecting the growing importance of foreign MNCs in Malaysia's electronics sector,

[9]Note that this result in particular contrasts with the results presented in the previous version of this paper and in Ramstetter (1994b, 1995, 1996), the differences being the result of using an incorrect t-statistic in the previous papers. Again, I am very grateful to an anonymous referee for pointing out this mistake.

which is rather labor intensive. Data for Indonesia and Taiwan indicate that differences in skilled-labor intensity (measured as non-production workers or salaried workers as a share of total employment) were also positive, with these differences being significant in Taiwan in both periods and in Indonesia in the early period. Data for Singapore and Taiwan also suggest that foreign MNCs had a higher degree of R&D intensity (measured as the ratio of R&D expenditures to total sales) but that differences were not statistically significant in Singapore in both periods or in Taiwan in the late period.

On the distribution side, the share of labor compensation in value added (or labor share) was generally lower in foreign MNCs than in local firms in Hong Kong, Malaysia, Singapore, and Taiwan. These differences were again significant in most cases, Malaysia in the late period being the exception. In Singapore, profit rates (measured as the profit-sales ratio) were higher in foreign MNCs than in local firms and these differences were significant statistically in all periods. In Malaysia, foreign MNCs also had significantly higher profitability in the early period, but this was reversed in the late period. Trade propensities (ratios of trade flows to total sales or production) were always higher in foreign MNCs than in local firms and these differences were almost always significant statistically. The one exception was in Taiwan's exports in the late period, where differences became very small.

In short, with a few notable exceptions, these results suggest that foreign MNCs tended to be relatively large and to have relatively high average labor productivity, average capital productivity, capital intensity, skilled-labor intensity, R&D-intensity, profit rates, and trade propensities, but relatively low labor shares of value added. Moreover, these differences were often highly significant statistically. The small number of economies examined here makes generalizing difficult, but these results are largely consistent with the view that foreign MNCs have relatively large endowments of firm-specific assets such as production technology and marketing networks. The results are also more or less consistent with more sophisticated cross sectional studies for Thailand and Indonesia.[10]

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[10]For example, analysis of plant-level Indonesian data reveal evidence that labor productivity and other indicators related to production technology are significantly higher in foreign MNCs than in local plants (e.g., Hill 1988, pp. 107-117; Sjöholm 1998) as well as evidence of significantly higher trade (both export and import) propensities in foreign MNCs (Ramstetter 1998b, 1998c). For Thailand, there is also evidence that export propensities are significantly higher in foreign MNCs than in local firms in Thailand (Ramstetter 1994a) and labor productivity and other indicators related to production technology also tend to be higher in foreign M NCs, but differences in production technology are often found to be insignificant statistically (e.g., Khanthachai et al. 1987; Ramstetter 1994a; Tambunlertchai and Ramstetter 1991).

5. Major Economic Differences Among Foreign Multinationals by Foreign Ownership Share

Another problem that exists with the data in Tables 1 and 2 is that the definition of foreign MNCs is not consistent across host economies. Foreign MNCs are defined as firms with foreign ownership shares of 50 percent or more in all economies but Taiwan, where foreign MNCs are firms with any degree of foreign ownership.[11] In this respect, data for Hong Kong, Indonesia, and Singapore are helpful because they allow a clearer disaggregation by foreign ownership share. Accordingly, the first step in Tables 3-5 is to compare local plants and three groups of foreign MNCs, minority-foreign MNCs (foreign shares of 1-49 percent in Hong Kong and Singapore or 10-49 percent in Indonesia), majority-foreign MNCs (foreign shares of 50-99 percent in Hong Kong and Singapore or 50-89 percent in Indonesia), and wholly- or heavily-foreign (foreign shares of 100 percent in Hong Kong and Singapore or 90 percent or more in Indonesia).[12] As might be expected, the differences between the three groups of MNCs and local plants were generally similar to the differences observed in Table 2. Given the space constraint, more detailed observations in this respect are left for the reader to make.

Of more concern here is whether there are differences among groups of foreign MNCs themselves depending on the foreign ownership share. In Hong Kong (Table 3), plant size and average labor productivity tended to be larger the larger the foreign ownership share. In terms of plant size, these differences were always statistically significant at the 5 percent level or better. Differences in average labor productivity were significant if wholly-foreign and minority-foreign plants are compared, but differences between the other two pairs of foreign plants (majority-foreign and minority-foreign, wholly-foreign and majority-foreign) were not significant. In contrast, differences in compensation per employee were generally very small in absolute value and never statistically significant. Shares of labor compensation in value added were smaller in groups with larger foreign ownership shares, and these differences were generally significant statistically.

In Indonesia (Table 4), differences in plant size contrast markedly with Hong Kong and Singapore. Specifically, differences were relatively small and insignificant if measured in terms of employment per plant,

[11]The definition is also not strictly consistent across variables in Hong Kong either, where exports have had to be proxied using data from another source (see Appendix A for details).

[12]In this and the following section, all data are compiled at the plant level. Hence the text refers to plants instead of firms.

while heavily-foreign plants were significantly smaller than the other two groups of foreign plants if measured in terms of net production per plant. Heavily-foreign plants also had significantly lower average labor productivity and significantly higher export propensities than the other two groups. This pattern is thought to be related to the concentration of heavily-foreign plants in industries which are highly export-oriented but are likely to have low labor productivity and low capital intensity (e.g., apparel, footwear, assembly of non-electric and electric machinery, see Ramstetter 1998b).[13] It is also interesting that differences among groups of foreign MNCs distinguished by foreign ownership share changed markedly between the early and the late period, with net production per plant and net production per worker in heavily-foreign plants falling relative to the other two groups of foreign plants. The fact that there was a large policy shift in 1986, with a marked liberalization of international trade and subsequent relaxation of foreign ownership regulations, leads one to speculate that these shifts were policy related, but there is no hard evidence of this correlation. A final observation is that import-sales ratios were significantly lower in minority-foreign plants than the other two groups and differences in skilled-labor intensity were generally insignificant.

In Singapore (Table 5), as in Hong Kong, plant size was positively related to foreign ownership shares, with many of these differences being significant statistically. Export propensities were also larger the larger the foreign ownership share is and all of these differences were statistically significant. Wholly-foreign plants also had significantly higher average labor productivity, R&D-sales ratios, and profitability, as well as significantly lower labor shares of value added compared to the other two groups. Average capital productivity also tended to be significantly higher in wholly-foreign plants, the comparison with minority-foreign plants in the early period being the one exception. Differences in capital intensity and compensation per employee were less often significant. In addition, differences between minority-foreign and majority-foreign plants were often insignificant statistically, a finding that is similar to Hong Kong and Indonesia.

To summarize, differences between wholly-foreign plants and other groups of foreign plants were often significant and generally in the same direction as differences between MNCs and local plants. The major exception here was with respect to plant size and average labor productivity in Indonesia. In contrast, differences between majority- and minority-foreign MNCs were generally smaller and less often significant. A

[13]Note that this pattern is consistent with the Heckscher-Ohlin notion that Indonesia, an economy that is likely to be labor abundant by any measure, should have a comparative advantage in labor-intensive industries.

notable exception is the finding for Singapore and to a lesser extent Indonesia, that export propensities were largest for wholly- or largely-foreign plants, followed by majority-foreign plants and then minority-foreign plants.[14]

6. Major Economic Differences Among Foreign Multinationals by Foreign Source

When comparing foreign MNCs by foreign source, four groups of MNCs are identified, U.S. MNCs, European MNCs, Japanese MNCs, and Other Asian MNCs. These data are available for Hong Kong and Singapore, though it should be noted that definitions of Europe and Other Asia differ somewhat in the two host economies (see notes to Tables 6-7). In Hong Kong (Table 6), differences among these groups of MNCs are relatively small and seldom statistically significant. There are two major exceptions. Japanese plants and Other Asian plants were significantly smaller than European or U.S. plants and Other Asian plants had significantly higher labor shares of value added in the late period than other groups. In the late period, average labor productivity in Other Asian plants was also significantly lower than in Japanese and European plants and almost significantly lower (at the 7 percent level) than in U.S. plants as well.

The data for Singapore contrast markedly, revealing several significant differences. First, if measured in terms of employment per plant, U.S. plants were the largest, followed by Japanese plants, European plants, and Other Asian plants, with all these differences being statistically significant at the 5 percent level or better. Differences in terms of production per plant were also consistently significant with U.S. plants again the largest, but with the Europeans second, followed by the Japanese and Other Asians. The ordering for average labor productivity was Europe, U.S., Japan, and Other Asia and again differences are usually significant, the exceptions being the Europe-U.S. comparison in the late period and the Other Asia-Japan comparison in the early period. The ordering for compensation per employee was the same but differences were less often significant. Average capital productivity was significantly higher in U.S. plants, but the ordering of the three other groups of MNCs was not consistent over time and differences were not always significant. European plants were the most capital intensive and differences between European plants and other plants were

[14]Note also that this results is consistent with the results of more sophisticated micro studies for Indonesia and Thailand (e.g., Ramstetter 1994a, 1998b, 1998c).

significant, perhaps reflecting the fact that highly capital-intensive oil refining plants are an important component of European activity in Singapore. Other Asian plants were the least capital intensive and U.S. plants were significantly more capital intensive than Japanese plants in the early period, but the differences between U.S. and Japanese plants disappeared in the late period. U.S. and European plants also tended to be significantly more R&D intensive than Japanese and Other Asian plants. Labor shares were the highest in Other Asian plants, followed by plants from Japan, Europe, and the United States, with this order reversed in for profit rates, and these differences were often significant. Finally, export propensities were highest in European (early) or U.S. (late) plants, followed by Japanese and Other Asian plants. This is interesting because, although Japanese plants tended to be relatively small and labor-intensive compared to European and U.S. plants as conjectured by Kojima (1978, 1990), these data would seem to contradict his other prediction that these differences would make Japanese MNCs more trade oriented.

Here again, it is important to reemphasize the fact that many of the differences observed above can be explained by differences in the industrial distributions of different groups of firms. For example, the dominanc e of the oil refining industry by U.S. and European plants and the large share of oil refining in the activities of European plants are thought to be particularly important reasons for the high levels of average labor productivity and capital intensity observed in these groups (see Ramstetter 1996 for more details). Accordingly, it would be interesting to see if the differences observed above persist if similar calculations are done at a more disaggregate level.[15] In sum, the two cases studied here contrast markedly, with evidence from Hong Kong suggesting that differences among MNCs distinguished by foreign source are generally insignificant and evidence from Singapore indicating large and significant differences in this respect.

7. Conclusions

The crude analytical tools employed in this study make any conclusions tentative at best. Nonetheless, there are few studies that have taken similar care to comprehensively examine trends in the real economic activities of foreign MNCs in Asia or to carefully compare foreign MNCs and local firms, as well as groups of

[15]Unfortunately, such are not yet available for Singapore and corresponding data for Hong Kong contain a large number of suppressed observations (to avoid revealing data for individual plants) so it is very difficult to do these calculations with existing data.

foreign MNCs, in a time series context. This fact alone makes the results of this study of some interest.

Shares of foreign MNCs in manufacturing sectors of the host economies studied tended to decline through the mid-1980s and increase thereafter. Foreign MNC shares tended to be lower in the mid-1990s than in the 1970s in Malaysia and Taiwan. Singapore was the only economy in the sample where all measures of foreign MNC shares increased in this period. It was also noted that shares of production tended to be more stable over time than FDI-related measures, and that shares of foreign MNCs tended to be more stable in terms of employment than in terms of production or exports. There was a wide variation in shares of foreign MNCs across host economies, with shares being quite large in Singapore and Malaysia but much smaller in Hong Kong, Indonesia, and Taiwan. Shares of foreign MNCs tended to be largest in terms of exports, smallest in terms of employment, and intermediate in terms of production, implying relatively high average labor productivity and export propensities in foreign MNCs compared to local firms.

Direct comparisons of these and other indicators for foreign MNCs and local firms generally confirmed this last observation. Foreign MNCs tended to be relatively large and to have relatively high average labor productivity, average capital productivity, capital intensity, skilled-labor intensity, R&D intensity, profit rates, and trade propensities, but relatively low labor shares of value added. Moreover, these differences were often highly significant statistically, though there were some notable exceptions (e.g., comparisons of labor productivity and capital intensity in Malaysia for the late period). In addition, differences in compensation per employee were relatively small and less often significant, a result that is perhaps surprising given the relatively large and significant differences in labor productivity and the theoretical prediction of a strong relationship between productivity and wages.

Comparisons among MNCs classified by foreign ownership share indicated that differences between wholly- or heavily-foreign plants and other groups of foreign plants were often significant and generally in the same direction as the differences between MNCs and local plants noted above. The major exception here was with respect to plant size and average labor productivity in Indonesia. In addition, differences between majorit y- and minority-foreign MNCs were generally smaller and less often significant, though there was a notable tendency for export propensities to be largest in wholly- or heavily-foreign plants, followed by majority-foreign plants and then minority-foreign plants.

Comparisons of groups MNCs classified by foreign source revealed few significant differences in

Hong Kong, but there were a number of large and significant differences in Singapore. For example, in Singapore, European and U.S. firms tended to be larger and characterized by relatively high labor productivity, capital intensity, profitability, and export propensities, but relatively low shares of labor compensation in value added compared to Japanese and Other Asian firms.

As noted in numerous places in this study, there are several important drawbacks to the methodology employed here, some of which could be addressed in future research. One of the most important ways in which the study could be extended would be to further disaggregate the data and examine trends in specific industries. This is possible in Indonesia and for some industries in Hong Kong and Taiwan. Moreover, if compilations of unpublished data could be arranged, underlying data bases could also facilitate similar calculations for Malaysia and Singapore. A second improvement that can be made is with respect to the Indonesian data, where use of a b ackcast data set that accounts for some of the coverage problems in the raw data used here would be highly desirable. Third, it would also be helpful to add host economies to the analysis as possible. A notable possibility in this respect would be to add data for China in recent years, though many of the necessary series are still quite short. It may also be possible to assemble relevant time series from private sources of firm-level information in Thailand which I am presently compiling, but no such data are available from official sources. Fourth, as emphasized in section 2 above, it would be very desirable to distinguish local MNCs, in addition to foreign MNCs and local non-MNCs, in the analysis. However, this would be a very costly exercise and would require access to the firm or plant level data that underlie the industry-level data used in this study, as well as additional data indicating whether the firms owned affiliates abroad or not.

Finally, even if one could make all four of the improvements mentioned above, it still remains that this type of analysis is only a one small step toward ascertaining how ownership is related to firm performance. As explained above, the fundamental problem is that one cannot reliably estimate models facilitating comparisons of groups of firms, while at the same time controlling for other relevant influences, in short time series such as those examined this study. As such time series studies of this nature, while of potential interest from a policy perspective in particular, are in many respects only a weak complement to more rigorous comparisons of foreign MNCs and local firms in large cross sections or panels.

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Appendix A: The Data and Their Sources

This appendix summarizes the sources of the data used and the methodology used for estimating the indicators analyzed in Tables 1-7. Appendix Table A1 summarizes the sources and major characteristics of the data while this write up emphasizes major concerns with the data and summarizes additional details that could not easily fit in the table.

For Hong Kong, data from industrial surveys were the primary source. These surveys are thought to be rather consistent over time and relatively comprehensive in coverage. Surveys of foreign firms in manufacturing were the source of exports-sales ratios for foreign firms (minority-owned firms included) in manufacturing and exports were proxied as the product of this ratio and total sales of majority-foreign firms from the industrial surveys. Thus, this estimate includes errors caused by differences in coverage and classification between the industrial surveys and the foreign firm surveys. Total manufacturing exports for 1986-1996 come from an industrial classification of domestic exports (i.e., entrepôt exports are excluded) supplied by the Hong Kong, Census and Statistics Department (various years b). Figures for 1983-1985 estimated as 99.4 percent of total domestic exports (the average ratio of manufacturing exports to total domestic exports for 1986-1991). For 1983-1990, these estimates are very close to estimates from Australian National University (1997). In Hong Kong there is no series on real GDP by industrial origin and hence all real variables are estimated by dividing the relevant nominal variable by the GDP deflator.

For Indonesia, industrial surveys were the primary data source. These data are known to have important coverage problems that mandate particular caution in a time series context. There is a "backcast" data set which adjusts certain variables (e.g., value added, employment) for this coverage problem but I have yet to get data which allow me to use this data set in conjunction with data on foreign ownership. Hence these results are based on compilations of "raw" data and should be interpreted with extreme caution. In the versions of these data sets that I have acquired, value added is missing for 1976-1979 and value added estimates for 1982 are very large (as if by 1decimal place). I have thus proxied value added with net production, that is production less expenditures on intermediate goods. In this respect, it is interesting to compare of estimates of mean foreign MNC shares in production from Table 1 with estimates from Aswicahyono, et al. (1995), who use value added estimates from the superior backcast data set mentioned above.

	1975	76-79	80-83	84-87	88-90
Estimates from Table 1	25%	30%	27%	19%	14%
Aswicahyono, et al. (1995)	21%	27%	27%	18%	18%

This comparison suggests that coverage adjustments result in smaller foreign shares in the 1970s but larger foreign shares in the late 1980s. It should also be noted that the Indonesian industrial survey data sets are extremely rich and only a portion of the available indicators have been used. In some cases (e.g., data on fixed assets) there are clear errors in the data sets that have yet to be resolved. In other cases, I simply have not had enough time to compile the aggregate indicators from the plant level data. Nonetheless, it remains that these "raw" data sets are probably much better suited to cross sectional analysis than to time series analysis. All real variables are calculated as the relevant nominal variable divided by the manufacturing GDP deflator.

For Malaysia, there are two data sources. The first is the financial survey of limited companies and the second is the industrial census/survey data. The limited company surveys have been conducted annually since the late 1960s but a notable change has been the exclusion of data on employment in recent years. These surveys cover rather large firms and comparison of estimates from the limited company surveys and industrial surveys indicate that, on average, firms in the limited company surveys accounted for about 70 percent of employment but 95 percent or value added in Malaysian manufacturing. The industrial censuses/surveys changed format in the early 1980s, were not published for 1980, and excluded some important variables (e.g., value added) for 1981-83. On the whole, both sources are thought to be relatively reliable and consistent in their coverage over time. All real variables are calculated by dividing the relevant nominal variable by the manufacturing GDP deflator. Note that national sources do not publish such a deflator but that the World Bank (1999) does estimate this deflator.

For Singapore, industrial surveys were the primary data source and are thought to be consistent and relatively comprehensive in coverage since 1980. The data for 1975-1979 differ in that they are classified by country of capital source, as opposed to being classified country of capital origin from 1980. The influence of this on ownership share classifications is relatively small but it has a large impact on classification by country of investor (see Low, Ramstetter, and Yeung 1998). All real variables are calculated as the relevant nominal variable divided by the manufacturing GDP deflator.

For Taiwan, the source of data for foreign multinationals is an annual survey of these firms. These surveys are thought to have some rather severe coverage problems (coverage varies markedly over time), a fact that mandates caution in a time series context. The definition of manufacturing is rather narrow, excluding paper, printing & publishing, and miscellaneous manufacturing, apparently because foreign firm presence is rather limited in these industries. I refer to this as "selected manufacturing" below. Figures for local firms are calculated as the difference between estimates for Taiwan and estimates for foreign firms. Total Taiwanese employment in selected manufacturing is estimated as the product of (1) labor survey estimates of total manufacturing employment and (2) the share of selected manufacturing in total manufacturing employment calculated from employment and earnings surveys. Likewise the total number of salaried workers in selected manufacturing in Taiwan is estimated as the product of (1) the share of salaried workers in total employment in selected manufacturing taken from employment and earnings surveys and (2) the estimate of total Taiwanese employment in selected manufacturing. Value added, gross output (a proxy for total sales) and compensation of employees come from national accounts. For 1974-1980, miscellaneous manufacturing and precision machinery are combined in these data and the share of miscellaneous manufacturing in this total is estimated using corresponding shares calculated from industrial census data for 1976 and 1981. Because data on R&D expenditures in selected manufacturing could not be obtained for 1980-1982 and 1990-1991, these figures were estimated as total R&D times the ratio of R&D in selected manufacturing to total R&D in surrounding years (79 percent in 1983-1987 and 94 percent in 1988-1989 and 1992-1993). Total exports in selected manufacturing are taken from Australian National University (1997). As for other economies, all real variables are calculated as the relevant nominal variable divided by the manufacturing GDP deflator.

Table 1: Shares of Foreign MNCs in Employment (=EM), Value Added (=VA), and Exports (=EX) in Manufacturing Industries of Selected Asian Host Economies (percent)

	Hong Kong			Indonesia			Malaysia-1			Malaysia-2		Singapore			Taiwan		
Year	EM	VA	EX	EM	VA	EX	EM	VA	EX	EM	VA	EM	VA	EX	EM	VA	EX
1970	..	..	..	..	..	..	..	68	77	32	53	..	..	..	..	..	..
1971	..	..	..	..	..	..	40	61	79	34	58	..	..	..	..	..	..
1972	..	..	..	..	..	..	39	58	70	32	56	..	..	..	..	..	..
1973	..	..	..	..	..	..	42	54	65	32	53	..	..	..	..	..	..
1974	..	..	..	..	..	..	44	57	72	35	54	..	..	..	16	20	30
1975	..	..	..	8	25	..	41	52	60	34	48	52	63	84	17	21	31
1976	..	..	..	11	32	..	40	47	59	35	52	54	64	85	18	20	30
1977	..	..	..	11	31	..	37	44	55	33	45	55	65	84	17	22	31
1978	..	..	..	11	29	..	38	44	60	34	44	53	63	84	17	24	32
1979	..	..	..	10	27	..	47	51	60	34	42	58	67	85	17	25	31
1980	..	..	..	11	28	..	47	50	41	..	..	52	64	82	16	20	29
1981	..	..	..	12	29	..	45	49	52	25	..	53	65	85	15	18	27
1982	..	..	..	11	27	..	44	47	53	26	..	50	64	83	15	17	25
1983	8	13	15	10	25	..	46	44	49	30	36	52	66	85	11	18	19
1984	8	13	..	9	22	..	45	38	49	30	33	54	67	85	14	24	25
1985	7	11	13	8	19	..	42	34	42	30	32	55	67	84	10	15	19
1986	8	13	16	7	18	..	44	36	51	30	33	56	72	85	11	17	20
1987	9	13	16	7	16	..	47	39	58	33	35	58	73	86	10	19	24
1988	9	14	17	6	13	..	49	41	60	36	37	60	72	86	10	25	17
1989	10	15	18	6	15	..	51	40	63	39	40	60	74	86	10	25	18
1990	10	16	21	7	13	16	..	41	64	42	42	60	73	87	12	25	20
1991	10	17	20	9	15	15	..	43	69	45	43	58	72	85	13	11	20
1992	10	17	19	11	18	26	..	45	69	45	45	57	70	84	12	15	18
1993	10	19	21	12	17	23	..	46	70	43	42	55	71	85	10	27	13
1994	12	22	23	14	19	26	..	51	73	43	44	55	70	85	11	31	17
1995	14	22	27	14	22	28	..	48	73	38	42	55	72	86	23	38	20
1996	14	22	26	..	..	..	..	..	..	..	..	54	71	86	..	..	..
All yrs,mean	10	16	19	10	22	..	44	47	61	35	44	55	68	85	13	21	24
All yrs,stdev	2.2	3.8	4.2	2.4	6.2	..	3.7	8.1	10.1	5.6	7.8	2.8	3.7	1.1	2.9	4.8	6.0
thru 86,mean	8	12	15	10	26	..	43	49	59	32	46	54	66	84	15	20	27
thru 86,stdev	0.5	1.1	1.4	1.6	4.5	..	3.0	9.0	11.1	3.0	9.1	2.2	2.4	0.9	2.5	3.1	4.8
from 87,mean	11	18	21	9	16	22	49	43	66	41	41	57	72	86	11	22	18
from 87,stdev	1.9	3.3	3.6	3.2	3.0	5.7	1.9	4.0	5.5	4.3	3.6	2.1	1.2	0.8	1.1	6.8	3.2

Notes:
..=not available, stdev=sample standard deviation;
means and standard deviations exclude years for which data are not available;
for Indonesia, net production (production less expenditures on intermediate goods) used as a proxy for value added;
Malaysia-1 refers to data on manufacturing firms (surveys of limited companies);
Malaysia-2 refers to data on manufacturing plants (data from industrial surveys or censuses);
see appendix A for further details on the data used and their sources.

Table 2: Differences between Foreign Firms or Plants and Local Firms or Plants in Manufacturing in Selected Asian Economies

HONG KONG, manufacturing plants	All years			Thru 1986			From 1987		
Indicator-nominal/real, period covered	%dif	t-stat.	signif.	%dif	t-stat.	signif.	%dif	t-stat.	signif.
1a. Employees per plant, 1983-96	828	19.47	0.00	856	45.37	0.00	814	38.64	0.00
1b. Value added per plant-real, 1983-96	1,545	21.38	0.00	1,506	16.42	0.00	1,559	17.91	0.00
2a. Value added per employee-real, 1983-96	77	5.74	0.00	67	8.11	0.00	80	7.31	0.00
2b. Compensation per employee-real, 1983-96	27	2.92	0.01	18	3.53	0.01	29	3.62	0.00
4a. Compensation/value added-nominal, 1983-96	-28	-13.68	0.00	-29	-6.97	0.00	-28	-18.61	0.00
5a. Exports/sales-nominal, 1983,1985-1996	30	12.37	0.00	20	2.52	0.09	33	17.51	0.00

INDONESIA, non-oil manufacturing plants	All years			Thru 1986			From 1987		
Indicator-nominal/real, period covered	%dif	t-stat.	signif.	%dif	t-stat.	signif.	%dif	t-stat.	signif.
1a. Employees per plant, 1975-95	203	12.08	0.00	214	13.03	0.00	192	9.24	0.00
1b. Net production per plant-real, 1975-95	606	12.68	0.00	862	8.86	0.00	464	17.13	0.00
2a. Net production per employee-real, 1975-95	148	10.53	0.00	210	9.16	0.00	100	7.33	0.00
3b. Non-production workers/all employees, 1975-95	18	3.28	0.00	32	6.63	0.00	1	0.08	0.94
5a. Exports/production-nominal, 1990-95	..	..	..	..	..	..	40	2.51	0.05
5b. Imports/production-nominal, 1978-95	104	22.81	0.00	87	13.28	0.00	124	25.76	0.00

MALAYSIA, manufacturing firms	All years			Thru 1986			From 1987		
Indicator-nominal/real, period covered	%dif	t-stat.	signif.	%dif	t-stat.	signif.	%dif	t-stat.	signif.
1a. Employees per firm, 1972-89	163	7.54	0.00	159	6.35	0.00	177	44.76	0.00
1b. Value added per firm-real, 1972-95	117	5.73	0.00	166	4.93	0.00	81	8.36	0.00
2a. Value added per employee-real, 1972-89	-2	-0.12	0.90	10	0.81	0.43	-30	-7.22	0.00
2c. Value added/fixed assets-nominal, 1972-95	34	5.47	0.00	42	5.58	0.00	20	3.00	0.01
3a. Fixed assets per employee-real, 1972-89	-35	-2.25	0.04	-28	-1.54	0.14	-53	-5.33	0.03
4b. Profits/sales-nominal, 1972-95	0	-0.02	0.99	36	3.27	0.00	-35	-4.12	0.00
5a. Exports/sales-nominal, 1972-95	60	5.87	0.00	32	3.41	0.00	103	27.81	0.00
5b. Imports/sales-nominal, 1972-95	89	14.69	0.00	86	10.63	0.00	92	21.06	0.00

MALAYSIA, manufacturing plants	All years			Thru 1986			From 1987		
Indicator-nominal/real, period covered	%dif	t-stat.	signif.	%dif	t-stat.	signif.	%dif	t-stat.	signif.
1a. Employees per plant, 1972-79,81-94	342	12.03	0.00	349	8.74	0.00	334	25.97	0.00
1b. Value added per plant-real, 1972-79,83-94	422	9.18	0.00	552	7.63	0.00	339	16.15	0.00
2a. Value added per employee-real, 1972-79,83-95	32	3.64	0.00	65	5.37	0.00	3	0.75	0.47
2b. Compensation per employee-real, 1972-79,81-95	20	2.36	0.02	33	2.90	0.01	6	1.51	0.15
2c. Value added/fixed assets-nominal, 1972-79,83-95	38	4.88	0.00	41	4.86	0.00	32	4.61	0.00
3a. Fixed assets per employee-real, 1972-79,81-95	-12	-1.05	0.30	0	-0.02	0.98	-22	-3.72	0.00
4a. Compensation/value added-nominal, 1972-79,81-95	-12	-4.10	0.00	-21	-5.15	0.00	3	1.65	0.12

SINGAPORE, manufacturing plants	All years			Thru 1986			From 1987		
Indicator-nominal/real, period covered	%dif	t-stat.	signif.	%dif	t-stat.	signif.	%dif	t-stat.	signif.
1a. Employees per plant,1975-96	336	32.37	0.00	309	40.18	0.00	367	45.44	0.00
1b. Value added per plant, real, 1975-96	703	9.82	0.00	585	20.22	0.00	794	13.50	0.00
2a. Value added per employee, real, 1975-96	81	5.88	0.00	67	7.48	0.00	93	7.19	0.00
2b. Compensation per employee, real, 1975-96	9	0.95	0.35	10	1.28	0.21	8	0.81	0.43
2c. Value added/fixed assets, nominal, 1975-96	4	0.69	0.49	-8	-1.14	0.27	16	3.82	0.00
3a. Fixed assets per employee, real, 1975-96	67	8.11	0.00	71	6.20	0.00	63	6.90	0.00
3c. R&D expenditures/sales, nominal, 1980-94	719	2.72	0.02	283	5.91	0.00	869	2.90	0.02
4a. Compensation/value added, nominal, 1975-96	-38	-16.61	0.00	-34	-12.06	0.00	-43	-12.76	0.00
4b. Profits/sales, nominal, 1980-96	93	6.12	0.00	100	2.66	0.02	89	10.00	0.00
5a. Direct exports/sales, nominal, 1975-96	96	50.43	0.00	99	42.72	0.00	93	29.04	0.00

TAIWAN, foreign manufacturing firms	All years			Thru 1986			From 1987		
Indicator-nominal/real, period covered	%dif	t-stat.	signif.	%dif	t-stat.	signif.	%dif	t-stat.	signif.
2a. Value added per employee, real, 1974-95	97	3.37	0.00	48	3.30	0.00	138	4.31	0.00
2b. Compensation per employee, real, 1974-95	16	1.00	0.32	2	0.21	0.84	26	2.07	0.06
3b. Salaried employees/all employees, 1983-95	43	4.09	0.00	47	5.39	0.01	42	4.50	0.00
3c. R&D expenditures/sales, nominal, 1980-95	107	2.15	0.05	21	0.58	0.58	146	3.07	0.01
4a. Compensation/value added, nominal, 1974-95	-34	-6.07	0.00	-29	-9.12	0.00	-39	-3.39	0.01
5a. Total exports/sales, nominal, 1974-95	54	6.61	0.00	101	23.50	0.00	2	0.29	0.77

Notes:
%dif=difference between means in percent; t-stat.=t-statistic testing for differences between two means as defined in the text
signif.=significance level of t-statistic using degrees of freedom as defined in the text; ..=data not available
For Hong Kong, Indonesia, Malaysia, and Singapore, foreign firms or plants are defined as firms of plants with foreign ownership shares of 50% or more and data for both foreign and local firms or plants generally come from the same sources
for Taiwan, foreign firms are defined as firms any level of foreign ownership and data for local firms must be estimated from data on foreign firms and data on the entire economy which come from difference sources
see appendix A for further details on the data used and their sources.

Table 3: Differences among Manufacturing Plants by Foreign Ownership Share in Hong Kong

Minority-foreign less wholly-local plants	All years			Thru 1986			From 1987		
Indicator-nominal/real, period covered	%dif	t-stat.	signif.	%dif	t-stat.	signif.	%dif	t-stat.	signif.
1a. Employees per plant, 1983-96	456	11.59	0.00	401	6.33	0.01	484	9.55	0.00
1b. Value added per plant-real, 1983-96	671	15.07	0.00	655	5.55	0.01	677	15.32	0.00
2a. Value added per employee-real, 1983-96	39	3.55	0.00	49	7.13	0.00	36	3.30	0.01
2b. Compensation per employee-real, 1983-96	28	2.89	0.01	22	4.22	0.01	30	3.11	0.01
4a. Compensation/value added-nominal, 1983-96	-9	-3.44	0.00	-18	-3.67	0.04	-4	-1.95	0.08

Majority-foreign less wholly-local plants	All years			Thru 1986			From 1987		
Indicator-nominal/real, period covered	%dif	t-stat.	signif.	%dif	t-stat.	signif.	%dif	t-stat.	signif.
1a. Employees per plant, 1983-96	681	13.67	0.00	740	16.70	0.00	650	16.95	0.00
1b. Value added per plant-real, 1983-96	1,210	11.40	0.00	1,234	8.96	0.00	1,201	8.71	0.00
2a. Value added per employee-real, 1983-96	66	4.54	0.00	57	5.51	0.01	69	5.04	0.00
2b. Compensation per employee-real, 1983-96	36	3.89	0.00	27	4.68	0.01	39	4.94	0.00
4a. Compensation/value added-nominal, 1983-96	-17	-5.92	0.00	-19	-6.22	0.00	-16	-4.69	0.00

Wholly-foreign less wholly-local plants	All years			Thru 1986			From 1987		
Indicator-nominal/real, period covered	%dif	t-stat.	signif.	%dif	t-stat.	signif.	%dif	t-stat.	signif.
1a. Employees per plant, 1983-96	918	19.56	0.00	929	24.92	0.00	913	25.86	0.00
1b. Value added per plant-real, 1983-96	1,756	23.12	0.00	1,688	13.92	0.00	1,780	21.51	0.00
2a. Value added per employee-real, 1983-96	82	6.15	0.00	73	8.46	0.00	85	8.18	0.00
2b. Compensation per employee-real, 1983-96	25	2.74	0.01	16	3.24	0.02	28	3.39	0.00
4a. Compensation/value added-nominal, 1983-96	-31	-14.15	0.00	-32	-7.10	0.00	-31	-18.75	0.00

Majority-foreign less minority-foreign plants	All years			Thru 1986			From 1987		
Indicator-nominal/real, period covered	%dif	t-stat.	signif.	%dif	t-stat.	signif.	%dif	t-stat.	signif.
1a. Employees per plant, 1983-96	41	3.57	0.00	68	4.38	0.01	28	2.62	0.02
1b. Value added per plant-real, 1983-96	70	4.68	0.00	77	3.19	0.02	67	3.62	0.00
2a. Value added per employee-real, 1983-96	20	1.67	0.11	6	0.73	0.50	24	1.98	0.06
2b. Compensation per employee-real, 1983-96	6	0.67	0.51	4	0.74	0.49	7	0.78	0.45
4a. Compensation/value added-nominal, 1983-96	-9	-2.61	0.02	-2	-0.24	0.82	-12	-2.90	0.01

Wholly-foreign less minority-foreign plants	All years			Thru 1986			From 1987		
Indicator-nominal/real, period covered	%dif	t-stat.	signif.	%dif	t-stat.	signif.	%dif	t-stat.	signif.
1a. Employees per plant, 1983-96	83	7.60	0.00	105	7.18	0.00	73	6.97	0.00
1b. Value added per plant-real, 1983-96	141	12.32	0.00	137	6.11	0.00	142	11.76	0.00
2a. Value added per employee-real, 1983-96	31	2.83	0.01	16	2.48	0.05	36	3.50	0.00
2b. Compensation per employee-real, 1983-96	-2	-0.25	0.81	-5	-1.07	0.32	-2	-0.17	0.87
4a. Compensation/value added-nominal, 1983-96	-25	-8.61	0.00	-18	-2.30	0.06	-28	-10.15	0.00

Wholly-foreign less majority-foreign plants	All years			Thru 1986			From 1987		
Indicator-nominal/real, period covered	%dif	t-stat.	signif.	%dif	t-stat.	signif.	%dif	t-stat.	signif.
1a. Employees per plant, 1983-96	30	3.48	0.00	23	3.27	0.02	35	5.08	0.00
1b. Value added per plant-real, 1983-96	42	4.19	0.00	34	2.48	0.05	45	3.60	0.00
2a. Value added per employee-real, 1983-96	10	0.88	0.39	10	1.26	0.26	10	1.00	0.33
2b. Compensation per employee-real, 1983-96	-8	-0.95	0.35	-8	-1.76	0.13	-8	-1.06	0.30
4a. Compensation/value added-nominal, 1983-96	-17	-4.83	0.00	-16	-2.58	0.05	-18	-4.16	0.00

Notes:
%dif=difference between means in percent;
t-stat.=t-statistic testing for differences between two means as defined in the text;
signif.=significance level of t-statistic using degrees of freedom as defined in the text;
see appendix A for details on the data used and their sources.

Table 4: Differences among Non-oil Manufacturing Plants by Foreign Ownership Share in Indonesia

Minority-foreign less local plants	All years			Thru 1986			From 1987		
Indicator-nominal/real, period covered	%dif.	t-stat.	signif.	%dif.	t-stat.	signif.	%dif.	t-stat.	signif.
1a. Employees per plant, 1975-95	194	8.95	0.00	165	9.32	0.00	222	13.84	0.00
1b. Net production per plant-real, 1975-95	777	6.25	0.00	618	5.69	0.00	870	10.95	0.00
2a. Net production per employee-real, 1975-95	186	6.94	0.00	165	6.11	0.00	203	9.80	0.00
2b. Non-production workers/all employees, 1975-95	29	7.98	0.00	37	6.10	0.00	20	7.14	0.00
5a. Exports/production-nominal, 1990-95	..	..	..	..	..	..	-8	-0.77	0.47
5b. Imports/production-nominal, 1978-95	52	5.89	0.00	56	5.95	0.00	47	3.40	0.01

Majority-foreign less local plants	All years			Thru 1986			From 1987		
Indicator-nominal/real, period covered	%dif.	t-stat.	signif.	%dif.	t-stat.	signif.	%dif.	t-stat.	signif.
1a. Employees per plant, 1975-95	215	13.93	0.00	231	17.57	0.00	199	9.58	0.00
1b. Net production per plant-real, 1975-95	739	11.01	0.00	955	7.42	0.00	613	15.65	0.00
2a. Net production per employee-real, 1975-95	178	9.65	0.00	220	6.78	0.00	144	10.72	0.00
2b. Non-production workers/all employees, 1975-95	17	3.57	0.00	27	4.74	0.00	5	0.70	0.51
5a. Exports/production-nominal, 1990-95	..	..	..	..	..	..	6	0.48	0.64
5b. Imports/production-nominal, 1978-95	110	24.25	0.00	92	15.60	0.00	131	22.38	0.00

Heavily-foreign less local plants	All years			Thru 1986			From 1987		
Indicator-nominal/real, period covered	%dif.	t-stat.	signif.	%dif.	t-stat.	signif.	%dif.	t-stat.	signif.
1a. Employees per plant, 1975-95	193	8.70	0.00	189	7.68	0.00	198	7.21	0.00
1b. Net production per plant-real, 1975-95	404	15.16	0.00	649	15.09	0.00	261	8.47	0.00
2a. Net production per employee-real, 1975-95	96	6.87	0.00	184	8.13	0.00	26	2.81	0.02
2b. Non-production workers/all employees, 1975-95	24	2.71	0.01	48	7.92	0.00	-5	-0.31	0.77
5a. Exports/production-nominal, 1990-95	..	..	..	..	..	..	161	6.73	0.00
5b. Imports/production-nominal, 1978-95	102	6.99	0.00	84	4.62	0.00	122	5.08	0.00

Majority-foreign less minority-foreign plants	All years			Thru 1986			From 1987		
Indicator-nominal/real, period covered	%dif.	t-stat.	signif.	%dif.	t-stat.	signif.	%dif.	t-stat.	signif.
1a. Employees per plant, 1975-95	7	0.81	0.43	25	3.12	0.01	-7	-0.86	0.40
1b. Net production per plant-real, 1975-95	-4	-0.27	0.79	47	2.02	0.06	-27	-2.92	0.01
2a. Net production per employee-real, 1975-95	-3	-0.27	0.79	21	1.37	0.18	-20	-2.43	0.03
2b. Non-production workers/all employees, 1975-95	-9	-2.10	0.04	-7	-1.25	0.22	-12	-1.78	0.11
5a. Exports/production-nominal, 1990-95	..	..	..	..	..	..	16	0.97	0.36
5b. Imports/production-nominal, 1978-95	39	6.42	0.00	23	3.75	0.00	57	5.72	0.00

Heavily-foreign less minority-foreign plants	All years			Thru 1986			From 1987		
Indicator-nominal/real, period covered	%dif.	t-stat.	signif.	%dif.	t-stat.	signif.	%dif.	t-stat.	signif.
1a. Employees per plant, 1975-95	0	-0.02	0.98	9	0.80	0.43	-7	-0.76	0.46
1b. Net production per plant-real, 1975-95	-43	-2.96	0.01	4	0.28	0.79	-63	-7.18	0.00
2a. Net production per employee-real, 1975-95	-31	-3.16	0.00	7	0.57	0.57	-59	-7.90	0.00
2b. Non-production workers/all employees, 1975-95	-4	-0.51	0.61	8	1.45	0.16	-21	-1.56	0.16
5a. Exports/production-nominal, 1990-95	..	..	..	..	..	..	185	6.77	0.00
5b. Imports/production-nominal, 1978-95	33	3.03	0.01	18	1.41	0.18	52	2.74	0.02

Heavily-foreign less majority-foreign plants	All years			Thru 1986			From 1987		
Indicator-nominal/real, period covered	%dif.	t-stat.	signif.	%dif.	t-stat.	signif.	%dif.	t-stat.	signif.
1a. Employees per plant, 1975-95	-7	-0.82	0.42	-13	-1.56	0.14	-1	-0.05	0.96
1b. Net production per plant-real, 1975-95	-40	-4.74	0.00	-29	-2.27	0.04	-49	-7.15	0.00
2a. Net production per employee-real, 1975-95	-29	-3.92	0.00	-11	-0.97	0.34	-48	-7.41	0.00
2b. Non-production workers/all employees, 1975-95	6	0.70	0.49	16	2.74	0.01	-10	-0.59	0.57
5a. Exports/production-nominal, 1990-95	..	..	..	..	..	..	145	5.91	0.00
5b. Imports/production-nominal, 1978-95	-4	-0.57	0.57	-5	-0.48	0.64	-4	-0.33	0.75

Notes:
%dif=difference between means in percent; t-stat.=t-statistic testing for differences between two means as defined in the text;
signif.=significance level of t-statistic using degrees of freedom as defined in the text; ..=data not available;
local plants are plants with foreign ownership shares below 10%;
minority-foreign plants are plants with foreign ownership shares of 10%-49.9%;
majority-foreign plants are plants with foreign ownership shares of 50%-89.9%;
heavily-foreign plants are plants with foreign ownership shares of 90% or more;
see appendix A for further details on the data used and their sources.

Table 5: Differences among Manufacturing Plants by Foreign Ownership Share in Singapore

Minority-foreign less wholly-local plants	All years			Thru 1986			From 1987		
Indicator-nominal/real, period covered	%dif	t-stat.	signif.	%dif	t-stat.	signif.	%dif	t-stat.	signif.
1a. Employees per plant,1975-96	203	22.43	0.00	184	24.18	0.00	224	23.05	0.00
1b. Value added per plant, real, 1975-96	383	7.92	0.00	286	18.84	0.00	461	9.68	0.00
2a. Value added per employee, real, 1975-96	56	4.66	0.00	36	5.62	0.00	72	6.45	0.00
2b. Compensation per employee, real, 1975-96	29	2.73	0.01	22	2.68	0.01	34	3.34	0.00
2c. Value added/fixed assets, nominal, 1975-96	-19	-3.71	0.00	-26	-3.49	0.00	-12	-1.86	0.09
3a. Fixed assets per employee, real, 1975-96	101	5.86	0.00	103	3.63	0.00	100	5.55	0.00
3c. R&D expenditures/sales, nominal, 1980-94	88	1.50	0.15	103	2.79	0.02	83	1.16	0.28
4a. Compensation/value added, nominal, 1975-96	-16	-6.81	0.00	-10	-3.10	0.01	-22	-8.54	0.00
4b. Profits/sales, nominal, 1980-96	107	3.82	0.00	57	0.94	0.37	138	7.27	0.00
5a. Direct exports/sales, nominal, 1975-96	44	14.19	0.00	40	8.21	0.00	49	16.09	0.00

Majority-foreign less wholly-local plants	All years			Thru 1986			From 1987		
Indicator-nominal/real, period covered	%dif	t-stat.	signif.	%dif	t-stat.	signif.	%dif	t-stat.	signif.
1a. Employees per plant,1975-96	273	23.82	0.00	305	15.92	0.00	236	32.44	0.00
1b. Value added per plant, real, 1975-96	439	11.50	0.00	397	21.75	0.00	473	13.70	0.00
2a. Value added per employee, real, 1975-96	51	3.78	0.00	26	2.86	0.01	73	5.70	0.00
2b. Compensation per employee, real, 1975-96	17	1.74	0.09	12	1.52	0.14	20	2.10	0.05
2c. Value added/fixed assets, nominal, 1975-96	-22	-5.76	0.00	-30	-6.32	0.00	-14	-2.98	0.01
3a. Fixed assets per employee, real, 1975-96	91	6.97	0.00	83	4.13	0.00	98	10.84	0.00
3c. R&D expenditures/sales, nominal, 1980-94	-12	-0.40	0.69	-31	-1.01	0.34	-6	-0.19	0.85
4a. Compensation/value added, nominal, 1975-96	-19	-7.14	0.00	-9	-3.19	0.00	-30	-10.56	0.00
4b. Profits/sales, nominal, 1980-96	9	0.42	0.68	-32	-0.89	0.39	34	1.54	0.15
5a. Direct exports/sales, nominal, 1975-96	93	22.47	0.00	99	17.11	0.00	86	15.55	0.00

Wholly-foreign less wholly-local plants	All years			Thru 1986			From 1987		
Indicator-nominal/real, period covered	%dif	t-stat.	signif.	%dif	t-stat.	signif.	%dif	t-stat.	signif.
1a. Employees per plant,1975-96	520	31.63	0.00	478	53.68	0.00	568	45.86	0.00
1b. Value added per plant, real, 1975-96	1,337	11.28	0.00	1,131	27.73	0.00	1,502	14.91	0.00
2a. Value added per employee, real, 1975-96	128	8.77	0.00	112	13.91	0.00	142	9.31	0.00
2b. Compensation per employee, real, 1975-96	21	2.31	0.03	20	2.47	0.02	22	2.44	0.03
2c. Value added/fixed assets, nominal, 1975-96	-3	-0.53	0.60	-16	-3.34	0.00	13	4.54	0.00
3a. Fixed assets per employee, real, 1975-96	129	16.04	0.00	149	18.17	0.00	110	9.34	0.00
3c. R&D expenditures/sales, nominal, 1980-94	1,160	2.94	0.01	579	6.74	0.00	1,344	3.08	0.02
4a. Compensation/value added, nominal, 1975-96	-46	-25.57	0.00	-43	-15.93	0.00	-49	-30.07	0.00
4b. Profits/sales, nominal, 1980-96	208	12.33	0.00	199	5.15	0.00	213	18.94	0.00
5a. Direct exports/sales, nominal, 1975-96	137	49.53	0.00	138	38.31	0.00	136	30.28	0.00

Majority-foreign less minority-foreign plants	All years			Thru 1986			From 1987		
Indicator-nominal/real, period covered	%dif	t-stat.	signif.	%dif	t-stat.	signif.	%dif	t-stat.	signif.
1a. Employees per plant,1975-96	23	4.88	0.00	43	5.95	0.00	4	1.09	0.29
1b. Value added per plant, real, 1975-96	12	0.91	0.37	29	4.66	0.00	2	0.21	0.84
2a. Value added per employee, real, 1975-96	-3	-0.27	0.79	-8	-1.00	0.33	0	0.04	0.97
2b. Compensation per employee, real, 1975-96	-9	-1.00	0.33	-7	-0.95	0.35	-10	-1.19	0.25
2c. Value added/fixed assets, nominal, 1975-96	-4	-0.54	0.59	-5	-0.57	0.58	-2	-0.28	0.78
3a. Fixed assets per employee, real, 1975-96	-5	-0.51	0.61	-10	-0.58	0.57	-1	-0.11	0.92
3c. R&D expenditures/sales, nominal, 1980-94	-53	-1.69	0.11	-66	-3.96	0.00	-49	-1.23	0.25
4a. Compensation/value added, nominal, 1975-96	-4	-1.13	0.27	1	0.32	0.75	-10	-2.50	0.02
4b. Profits/sales, nominal, 1980-96	-47	-3.09	0.00	-56	-1.49	0.17	-44	-3.70	0.00
5a. Direct exports/sales, nominal, 1975-96	34	10.19	0.00	42	8.56	0.00	25	6.29	0.00

Table 5 (continued)

Wholly-foreign less minority-foreign plants	All years			Thru 1986			From 1987		
Indicator-nominal/real, period covered	%dif	t-stat.	signif.	%dif	t-stat.	signif.	%dif	t-stat.	signif.
1a. Employees per plant,1975-96	105	17.08	0.00	104	25.89	0.00	106	22.47	0.00
1b. Value added per plant, real, 1975-96	197	7.47	0.00	219	19.42	0.00	186	9.38	0.00
2a. Value added per employee, real, 1975-96	47	4.07	0.00	56	7.91	0.00	40	3.89	0.00
2b. Compensation per employee, real, 1975-96	-6	-0.67	0.51	-1	-0.12	0.91	-10	-1.16	0.26
2c. Value added/fixed assets, nominal, 1975-96	21	2.67	0.01	13	1.33	0.20	28	3.97	0.00
3a. Fixed assets per employee, real, 1975-96	14	1.58	0.13	23	1.64	0.13	5	0.54	0.60
3c. R&D expenditures/sales, nominal, 1980-94	571	2.70	0.02	234	5.47	0.00	689	2.86	0.02
4a. Compensation/value added, nominal, 1975-96	-36	-14.54	0.00	-37	-9.86	0.00	-35	-12.22	0.00
4b. Profits/sales, nominal, 1980-96	49	3.45	0.00	91	2.32	0.05	32	3.61	0.00
5a. Direct exports/sales, nominal, 1975-96	64	25.32	0.00	70	18.95	0.00	58	17.73	0.00

Wholly-foreign less majority-foreign plants	All years			Thru 1986			From 1987		
Indicator-nominal/real, period covered	%dif	t-stat.	signif.	%dif	t-stat.	signif.	%dif	t-stat.	signif.
1a. Employees per plant,1975-96	66	12.45	0.00	43	8.24	0.00	99	23.83	0.00
1b. Value added per plant, real, 1975-96	167	7.23	0.00	148	16.45	0.00	180	9.71	0.00
2a. Value added per employee, real, 1975-96	51	4.07	0.00	69	7.51	0.00	40	3.64	0.00
2b. Compensation per employee, real, 1975-96	4	0.39	0.70	7	0.82	0.42	1	0.10	0.92
2c. Value added/fixed assets, nominal, 1975-96	26	3.78	0.00	19	3.09	0.01	32	5.86	0.00
3a. Fixed assets per employee, real, 1975-96	20	2.83	0.01	36	3.30	0.01	6	1.05	0.31
3c. R&D expenditures/sales, nominal, 1980-94	1,337	2.97	0.01	890	7.21	0.00	1,441	3.09	0.02
4a. Compensation/value added, nominal, 1975-96	-34	-11.01	0.00	-37	-11.81	0.00	-28	-7.64	0.00
4b. Profits/sales, nominal, 1980-96	183	8.83	0.00	338	6.21	0.00	134	7.60	0.00
5a. Direct exports/sales, nominal, 1975-96	23	9.61	0.00	20	6.50	0.00	27	7.36	0.00

Notes:
%dif=difference between means in percent;
t-stat.=t-statistic testing for differences between two means as defined in the text;
signif.=significance level of t-statistic using degrees of freedom as defined in the text;
see appendix A for details on the data used and their sources.

Table 6: Percentage Differences among Manufacturing Plants by Origin of Major Owner in Hong Kong

European plants less US plants	All years			Thru 1986			From 1987		
Indicator-nominal/real, period covered	%dif	t-stat.	signif.	%dif	t-stat.	signif.	%dif	t-stat.	signif.
1a. Employees per plant, 1983-96	-5	-0.48	0.63	-20	-1.93	0.10	5	0.43	0.67
1b. Value added per plant-real, 1983-96	-2	-0.35	0.73	-23	-1.85	0.11	7	0.83	0.42
2a. Value added per employee-real, 1983-96	-2	-0.23	0.82	-3	-0.34	0.75	-2	-0.23	0.82
2b. Compensation per employee-real, 1983-96	5	0.50	0.62	6	1.05	0.33	5	0.50	0.63
4a. Compensation/value added-nominal, 1983-96	6	1.12	0.27	10	0.92	0.39	4	0.69	0.50

Japanese plants less U.S. plants	All years			Thru 1986			From 1987		
Indicator-nominal/real, period covered	%dif	t-stat.	signif.	%dif	t-stat.	signif.	%dif	t-stat.	signif.
1a. Employees per plant, 1983-96	-42	-4.51	0.00	-54	-7.20	0.00	-34	-3.96	0.00
1b. Value added per plant-real, 1983-96	-36	-6.12	0.00	-52	-4.96	0.00	-29	-4.44	0.00
2a. Value added per employee-real, 1983-96	2	0.17	0.86	2	0.27	0.79	2	0.17	0.87
2b. Compensation per employee-real, 1983-96	2	0.21	0.84	4	0.94	0.38	1	0.15	0.88
4a. Compensation/value added-nominal, 1983-96	-1	-0.31	0.76	2	0.22	0.84	-3	-0.57	0.58

Other Asian less U.S. plants	All years			Thru 1986			From 1987		
Indicator-nominal/real, period covered	%dif	t-stat.	signif.	%dif	t-stat.	signif.	%dif	t-stat.	signif.
1a. Employees per plant, 1983-96	-48	-4.64	0.00	-65	-7.35	0.00	-37	-3.22	0.00
1b. Value added per plant-real, 1983-96	-52	-6.61	0.00	-68	-7.03	0.00	-45	-4.43	0.00
2a. Value added per employee-real, 1983-96	-17	-1.74	0.10	-6	-0.61	0.57	-20	-2.01	0.07
2b. Compensation per employee-real, 1983-96	4	0.47	0.64	15	2.52	0.05	1	0.12	0.91
4a. Compensation/value added-nominal, 1983-96	26	2.94	0.01	24	2.37	0.06	27	2.23	0.04

Japanese plants less European plants	All years			Thru 1986			From 1987		
Indicator-nominal/real, period covered	%dif	t-stat.	signif.	%dif	t-stat.	signif.	%dif	t-stat.	signif.
1a. Employees per plant, 1983-96	-39	-5.57	0.00	-42	-3.66	0.02	-37	-5.05	0.00
1b. Value added per plant-real, 1983-96	-35	-4.96	0.00	-38	-2.71	0.04	-34	-4.52	0.00
2a. Value added per employee-real, 1983-96	4	0.48	0.64	6	0.58	0.58	4	0.59	0.56
2b. Compensation per employee-real, 1983-96	-3	-0.34	0.74	-2	-0.33	0.76	-3	-0.41	0.68
4a. Compensation/value added-nominal, 1983-96	-7	-1.65	0.11	-7	-0.60	0.57	-7	-1.83	0.09

Other Asian plants less European plants	All years			Thru 1986			From 1987		
Indicator-nominal/real, period covered	%dif	t-stat.	signif.	%dif	t-stat.	signif.	%dif	t-stat.	signif.
1a. Employees per plant, 1983-96	-45	-5.36	0.00	-57	-4.34	0.00	-40	-3.87	0.00
1b. Value added per plant-real, 1983-96	-51	-5.79	0.00	-59	-4.49	0.01	-48	-4.67	0.00
2a. Value added per employee-real, 1983-96	-15	-1.84	0.08	-4	-0.31	0.77	-18	-2.68	0.02
2b. Compensation per employee-real, 1983-96	-1	-0.13	0.90	9	1.33	0.23	-4	-0.52	0.61
4a. Compensation/value added-nominal, 1983-96	19	2.36	0.03	13	1.28	0.25	22	1.98	0.07

Other Asian plants less Japanese plants	All years			Thru 1986			From 1987		
Indicator-nominal/real, period covered	%dif	t-stat.	signif.	%dif	t-stat.	signif.	%dif	t-stat.	signif.
1a. Employees per plant, 1983-96	-10	-1.04	0.31	-25	-1.50	0.19	-4	-0.29	0.77
1b. Value added per plant-real, 1983-96	-24	-2.05	0.05	-33	-1.98	0.10	-22	-1.58	0.14
2a. Value added per employee-real, 1983-96	-19	-2.38	0.03	-9	-0.81	0.45	-21	-3.32	0.00
2b. Compensation per employee-real, 1983-96	2	0.27	0.79	10	1.89	0.12	0	-0.06	0.95
4a. Compensation/value added-nominal, 1983-96	28	3.25	0.00	21	1.84	0.12	31	2.68	0.02

Notes:
%dif=difference between means in percent;
t-stat.=t-statistic testing for differences between two means as defined in the text;
signif.=significance level of t-statistic using degrees of freedom as defined in the text;
European plants are plants from Germany, the Netherlands, Switzerland, and the United Kingdom;
Other Asian plants are plants from China, Singapore, and Taiwan;
see appendix A for further details on the data used and their sources.

Table 7: Percentage Differences among Manufacturing Plants by Origin of Major Owner in Singapore

European plants less U.S. plants	All years			Thru 1986			From 1987		
Indicator-nominal/real, period covered	%dif	t-stat.	signif.	%dif	t-stat.	signif.	%dif	t-stat.	signif.
1a. Employees per plant,1980-96	-56	-15.85	0.00	-53	-13.77	0.00	-58	-22.46	0.00
1b. Value added per plant, real, 1980-96	-52	-5.76	0.00	-44	-7.42	0.00	-55	-7.79	0.00
2a. Value added per employee, real, 1980-96	10	1.11	0.28	18	2.45	0.03	6	0.61	0.55
2b. Compensation per employee, real, 1980-96	24	2.84	0.01	18	1.98	0.07	27	2.85	0.01
2c. Value added/fixed assets, nominal, 1980-96	-28	-4.76	0.00	-28	-4.25	0.00	-29	-10.25	0.00
3a. Fixed assets per employee, real, 1980-96	54	9.04	0.00	62	8.51	0.00	49	5.59	0.00
3c. R&D expenditures/sales, nominal, 1980-94	-62	-1.58	0.14	57	1.77	0.11	-70	-1.97	0.09
4a. Compensation/value added, nominal, 1980-96	10	1.92	0.06	1	0.13	0.90	17	4.47	0.00
4b. Profits/sales, nominal, 1980-96	-19	-2.33	0.03	-26	-1.54	0.15	-15	-3.19	0.01
5a. Direct exports/sales, nominal, 1980-96	-14	-3.01	0.01	5	1.34	0.22	-25	-4.32	0.00

Japanese plants less U.S. plants	All years			Thru 1986			From 1987		
Indicator-nominal/real, period covered	%dif	t-stat.	signif.	%dif	t-stat.	signif.	%dif	t-stat.	signif.
1a. Employees per plant,1980-96	-45	-13.08	0.00	-37	-9.39	0.00	-50	-19.77	0.00
1b. Value added per plant, real, 1980-96	-70	-7.96	0.00	-69	-13.39	0.00	-70	-10.51	0.00
2a. Value added per employee, real, 1980-96	-43	-5.28	0.00	-50	-7.70	0.00	-40	-4.92	0.00
2b. Compensation per employee, real, 1980-96	-7	-0.94	0.35	-18	-2.23	0.05	-1	-0.18	0.86
2c. Value added/fixed assets, nominal, 1980-96	-31	-6.20	0.00	-17	-2.77	0.03	-38	-15.39	0.00
3a. Fixed assets per employee, real, 1980-96	-18	-2.56	0.02	-41	-5.77	0.00	-2	-0.27	0.79
3c. R&D expenditures/sales, nominal, 1980-94	-91	-2.35	0.03	-45	-1.44	0.18	-94	-2.67	0.03
4a. Compensation/value added, nominal, 1980-96	62	10.79	0.00	64	9.13	0.00	61	11.45	0.00
4b. Profits/sales, nominal, 1980-96	-63	-9.45	0.00	-61	-4.12	0.00	-64	-13.79	0.00
5a. Direct exports/sales, nominal, 1980-96	-18	-7.87	0.00	-8	-2.51	0.04	-23	-16.12	0.00

Other Asian plants less U.S. plants	All years			Thru 1986			From 1987		
Indicator-nominal/real, period covered	%dif	t-stat.	signif.	%dif	t-stat.	signif.	%dif	t-stat.	signif.
1a. Employees per plant,1980-94	-79	-20.58	0.00	-75	-21.16	0.00	-81	-30.21	0.00
1b. Value added per plant, real, 1980-94	-92	-11.45	0.00	-90	-18.12	0.00	-92	-15.67	0.00
2a. Value added per employee, real, 1980-94	-59	-9.58	0.00	-59	-9.73	0.00	-59	-8.65	0.00
2b. Compensation per employee, real, 1980-94	-15	-2.31	0.03	-20	-2.84	0.02	-12	-1.43	0.18
2c. Value added/fixed assets, nominal, 1980-94	-25	-4.16	0.00	-19	-2.78	0.02	-28	-11.04	0.00
3a. Fixed assets per employee, real, 1980-94	-46	-10.26	0.00	-50	-8.51	0.00	-43	-6.21	0.00
3c. R&D expenditures/sales, nominal, 1980-94	-88	-2.24	0.04	-62	-1.87	0.09	-90	-2.50	0.04
4a. Compensation/value added, nominal, 1980-94	107	14.94	0.00	98	7.34	0.00	115	20.95	0.00
4b. Profits/sales, nominal, 1980-94	-78	-8.32	0.00	-82	-3.96	0.00	-76	-12.82	0.00
5a. Direct exports/sales, nominal, 1980-94	-32	-10.63	0.00	-26	-5.32	0.00	-37	-15.68	0.00

Japanese plants less European plants	All years			Thru 1986			From 1987		
Indicator-nominal/real, period covered	%dif	t-stat.	signif.	%dif	t-stat.	signif.	%dif	t-stat.	signif.
1a. Employees per plant,1980-96	24	7.24	0.00	33	5.58	0.00	18	5.52	0.00
1b. Value added per plant, real, 1980-96	-37	-4.84	0.00	-45	-6.99	0.00	-34	-5.58	0.00
2a. Value added per employee, real, 1980-96	-48	-7.56	0.00	-58	-11.42	0.00	-43	-6.92	0.00
2b. Compensation per employee, real, 1980-96	-25	-3.30	0.00	-31	-3.82	0.00	-22	-2.77	0.01
2c. Value added/fixed assets, nominal, 1980-96	-4	-0.83	0.41	15	3.29	0.01	-14	-3.65	0.00
3a. Fixed assets per employee, real, 1980-96	-47	-10.18	0.00	-63	-15.31	0.00	-34	-6.86	0.00
3c. R&D expenditures/sales, nominal, 1980-94	-77	-5.71	0.00	-65	-4.83	0.00	-82	-9.50	0.00
4a. Compensation/value added, nominal, 1980-96	47	8.20	0.00	62	5.78	0.00	37	9.61	0.00
4b. Profits/sales, nominal, 1980-96	-55	-6.98	0.00	-48	-2.90	0.02	-58	-11.12	0.00
5a. Direct exports/sales, nominal, 1980-96	-4	-0.87	0.40	-12	-7.44	0.00	3	0.32	0.76

Table 7 (continued)

Other Asian plants less European plants	All years			Thru 1986			From 1987		
Indicator-nominal/real, period covered	%dif	t-stat.	signif.	%dif	t-stat.	signif.	%dif	t-stat.	signif.
1a. Employees per plant,1980-94	-53	-17.02	0.00	-48	-10.39	0.00	-56	-18.98	0.00
1b. Value added per plant, real, 1980-94	-83	-13.20	0.00	-82	-13.86	0.00	-84	-13.50	0.00
2a. Value added per employee, real, 1980-94	-64	-13.21	0.00	-65	-14.07	0.00	-63	-11.15	0.00
2b. Compensation per employee, real, 1980-94	-30	-4.66	0.00	-32	-4.44	0.00	-29	-3.72	0.00
2c. Value added/fixed assets, nominal, 1980-94	5	0.76	0.46	12	1.83	0.09	1	0.17	0.87
3a. Fixed assets per employee, real, 1980-94	-66	-20.07	0.00	-69	-20.50	0.00	-63	-13.27	0.00
3c. R&D expenditures/sales, nominal, 1980-94	-68	-3.40	0.00	-76	-5.00	0.00	-66	-3.11	0.01
4a. Compensation/value added, nominal, 1980-94	93	12.54	0.00	96	6.15	0.00	91	20.25	0.00
4b. Profits/sales, nominal, 1980-94	-73	-6.50	0.00	-75	-2.97	0.01	-72	-10.88	0.00
5a. Direct exports/sales, nominal, 1980-94	-24	-5.21	0.00	-29	-7.72	0.00	-20	-2.47	0.04

Other Asian plants less Japanese plants	All years			Thru 1986			From 1987		
Indicator-nominal/real, period covered	%dif	t-stat.	signif.	%dif	t-stat.	signif.	%dif	t-stat.	signif.
1a. Employees per plant,1980-94	-62	-30.39	0.00	-61	-15.88	0.00	-63	-30.17	0.00
1b. Value added per plant, real, 1980-94	-73	-9.68	0.00	-67	-12.30	0.00	-76	-21.51	0.00
2a. Value added per employee, real, 1980-94	-29	-3.38	0.00	-18	-2.11	0.06	-35	-5.79	0.00
2b. Compensation per employee, real, 1980-94	-6	-0.75	0.46	-2	-0.25	0.81	-9	-0.96	0.36
2c. Value added/fixed assets, nominal, 1980-94	8	1.85	0.08	-3	-0.58	0.58	18	4.26	0.00
3a. Fixed assets per employee, real, 1980-94	-34	-4.39	0.00	-16	-1.82	0.10	-45	-7.08	0.00
3c. R&D expenditures/sales, nominal, 1980-94	40	0.57	0.57	-31	-0.76	0.46	86	0.78	0.46
4a. Compensation/value added, nominal, 1980-94	30	5.74	0.00	21	2.48	0.04	40	9.24	0.00
4b. Profits/sales, nominal, 1980-94	-41	-2.01	0.06	-52	-1.18	0.27	-33	-2.06	0.06
5a. Direct exports/sales, nominal, 1980-94	-18	-7.19	0.00	-19	-4.50	0.00	-18	-5.57	0.00

Notes:
%dif=difference between means in percent;
t-stat.=t-statistic testing for differences between two means as defined in the text;
signif.=significance level of t-statistic using degrees of freedom as defined in the text;
Other Asian plants are plants from Hong Kong, Malaysia, and Taiwan;
data for Other Asian plants have not been published in recent years and have only been obtained for 1980-1994;
see appendix A for further details on the data used and their sources.

Appendix Table A1: Summary of Data Sources Used

Data type	Units covered	Indicators	Source	Notes
HK1. Hong Kong, industrial survey data	all manufacturing plants in Hong Kong	Number of plants, employees, nominal value added, nominal sales, nominal compensation	Hong Kong, Census and Statistics Department (various years a)	These data come from computer printouts with unpublished data from the industrial surveys in Hong Kong. They are available from the source cited.
HK2. Hong Kong, surveys of foreign manufacturing firms	foreign manufacturing firms in Hong Kong	Export/sales ratios for foreign plants	Hong Kong, Industry Department (various years)	These are surveys of foreign manufacturing firms. Data cover known foreign firms, including minority-foreign firms. Exports of majority-foreign firms are proxied as the product of the export-sales ratio and nominal sales from industrial survey
HK3. Hong Kong, exports by industrial origin	all exports from Hong Kong	Direct exports from Hong Kong manufacturing	Hong Kong, Census and Statistics Department (various years b), Australian National University (1997).	These are commodity trade data reclassified by standard industrial classification; data refer to all Hong Kong; data for local firms estimated as this total less estimates for foreign firms.
HK4. Hong Kong, national accounts	Hong Kong GDP and components	Hong Kong, GDP deflator; exchange rates	World Bank (1999)	The GDP deflator is not disaggregated by industry in Hong Kong.
ID1: Indonesia, industrial survey data	all manufacturing plants in Indonesia with 20+ employees, oil & coal products excluded	Number of plants, employees, non-production workers, nominal net production, nominal production, nominal exports, nominal imports	Indonesia, Biro Pusat Statistik (various years)	These data compiled from plant level data obtained through the Ministry of Industry and Trade and Biro Pusat Statistik. Coverage over time is very uneven; hence caution is mandated when using thes+E15e data in a time series
ID2: Indonesia, national accounts	Indonesia GDP and components	Indonesia, manufacturing GDP deflator	World Bank (1999)	none
ML1: Malaysia, limited com-pany surveys	all limited companies in Malaysia above a certain size	Number of firms, employees, nominal value added, nominal sales, nominal fixed assets, nominal profits, nominal exports, nominal imports	Malaysia (various years e)	These data cover only relatively large firms (registered capital of more than M$5 million from 1979 or M$1 million earlier) but these firms apparently account for about 90 percent of manufacturing output in Malaysia.
ML2: Malaysia, industrial survey data	all manufacturing plants in Malaysia	Number of plants, employees, nominal value added, nominal sales, nominal fixed assets, nominal compensation	Malaysia, Department of Statistics (no date a, no date b, 1996, various years a, various years b, various years c, various years d)	These are Malaysia's industrial census and survey data.
ML3: Malaysia, national accounts	Malaysia GDP and components	Malaysia, manufacturing GDP deflator	World Bank (1999)	Estimates of nominal GDP by industry are not available from national sources (see Asian Development Bank, various years).
SI1: Singapore, industrial census data	all manufacturing plants in Singapore with more than 5 employees	Number of plants, employees, nominal value added, nominal output, nominal fixed assets, nominal R&D expenditures, nominal compensation,nominal profits, nominal direct exports	Singapore, Department of Statistics (various years); Singapore, Economic Development Board (various years a, various years b)	Data for 1980 forward are classified by country of ultimate beneficial owner but data for 1975-1979 are classified by country of capital source. Due to incompatibilities between these two estimates, country-wise breakdowns are only analyzed for 1980 forward.
SI2: Singapore, national accounts	Singapore GDP and compenents	Singapore, manufacturing GDP deflator	World Bank (1999)	none
TA1: Taiwan, foreign firm surveys	all foreign firms in Taiwan; paper, printing, & miscellaneous manfuacturing excluded	Employees, salaried employees, nominal value added, nominal sales, nominal fixed assets, nominal R&D expenditures, nominal compensation, nominal exports	Republic of China, Investment Commission (various years)	The coverage of these surveys apparently varies markedly over time; hence caution is mandated when using these data in a time series context.
TA2: Taiwan, national accounts	Taiwan GDP and components	Nominal value added, nominal output, nominal compensation, manufacturing GDP deflator	Republic of China, Dirctorate-General of Budget, Accounting and Statistics (1978, 1983, 1997, various years a)	Data refer to all Taiwan; data for local firms estimated as this total less estimates for foreign firms
TA3: Taiwan, labor force & employment	Taiwan labor forces & employment data	Employees, salaried employees	Republic of China, Dirctorate-General of Budget, Accounting and Statistics (various years b, various years c)	Data refer to all Taiwan; data for local firms estimated as this total less estimates for foreign firms
TA4: Taiwan, R&D expenditures	Taiwan, science & technology indicators	R&D expenditures	Republic of China, Executive Yuan (various years); Republic of China, Directorate-General of Budget, Accounting and Statistics (various years b)	Data refer to all Taiwan; data for local firms estimated as this total less estimates for foreign firms; estimates for all Taiwan calculated as 79% of total R&D expenditures in 1980-1982 and 94% of total R&D expenditures in 1990-1991; see text.
TA5: Taiwan, total exports	Taiwan, total exports	Nominal exports by industry classification	Australian National University (1997)	Commodity trade data reclassified by international standard industry classification (ISIC); data refer to all Taiwan; data for local firms estimated as this total less estimates for foreign firms.
TA6: Taiwan, exchange rates	Taiwan, exchange rates	Period average exchange rates	Asian Development Bank (various years a, various years b)	none