Trade Propensities and Foreign Ownership Shares in Indonesian Manufacturing in the Early 1990s

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Abstract

This paper examines the relationship between trade propensities and foreign ownership shares in Indonesian manufacturing in the early 1990s. The empirical findings strongly suggest that foreign plants tended to have relatively high trade propensities, both in terms of exports and imports, in Indonesian manufacturing in 1990, 1992, and 1994. Moreover, the results also suggest that plants with high foreign ownership shares had by far the highest export propensities in all years. However, differences in import propensities among foreign ownership groups were relatively small. In Indonesia, as in other Southeast Asian economies, it is possible to argue that trade propensities determine foreign ownership shares because Indonesia has a history of allowing exceptions to foreign ownership restrictions for firms that export a large portion of their output. However, this paper argues that the causation is likely to run from foreign ownership shares to trade propensities because (1) multinational firms have strong incentives to restrict the access of uncontrolled affiliates to their international marketing networks, (2) part of the above-mentioned policy influence is captured in the statistical analysis, and (3) a similar correlation has been observed in Singapore where there are no foreign ownership restrictions of this nature. One important policy implication of this interpretation is that foreign ownership restrictions can reduce the exports of affiliates of foreign multinationals and thereby be costly for the host economy. On the other hand, although of limited importance in an economy like Indonesia, ownership restrictions that discriminate among foreign ownership groups apparently have a much weaker effect on imports.

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1. Introduction

This paper examines the relationship between trade propensities and foreign ownership shares in Indonesian manufacturing in the early 1990s. The fact that foreign multinationals have tended to make their largest direct contributions to host economies in Asia and elsewhere in terms of exports, as compared to employment or production for example, has been well documented elsewhere (e.g., Blomström 1990, Ramstetter 1993). Other studies of Asian economies (e.g., Ramstetter 1994a, 1994b, 1995, 1996a) have put this problem somewhat differently, showing that differences between foreign multinationals and local firms are often significant in terms of export-propensities, but less often significant in terms of other indicators such as average labor productivity. Moreover, Ramstetter (forthcoming), observes a very strong and positive correlation between foreign ownership shares and export propensities in manufacturing in Indonesia, Singapore, and Thailand. This paper presents further evidence

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on this and related points for Indonesian manufacturing.

The paper first reviews the theoretical principles underlying the emp irical analysis (Section 2). Second, the paper examines patterns of exports and imports as well as patterns of trade propensities by industry for four different ownership groups of Indonesian manufacturing plants (Section 3). Third, the determinants of trade propensities are examined with the aim of determining whether the differences observed in trade propensities among ownership groups are statistically significant after other relevant factors are accounted for (Section 4). Finally, some concluding observations are offered (Section 5).

2. A Brief Theoretical Overview

The theory of the multinational firm focuses first and foremost on the question of why a firm chooses to become a multinational and incur costs of cross-border operations not incurred by nonmultinationals.[1] The answer to this question is commonly thought to lie in identifying the advantages multinationals have that allow them to overcome the disadvantages presented by the incurrence of additional costs of operating across borders. There is substantial disagreement in the theoretical literature over the advantages that are necessary and/or sufficient for a firm to become a multinational firm.[2] However, when making empirical

[1]For good reviews of the theoretical and empirical literature on multinationals see, for example, Caves (1996), Dunning (1993), and Markusen (1992).

[2]For example, according to Dunning (1981, 1993), three types of advantages are necessary, (1) ownership advantages or advantages accruing from exploitation of firm-specific assets (e.g., patents, marketing networks), (2) internalization advantages or advantages accruing from the internalization of economic transactions within a single firm unit (e.g., the reduction of transactions costs where uncertainty makes inter-firm transactions risky and thus costly), and (3) locational advantages or advantages accruing from operating in a specific location (e.g., reductions in transport or labor costs). In contrast, others (e.g., Buckley and Casson 1991, Casson 1987, Rugman 1980, 1985) argue that internalization

comparisons of multinationals and nonmultinationals (e.g., Ramstetter 1994a, 1994b, 1995, 1996a, forthcoming), I believe the more relevant point is the general empirical agreement that multinationals tend to possess a distinctive set of firm-specific assets, regardless of whether these assets are thought to be necessary for a firm to become a multinational. More specifically, there are at least three interrelated sets of intangible assets that multinational firms are thought to possess in relatively large amounts, production technology, marketing networks, and management know-how.

Simply by virtue of possessing these assets in relatively large amounts, multinational firms can be expected to differ systematically from nonmultinational firms. Two differences are particularly important when analyzing differences in trade propensities between multinationals and nonmultinationals. First, by virtue of their superior production technology and management know-how, multinationals may produce more efficiently than nonmultinationals and hence may be better able to produce internationally marketable products. If this is the case, it then follows that export propensities will be higher in multinational firms than in nonmultinationals.[3] Moreover, if multinationals restrict technology transfer to affiliates they do not control (e.g., joint ventures), then there may also be a positive correlation between export propensities and foreign ownership shares.

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alone is sufficient to explain the existence of the multinational firm.

[3]Note, however, that time series evidence for Hong Kong, Malaysia, Singapore, and Taiwan (e.g., Ramstetter 1994b, 1995, 1996a) and cross section evidence from Thailand (e.g., Ramstetter 1994a) suggests that, although multinationals tend to have higher average labor productivity, wages, and/or capital intensity than nonmultinationals, such differences are not statistically significant in many cases. Production function estimates for Thailand also indicate that differences in production technology between multinationals and nonmultinationals are often not statistically significant (e.g., Brimble 1993, Khanthachai et al. 1987, Tambunlertchai and Ramstetter 1991). No similar estimates are known to be available for Indonesia yet.

Perhaps more important in this context, however, is the possibility that multinationals possess relatively sophisticated marketing networks in general, and international marketing networks in particular. If this is the case, it then follows that multinationals will also tend to be more able to exploit trading opportunities in foreign markets than nonmultinationals. This in turn suggests that multinationals will be characterized by relatively high export and import propensities compared to nonmultinationals.

On the export side, it is also important to recognize that multinationals have a strong motive to restrict access of affiliates they do not control to their international marketing networks. This motive exists because the lack of coordination between uncontrolled affiliates on the one hand, and the parent and/or other affiliates on the other, could result in excess supply in specific markets. Thus, firms with larger foreign ownership shares are expected to have higher export propensities than firms with lower foreign ownership shares. It is less clear whether a similar pattern can be expected on the import side. If (1) parents think that relatively high levels of imports will improve performance, either in the affiliate or the multinational firm as a whole, (2) parents are poorly informed about local suppliers in the host economy, and/or (3) local partners are import averse, there may also be a positive relationship between import propensities and foreign ownership shares. However, unlike on the export side, these factors do not constitute clear and strong motives for firms with different foreign ownership shares to consistently restrict or promote imports.

3. Exports, Imports, and Trade Propensities of Manufacturing Plants

Before looking at the relationship between trade propensities and foreign ownership shares, it is first helpful to examine the patterns of

trade in the samples of manufacturing plants used here (Table 1). This examination first reveals that survey plants accounted for increasing shares of Indonesian trade in 1990-1994. Specifically, the share of survey plants in Indonesia's total exports rose from 24 percent to 44 percent, while shares of Indonesia's total imports rose from 26 percent to 32 percent. Much of this rise is due to the increasing importance of manufacturing in Indonesia over this period, as illustrated by the rapid rise in manufacturing's share of total exports, from 47 percent in 1990 to 61 percent in 1994 if manufacturing exports are defined on an ISIC (International Standard Industrial Classification) basis.[4] However, a substantial portion of the rise on the export side is also due to increasingly comprehensive coverage of the industrial surveys. This fact is illustrated by the increase in the ratio of exports by sample plants to total manufacturing exports (ISIC basis) from 47 percent in 1990 to 61 percent in 1994.[5]

The second major observation from these data is a marked change in the structure of trade in survey plants (Table 1). In 1990, food, textiles, wood, and rubber were the only industries with exports of more than 1 trillion rupiah. However, by 1994 the structure was much more diverse with these industries, as well as apparel, footwear, industrial chemicals, iron and steel, metal products, and electric machinery exceeding this threshold. A similar diversification is seen on the import side with

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[4]Note that manufacturing shares are smaller if manufacturing exports are defined as the sum of SITC (Standard International Trade Classification) sections 5 to 8, for example 38 percent versus 47 percent in 1990 and 53 percent versus 61 percent in 1994.

[5]Note that the ISIC-based calculations are thought to be more accurate than the more common SITC-based classifications in this case because the industrial survey data use a classification similar to the ISIC. It is also important to recognize that shares of sample plants in manufacturing exports are approximations based on the assumption that manufacturing plants export only manufactures. A similar calculation is not made for the import side because it is not reasonable to assume that manufacturing plants import only manufactures.

plants in textiles, industrial chemicals, and transport machinery being by far the largest importers in 1990, but with food, footwear, other chemicals, iron & steel, and electric machinery also becoming large importers in 1994.

In this paper four ownership groups are identified, local plants (i.e., plants with foreign ownership shares of less than 10 percent), foreign plants with low foreign ownership shares (10 percent to 50 percent), foreign plants with moderate foreign ownership shares (between 50 percent and 90 percent), and foreign plants with large foreign ownership shares (90 percent and above). Table 2 shows the share of the three foreign ownership groups in total exports for each industry in 1990, 1992, and 1994. The combined shares of all foreign plants in Indonesian exports, like corresponding shares of production, are generally rather modest compared to other Asian countries (e.g., Ramstetter 1994b, 1995, 1996b, forthcoming). However, the combined share of all foreign plants in exports of sample plants in all manufacturing did rise markedly from 22 percent in 1990 to 32 percent in 1994, the majority of this growth coming in plants with moderate foreign ownership shares. Patterns by industry differ markedly from year to year reflecting in part the rapid changes that Indonesia's manufacturing industries are now undergoing. Variations in survey coverage from year to year may also have something to do with the changes observed. Of particular interest below will be the group with high foreign ownership shares (90 percent and above) and it is notable that shares of this group in sample exports have risen markedly in a wide variety of industries, beverages, apparel, other chemicals, plastics, other nonmetallic mineral products, metal products, the four (nonelectrical, electric, transport, and precision) machinery industries, and miscellaneous manufacturing. However, shares of this group in sample exports remained relatively small in 1994, only 8 percent in all manufacturing and over 30 percent in only 4 individual industries, beverages, nonelectrical

machinery, electric machinery, and miscellaneous manufacturing.

On the import side (Table 3), the total share of all foreign plants in the imports of sample plants in all manufacturing was significantly higher than for exports, but increased very little over time, from 38 percent in 1990 to 40-41 percent in 1992 and 1994. The moderate ownership group was by far the largest importer of the foreign ownership groups, and this group accounted for relatively large shares of imports in a wide variety of industries. For example, in 1994, the moderate ownership group accounted for more than one fifth of all imports by sample plants in beverages, leather, footwear, printing and publishing, industrial chemicals, other chemicals, rubber, nonferrous metals, metal products, nonelectrical machinery, electric machinery, and miscellaneous manufacturing. On the other hand, plants with high foreign ownership shares accounted for large shares in only a few industries. For example, in 1994 plants with large foreign ownership shares accounted for more than 20 percent of imports in only 5 industries, beverages, apparel, electric machinery, precision machinery, and miscellaneous machinery.

Turning next to trade propensities, calculations of mean export propensities by industry and ownership category (Table 4) reveal three important patterns. First, in all manufacturing for all years, although the shares of foreign plants in exports sample plants are generally modest (see above), these shares are generally higher than corresponding shares of output. In other words, foreign plants had relatively high export propensities (=export-output ratios) compared to local firms. Second, among foreign plants in all manufacturing, plants with high ownership shares had by far the highest export propensities and these propensities increased rapidly from 40 percent in 1990 to 68 percent in 1994. Local plants also experienced a marked increase in export propensities from 8 percent in 1990 to 12 percent in 1992 and 1994, but these propensities still remained far smaller than in any of the groups of foreign plants.

Third, even at the industry level, export propensities tend to be higher in plants with large foreign ownership shares in a large number of industries. For example, in 1994, plants with large foreign ownership shares had export propensities of 50 percent or more in 16 of 24 industries for which such calculations could be made. However, this threshold was exceeded in only 10 of 28 industries for plants with moderate foreign ownership shares, 8 of 28 industries for plants with low foreign ownership shares and 0 of 29 industries for local plants.

As on the export side, three important patterns are revealed when mean import propensities (Table 5) are examined. However, there are some important differences between the pattens in import propensities and export propensities. First, in all manufacturing, import propensities are relatively small in local plants and relatively large in foreign plants. However, in contrast to the export side, changes in import propensities were relatively small in 1990-1994. Second, among foreign plants in all manufacturing, plants with moderate ownership shares had the highest import propensity in 1990, followed by plants with low foreign ownership shares, and lastly by plants with high foreign ownership shares. However, this changed by 1992 and 1994, with the high foreign ownership group having the highest overall import propensities in these years. Third, at the industry level, patterns were more diverse than for exports, with relatively high import propensities observed in a relatively large number of industries for all foreign ownership groups. For example, in 1994, import propensities exceeded 50 percent in 11 of 24 industries for plants with large foreign ownership shares, 13 of 28 industries for plants with moderate foreign ownership shares, and 10 of 28 industries with low foreign ownership shares, but 0 of 29 industries for local plants.

In short, these data indicate a strong tendency for export propensities to be largest in plants with relatively large foreign ownership shares, second largest in plants with moderate foreign ownership

shares, third largest in plants with small foreign ownership shares, and smallest in local plants. Import propensities are also much larger for all foreign ownership groups than for local plants. However, differences among foreign ownership groups are much smaller in terms of import propensities than in terms of export propensities.

4. The Determinants of Trade Propensities in Manufacturing Plants

The next step is to try to ascertain whether the differences in trade propensities among different ownership groups are statistically significant. In order to isolate the effects of ownership from other factors affecting trade propensities, dummy variables for each foreign ownership group (i.e., local plants are taken as the base) are added to models of the determinants of trade propensities in manufacturing plants. More specifically, a plant's trade propensity is viewed as a function of the same trade propensity in the 3-digit industry category to which the plant belongs, as well as the plant's factor (capital and skilled-labor) intensities, size, vintage, and a dummy variable for registration with the Investment Coordinating Board (BKPM).[6] The resulting specifications are as follows:

(1) $(X/O)ij = f1((X/O)i, (K/E)ij, (ES/E)ij, Oij, AGEij, DBKPMij, DF1050ij, DF5090ij, DF90ij)$

(2) $(M/R)ij = f2((M/R)i, (K/E)ij, (ES/E)ij, Oij, AGEij, DBKPMij, DF1050ij, DF5090ij, DF90ij)$

where AGE=the age of the plant (years), DBKPM=a dummy variable for plants

[6]This approach was originally suggested by Lipsey (1987). Note that a more orthodox specification might, for example, concentrate on measuring income and price effects that affect trade flows and thus trade propensities. However, because appropriate price and income variables are not available, the industry trade propensity is used as a proxy for the industry-specific price and income effects involved.

registered with BKPM (the Investment Coordinating Board), DF1050=a dummy variable for plants with foreign ownership shares of 10 percent or more and 50 percent or less, DF5090=a dummy variable for plants with foreign ownership shares between 50 and 90 percent, DF90=a dummy variable for plants with foreign ownership shares of 90 percent or greater, E=employment (number), ES=nonproduction workers (number), K=fixed assets (1000 rupiah), M=imports of raw materials (1000 rupiah); O=gross output (1000 rupiah); R=total purchases of raw materials (1000 rupiah); X=exports (1000 rupiah), i=industry i, j=firm j.

The industry-level trade propensity is expected to be positively correlated with the firm-level trade propensity. Reflecting the relative abundance of unskilled labor in Indonesia, the exports of Indonesia's manufacturing plants are expected to be intensive in unskilled labor, and both capital and skilled-labor intensities are expected to be negatively correlated with export propensities. The link between import propensities and factor intensities is less clear because plants may import products that are very different from the products they produce, but there is a weak expectation of a positive correlation with both factor intensities measured. Size is thought be positively correlated as bigger plants are better able to take advantage of trading opportunities. The sign of the vintage variable is somewhat ambiguous. On the one hand, more experienced plants may be expected to be relatively well informed about trading opportunities and thus a positive correlation might be expected between plant age and trade propensities. On the other hand, Indonesian policy has become much less restrictive of trade, both exports and imports, since the mid-1980s, and a negative correlation might be expected because newer plants have been established under conditions more favorable toward international trade. BKPM registration is thought to be positively correlated because BKPM offers incentives to exporting plants and allows

some registered firms exemptions on import restrictions.[7] Finally, if the coefficient on a dummy variable for a foreign ownership group remains significantly different from zero after these industry- and plant-level characteristics are accounted for, it seems reasonable to conclude that differences in a trade propensity in local plants and in the foreign ownership group in question are statistically significant.

Before proceeding to the estimation results it is also important to mention several more technical considerations. First, previous work with similar specifications (e.g., Ramstetter 1994a, forthcoming) has indicated that double-log specifications provide a somewhat better fit than linear specifications. Thus, double-log specifications are also used here. Since trade propensities (X/O, M/R) and the measure of skilled-labor intensity (ES/E) take zero for a number of observations, these variables are redefined as 1 plus the original value to facilitate the use of a double-log specification. Second, since trade propensities are truncated variables with clear minimum and maximum values, a Tobit estimator is most appropriate in this case.[8] Third, although the Tobit estimator is superior to the alternatives, it has the drawback of precluding use of standard

[7]Note that there are several ways in which BKPM-registered firms can get exemptions on import restrictions, including, (1) acquisition of limited importer/exporter identification numbers (APIs) which allow authorized imports, (2) general import tax and duty exemptions on imports for goods included on an approved masterlist, (3) use of bonded zones and export-oriented production entrepots, (4) access to export credit and insurance, and (5) after July 1986, exemption on imports restrictions for for firms with export propensities exceeding a certain threshold (Davidson and Ciambella, 1995, pp. 55-58, 67-70). The last measure is of particular importance in this context and it is notable that the threshold used has apparently declined from 85 percent in earlier years (Davidson and Ciambella, 1995, p. 69) to 65 percent in more recent years (PT. SUCOFINDO, 1996, p. 53).

[8]For details on the Tobit estimator, see Amemiya (1984). For more general discussions of estimation problems encountered when the dependent variable is limited, see Gujarati (1995, ch. 16) and Kennedy (1992, ch. 15).

statistical tests for heteroscedasticitiy.[9] Heteroscedasticity can lead to inefficient estimates and is a potential concern in cross section regressions such as these. Thus, both weighted and non-weighted Tobit estimates are presented as a means of partially compensating for this potential problem. Without formal tests for heteroscedasiticity it is difficult to know which of these estimation techniques is most appropriate, but the fact that standard errors are sometimes much smaller in the weighted regressions is taken as an indication that heteroscedasticity may be a problem in the unweighted regressions. Fourth, estimates are performed for both the entire sample of plants and a subsample of large plants, defined as plants with total output of 2 billion rupiah or more. Here it is important to recognize that comparisons of foreign multinationals (which are predominately large) and local plants may be less meaningful in a heterogeneous sample of small plants (which are predominately local) and large plants, than in a more homogeneous sample of large plants.

Estimates of the determinants of export propensities generally conform with expectations (Table 6).[10] Coefficients on factor intensities are negative and coefficients on the industry export propensity, size, and the BKPM dummy are positive. The coefficient on the age variable is negative, indicating that newer plants export more of their output than older plants. Moreover, with the exception of the capital-intensity variable in some specifications and the BKPM in one specification, all of

[9]In a similar analysis for firms in Thailand, Ramstetter (1994a) also presents ordinary least squares estimates for a subsample of firms with positive export propensities and probit estimates for a subsample of firms with either very low or very high trade propensities. Interestingly, these specifications and corresponding Tobit estimates generated very similar results. However, both of these other methodologies have the disadvantage of discarding portions of the total sample, something that can be avoided when a Tobit estimator is used.

[10]Note that it proved impossible to calculate weighted regressions for 1990 as the estimation algorithm would not converge.

these coefficients are highly significant (often at the 0.001 level or better).

Of most consequence in this context is that all results obtained indicate that plants with large foreign ownership shares have by far the highest export propensities even after these other factors are taken into account (Table 6). Moreover, differences between plants with large foreign ownership shares and local plants are highly significant in all samples. Differences between plants with moderate foreign ownership shares and local plants are also highly significant in 1992 and 1994. However, these differences are not significant in the sample of large plants in 1990, though only unweighted estimates could be calculated for this year.[11] Differences between plants with low foreign ownership shares and local plants are less consistently significant, with significant differences observed only in both weighted regressions for 1992 and in the weighted, large-firm sample for 1994.[12] In short, the patterns observed here are broadly consistent with the patterns observed in the simple descriptive statistics analyzed above (c.f., Table 4).

The results of estimating determinants of import propensities are similar in that coefficients on the industry variable, size, and the BKPM dummy are positive and highly significant in most specifications (Table 7).[13] However, there are also several important differences between the export and import side. First, coefficients on factor intensities are insignificant in all unweighted regressions.[14] In the weighted regressions

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[11]Note that the lack of statistical significance in the 1990 sample may be the result of heteroscedasticity that cannot be corrected for because of the inability to calculate weighted Tobit estimates.

[12]Here again heteroscedasticity is a potential cause for the lack of significant coefficients in the unweighted samples.

[13]The insignificance of the coefficient on the BKPM dummy in the unweighted estimates for large plants in 1994 is the only exception.

[14]Again, heteroscedasticity is a potential problem in this respect.

for 1992 and 1994 the coefficient on capital intensity is positive, but the coefficient on skill intensity is negative. Since imports themselves would be expected to be relatively capital- and skill-intensive, this indicates that imports and importing plants share capital intensity as a trait but diverge in terms of skill intensity. Another interesting contrast with the export side is that the sign of the coefficient on the age variable differs depending on the sample for imports. In the large sample of all plants, this coefficient is positive and significant in 1990 and 1992, and positive but not significant in 1994. In the smaller sample of large plants, however, this coefficient is negative and highly significant in all years. This suggests that the relationship between plant age and import propensities differs according to the size of the plant.

Again, the most important result in this context is that differences between all foreign ownership groups and local plants are significant in all samples, with foreign plants having higher import propensities than local plants (Table 7). In this respect, the results of these regressions and the descriptive analysis above (c.f., Table 5) are consistent. Two other results that are consistent with the descriptive analysis above are indications that (1) plants with moderate ownership shares had the highest import propensities in 1990 but that firms with high foreign ownership shares the highest import propensities in 1992 and 1994, and (2) differences in import propensities among foreign ownership groups are relatively small compared to differences in export propensities.

5. Conclusions and Policy Implications

The above results strongly suggest that foreign plants tended to have relatively high trade propensities, both in terms of exports and imports, in Indonesian manufacturing in 1990, 1992, and 1994. Moreover, the results also suggest that plants with high foreign ownership shares had by far the

highest export propensities in all years. However, differences in import propensities among foreign ownership groups were relatively small.

Although the correlations between foreign ownership and trade propensities appear quite strong, the interpretation of these correlations is not straightforward, especially given Indonesia's history of granting exceptions to ownership and import restrictions for plants that export a high proportion of their output. For example, in contrast to the assumption here, it is possible to interpret high trade propensities as a cause of high ownership shares. However, three factors suggest that causality runs from ownership shares to trade propensities, at least on the export side. First, and most importantly, theory suggests that a well-developed marketing network is often one of a multinational firm's most valuable assets. Thus, as described above, profit-maximizing multinationals are often hesitant to let affiliates that the parent does not control export through such networks. Second, a major policy influence, whether a plant is registered with BKPM, is accounted for in this analysis. Certainly this variable does not capture all incentive-related effects, but it is important that BKPM registration and foreign ownership shares appear to have different impacts on trade propensities. Third, another study (Ramstetter forthcoming) shows a similarly positive correlation between export propensities and foreign ownership shares in Singaporean manufacturing, where ownership and import restrictions are virtually non-existent, as well as for Thai manufacturing.

This interpretation suggests that ownership restrictions may in turn limit the potential for multinational affiliates to increase their exports. Perhaps more importantly, such restrictions can also limit the important demonstration effects that increased export growth in multinational affiliates can impart on local firms. In other words, there would appear to be a high opportunity cost associated with ownership restrictions in this respect. Although this is most certainly not the only relevant

consideration when evaluating ownership restrictions, policy makers do need to take this high cost into consideration. In the Indonesian context, it is likely that ownership restrictions are no longer a substantial obstacle in this respect because much progress has been made in relaxing ownership restrictions over the last decade and especially in the last few years. Nonetheless, continued progress in this area could further increase the benefits that Indonesia gains from the presence of foreign multinationals.

The fact that differences in import propensities among ownership groups are relatively minor also suggests that there is little reason to discriminate among ownership groups on the basis of import performance. There is also a strong argument that import propensities should not be a major policy criterion in a country like Indonesia, where imports provide crucial capital goods and financing balance of payments deficits has not proved to be a major economic problem. Moreover, high export propensities often go hand in hand with high import propensities when exporting firms must obtain a large portion of their raw materials from abroad to remain competitive. Nonetheless, even if the authorities are concerned about import propensities, there appears to be little reason to favor one foreign ownership group over another. In short, among foreign plants, there is an apparent asymmetry between the relationship between foreign ownership shares and import propensities, which is rather weak and of relatively minor consequence, and the relationship between foreign ownership shares and export propensities, which is quite strong and of relatively large consequence.

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Table 1: Exports and imports from Indonesia by survey plants (rupiah billions)

	Exports			Imports		
Industry	1990	1992	1994	1990	1992	1994
Total	47,314	68,950	86,547	40,241	55,376	69,109
Manufacturing-SITC	17,947	34,165	45,545	nm	nm	nm
Manufacturing-ISIC	22,267	39,928	52,922	nm	nm	nm
Manufacturing-Survey	11,206	25,828	37,659	10,293	15,859	21,975
Food	1,222	2,892	4,268	608	936	1,425
Beverages	9	52	69	24	46	75
Tobacco	75	448	775	235	115	185
Textiles	1,185	2,540	3,101	1,165	1,803	2,824
Apparel	842	2,442	2,929	361	1,217	889
Leather	99	166	173	24	48	97
Footwear	372	2,038	3,551	128	891	1,355
Wood	3,252	5,412	7,909	130	137	157
Furniture	253	670	934	6	10	23
Paper	245	760	446	429	626	865
Printing, publishing	15	54	132	121	58	121
Industrial chemicals	417	659	1,110	1,150	1,609	1,256
Other chemicals	110	155	315	617	860	1,200
Oil refineries & gas	0	0	0	0	4	0
Other oil & coal	0	0	1	7	13	4
Rubber	1,331	2,253	2,553	376	440	214
Plastics	124	411	671	363	743	651
Porcelin	43	110	37	65	94	123
Glass	24	189	63	26	70	96
Cement	138	66	21	58	23	31
Clay	0	7	7	13	22	14
Other nonmetallic	7	31	41	26	44	87
Iron, steel	360	675	2,383	814	1,159	1,513
Nonferrous metals	419	826	781	500	625	887
Metal products	195	388	1,124	513	540	915
Nonelectrical mach.	12	52	209	342	451	817
Electric machinery	341	1,788	3,000	952	1,836	3,099
Transport machinery	61	295	276	1,171	1,247	2,688
Precision machinery	4	32	170	16	61	127
Miscellaneous	50	418	609	55	130	237

nm=not meaningful in this context.
Exports estimated as the product of the percentage of production exported as reported by survey plants and gross output. Imports refer to imports of raw materials. All variables in current rupiah.

Sources: Asian Development Bank (1996), Australian National University (1997), Biro Pusat Statistik (various years).

Table 2: Foreign shares of exports of sample plants by industry and ownership share (percent of exports in each industry)

Industry	1990			1992			1994		
	FS >= 10 <= 50	FS > 50 < 90	FS >= 90	FS >= 10 <= 50	FS > 50 < 90	FS >= 90	FS >= 10 <= 50	FS > 50 < 90	FS >= 90
All manufacturing	8	7	7	8	15	10	9	13	10
Food	1	1	2	7	3	4	7	6	3
Beverages	0	0	0	4	3	60	3	0	58
Tobacco	1	0	0	0	0	0	1	0	0
Textiles	0	12	8	7	22	5	6	17	7
Apparel	4	3	6	5	35	9	8	9	18
Leather	0	0	0	8	4	4	7	3	4
Footwear	1	29	9	12	30	17	10	33	10
Wood	12	0	0	6	3	1	11	3	1
Furniture	4	14	0	1	3	0	0	7	1
Paper	50	6	0	23	1	0	0	0	0
Printing, publishing	0	0	0	5	21	0	5	58	0
Industrial chemicals	24	17	0	26	9	0	2	16	0
Other chemicals	1	15	1	3	30	4	4	26	7
Oil refineries & gas	T=0	T=0	T=0	T=0	T=0	T=0	T=0	T=0	T=0
Other oil & coal	T=0	T=0	T=0	0	0	0	0	0	0
Rubber	5	5	14	5	4	6	3	7	11
Plastics	9	0	0	6	4	3	6	10	13
Porcelin	26	46	0	8	11	0	0	0	0
Glass	0	0	0	5	0	0	0	19	0
Cement	0	0	0	0	0	0	0	0	0
Clay	0	0	0	72	0	0	96	0	0
Other nonmetallic	0	0	0	8	3	0	7	1	13
Iron, steel	0	4	0	0	28	0	0	6	0
Nonferrous metals	0	0	96	0	40	48	0	73	4
Metal products	9	65	2	9	56	1	35	25	16
Nonelectrical mach.	2	45	13	32	16	3	3	26	31
Electric machinery	17	45	3	14	16	46	18	21	44
Transport machinery	82	2	0	23	36	0	6	9	12
Precision machinery	10	0	0	0	3	44	0	7	18
Miscellaneous	0	12	25	9	15	43	12	17	40

FS=foreign ownership share.
T=0 indicates that total exports are zero for that industry.
Exports estimated as the product of the percentage of production exported as reported by survey plants and gross output. Imports refer to imports of raw materials. All variables in current rupiah.

Source: Biro Pusat Statistik (various years).

Table 3: Foreign shares of imports of sample plants by industry and ownership share (percent of imports in each industry)

Industry	1990			1992			1994		
	FS >= 10 <= 50	FS > 50 < 90	FS >= 90	FS >= 10 <= 50	FS > 50 < 90	FS >= 90	FS >= 10 <= 50	FS > 50 < 90	FS >= 90
All manufacturing	11	21	6	9	25	7	11	21	8
Food	15	5	0	12	7	2	14	3	0
Beverages	26	53	0	14	25	46	14	22	59
Tobacco	0	0	0	0	13	8	5	9	5
Textiles	2	16	7	4	22	2	5	16	5
Apparel	5	7	11	6	55	11	7	10	30
Leather	0	1	0	9	22	7	16	35	5
Footwear	2	34	13	13	36	20	11	49	7
Wood	13	1	0	7	4	1	9	1	2
Furniture	7	15	0	0	4	1	12	16	0
Paper	5	3	0	3	1	0	8	0	8
Printing, publishing	0	0	0	12	2	0	0	28	0
Industrial chemicals	9	34	1	6	53	1	10	40	2
Other chemicals	17	21	12	18	25	6	14	28	4
Oil refineries & gas	T=0	T=0	T=0	0	0	0	T=0	T=0	T=0
Other oil & coal	100	0	0	80	0	0	59	0	0
Rubber	17	13	22	13	21	0	25	29	0
Plastics	3	6	0	3	2	1	7	13	6
Porcelin	28	14	0	22	21	0	21	5	1
Glass	0	0	0	36	0	0	0	12	0
Cement	2	10	0	29	19	0	33	9	0
Clay	0	4	0	6	2	0	11	0	0
Other nonmetallic	11	0	0	13	11	0	3	8	0
Iron, steel	14	14	0	0	13	0	1	16	0
Nonferrous metals	1	1	64	0	0	25	4	28	0
Metal products	5	60	0	5	51	0	9	27	10
Nonelectrical mach.	9	51	0	5	66	0	5	68	5
Electric machinery	7	25	1	15	22	23	19	22	28
Transport machinery	36	34	0	14	13	1	17	8	0
Precision machinery	57	1	0	15	1	44	0	7	35
Miscellaneous	4	23	22	17	18	25	10	41	22

FS=foreign ownership share.
T=0 indicates that total imports are zero for that industry.
Exports estimated as the product of the percentage of production exported as reported by survey plants and gross output. Imports refer to imports of raw materials. All variables in current rupiah.

Source: Biro Pusat Statistik (various years).

Table 4: Export propensities by industry and foreign ownership share in Indonesian manufacturing establishments, 1990-1994

Industry	1990 Local	1990 FS >= 10 <= 50	1990 FS > 50 < 90	1990 FS >= 90	1992 Local	1992 FS >= 10 <= 50	1992 FS > 50 < 90	1992 FS >= 90	1994 Local	1994 FS >= 10 <= 50	1994 FS > 50 < 90	1994 FS >= 90
All manufacturing	8	19	20	40	12	32	36	57	12	28	36	68
Food	5	2	13	31	8	34	31	32	8	31	33	59
Beverages	1	0	0	N=0	3	6	8	61	2	2	0	38
Tobacco	2	25	N=0	0	2	N=0	0	0	1	63	50	50
Textiles	6	8	29	22	7	37	28	53	5	14	22	54
Apparel	11	80	44	61	19	69	83	63	20	61	66	75
Leather	15	0	100	N=0	19	76	48	100	14	73	50	92
Footwear	17	50	83	60	34	79	79	75	25	85	77	65
Wood	20	54	37	60	29	63	62	85	31	63	81	93
Furniture	27	60	65	0	38	63	76	0	37	26	80	49
Paper	1	36	21	0	7	11	51	4	9	0	6	0
Printing, publishing	1	0	0	N=0	2	33	50	0	1	67	52	N=0
Industrial chemicals	10	5	5	10	12	7	6	0	13	4	15	56
Other chemicals	4	1	5	0	3	2	7	8	4	2	9	14
Oil refineries & gas	N=0	N=0	N=0	N=0	0	N=0	N=0	N=0	N=0	N=0	N=0	N=0
Other oil & coal	0	0	N=0	N=0	1	0	N=0	N=0	4	0	0	N=0
Rubber	22	32	52	56	26	28	56	61	26	35	39	81
Plastics	3	25	14	0	4	13	14	49	5	20	31	75
Porcelin	5	7	49	0	14	34	67	N=0	7	0	0	0
Glass	6	N=0	N=0	N=0	13	40	N=0	N=0	5	0	48	N=0
Cement	1	0	0	N=0	1	0	0	0	0	0	0	N=0
Clay	1	N=0	0	N=0	1	100	0	0	0	100	N=0	N=0
Other nonmetallic	6	0	N=0	N=0	6	28	15	0	3	25	1	41
Iron, steel	6	0	26	N=0	12	0	59	40	6	0	29	0
Nonferrous metals	1	0	13	33	9	0	37	43	10	0	53	70
Metal products	2	8	8	34	4	18	22	96	4	38	30	56
Nonelectrical mach.	1	1	6	29	2	8	9	50	2	5	20	45
Electric machinery	4	25	18	61	14	36	30	82	10	32	31	91
Transport machinery	1	11	4	N=0	2	20	21	12	3	5	8	55
Precision machinery	5	11	0	N=0	8	14	49	43	10	N=0	52	75
Miscellaneous	8	0	51	72	23	61	64	63	22	60	68	72

Export propensities are the percentage of production exported as reported by plants.
FS=foreign ownership share.
N=0 indicates that there are no plants in that category.

Source: Biro Pusat Statistik (various years).

Table 5: Import propensities by industry and foreign ownership share in Indonesian manufacturing establishments

Industry	1990 Local	1990 FS >= 10 <= 50	1990 FS > 50 < 90	1990 FS >= 90	1992 Local	1992 FS >= 10 <= 50	1992 FS > 50 < 90	1992 FS >= 90	1994 Local	1994 FS >= 10 <= 50	1994 FS > 50 < 90	1994 FS >= 90
All manufacturing	9	41	51	38	9	42	48	49	8	35	45	51
Food	2	21	6	0	2	11	10	9	2	15	9	8
Beverages	3	50	63	N=0	3	13	60	93	2	14	79	93
Tobacco	1	10	N=0	3	1	N=0	63	43	1	46	11	37
Textiles	11	43	47	27	11	41	40	34	9	44	32	55
Apparel	8	72	80	81	7	66	43	87	7	37	39	77
Leather	11	4	100	N=0	7	45	67	65	9	69	73	46
Footwear	13	100	74	60	17	70	71	82	15	61	74	42
Wood	1	3	1	3	1	8	3	4	1	2	1	11
Furniture	1	7	1	0	1	0	6	1	1	5	5	0
Paper	13	21	38	0	12	35	14	0	10	21	3	64
Printing, publishing	9	0	56	N=0	8	16	8	0	8	10	54	N=0
Industrial chemicals	20	56	73	93	22	56	75	34	19	51	72	68
Other chemicals	34	46	67	71	34	46	67	78	31	43	61	39
Oil refineries & gas	N=0	N=0	N=0	N=0	11	N=0	N=0	N=0	N=0	N=0	N=0	N=0
Other oil & coal	0	94	N=0	N=0	25	66	N=0	N=0	12	92	0	N=0
Rubber	13	58	47	19	11	17	20	0	7	23	18	1
Plastics	41	31	59	79	32	49	25	84	24	33	38	79
Porcelin	31	73	85	0	33	63	89	N=0	34	60	84	46
Glass	14	N=0	N=0	N=0	16	65	N=0	N=0	24	33	44	N=0
Cement	3	12	28	N=0	2	6	13	0	1	16	7	N=0
Clay	0	N=0	16	N=0	1	83	14	0	1	83	N=0	N=0
Other nonmetallic	10	54	N=0	N=0	10	91	26	0	8	34	27	0
Iron, steel	21	37	50	N=0	28	12	25	0	23	21	49	0
Nonferrous metals	9	8	55	49	23	8	64	44	20	75	50	82
Metal products	14	40	48	8	14	46	52	39	13	41	46	37
Nonelectrical mach.	23	70	76	67	21	60	72	100	18	58	65	58
Electric machinery	37	53	65	61	32	65	74	92	27	54	65	89
Transport machinery	14	70	49	N=0	13	62	58	98	11	54	59	69
Precision machinery	19	94	60	N=0	25	86	55	98	23	N=0	83	66
Miscellaneous	18	64	55	100	16	51	57	55	15	28	63	46

Import propensities are the share of imports in purchases of raw materials.
FS=foreign ownership share.
N=0 indicates that there are no plants in that category.

Source: Biro Pusat Statistik (various years).

Table 6: Determinants of Export Propensities (=ln(X/O+1)ij) in Indonesia's Manufacturing Establishments, Tobit Estimates

	All plants, unweighted		All plants, weighted by ln(Oij)		Large plants, unweighted		Large plants, weighted by ln(Oij)	
Independent variables, equation statistics	Coefficients, etc.	Significance level	Coefficients, etc.	Significance level	Coefficients, etc.	Significance level	Coefficients, etc.	Significance level
1990 estimates								
Constant	-2.9098	0.000	nc	nc	-1.2644	0.000	nc	nc
ln((X/O+1)i)	3.6360	0.000	nc	nc	3.1419	0.000	nc	nc
ln((K/E)ij)	-0.0105	0.157	nc	nc	-0.0117	0.223	nc	nc
ln((ES/E)ij+1)	-0.4962	0.000	nc	nc	-0.6639	0.000	nc	nc
ln(Oij)	0.1632	0.000	nc	nc	0.0710	0.000	nc	nc
ln(AGEij)	-0.1270	0.000	nc	nc	-0.0968	0.000	nc	nc
DBKPMij	0.0649	0.009	nc	nc	0.0483	0.090	nc	nc
DF1050ij	0.0287	0.669	nc	nc	-0.0031	0.959	nc	nc
DF5090ij	0.1221	0.032	nc	nc	0.0689	0.167	nc	nc
DF90ij	0.2602	0.002	nc	nc	0.1846	0.016	nc	nc
SIGMA	0.6911	0.000	nc	nc	0.5498	0.000	nc	nc
Sample size	14,153		nc		2,964		nc	
% Positive	12.49		nc		31.07		nc	
Log likelihood fn.	-4,467		nc		-1,692		nc	
1992 estimates								
Constant	-2.6199	0.000	-2.4674	0.000	-0.9029	0.000	-0.8769	0.000
ln((X/O+1)i)	2.7029	0.000	2.6386	0.000	2.3051	0.000	2.2896	0.000
ln((K/E)ij)	-0.0069	0.204	-0.0067	0.000	-0.0036	0.559	-0.0038	0.014
ln((ES/E)ij+1)	-0.4190	0.000	-0.4393	0.000	-0.6482	0.000	-0.6544	0.000
ln(Oij)	0.1500	0.000	0.1416	0.000	0.0504	0.000	0.0492	0.000
ln(AGEij)	-0.1151	0.000	-0.1125	0.000	-0.0706	0.000	-0.0697	0.000
DBKPMij	0.1145	0.000	0.1065	0.000	0.0468	0.014	0.0479	0.000
DF1050ij	0.0565	0.206	0.0458	0.000	0.0448	0.239	0.0417	0.000
DF5090ij	0.1137	0.003	0.0950	0.000	0.0795	0.013	0.0725	0.000
DF90ij	0.2373	0.000	0.2327	0.000	0.2093	0.000	0.2096	0.000
SIGMA	0.6005	0.000	0.5778	0.000	0.4682	0.000	0.4641	0.000
Sample size	15,455		15,455		4,069		4,069	
% Positive	18.81		18.81		42.03		42.03	
Log likelihood fn.	-5,960		-84,191		-2,443		-39,095	

Table 6 (continued)

Independent variables, equation statistics	All plants, unweighted Coeffi- cients, etc.	Sig- nifi- cance level	All plants, weighted by ln(Oij) Coeffi- cients, etc.	Sig- nifi- cance level	Large plants, unweighted Coeffi- cients, etc.	Sig- nifi- cance level	Large plants, weighted by ln(Oij) Coeffi- cients, etc.	Sig- nifi- cance level
1994 estimates								
Constant	-2.7511	0.000	-2.6062	0.000	-1.0921	0.000	-1.0551	0.000
ln((X/O+1)i)	2.9627	0.000	2.9024	0.000	2.6555	0.000	2.6364	0.000
ln((K/E)ij)	-0.0221	0.000	-0.0199	0.000	-0.0089	0.148	-0.0088	0.000
ln((ES/E)ij+1)	-0.2592	0.000	-0.2800	0.000	-0.4648	0.000	-0.4683	0.000
ln(Oij)	0.1602	0.000	0.1508	0.000	0.0556	0.000	0.0537	0.000
ln(AGEij)	-0.1148	0.000	-0.1089	0.000	-0.0512	0.000	-0.0509	0.000
DBKPMij	0.1132	0.000	0.1042	0.000	0.0622	0.001	0.0596	0.000
DF1050ij	0.0020	0.962	0.0010	0.924	0.0302	0.408	0.0273	0.002
DF5090ij	0.1059	0.003	0.0991	0.000	0.1092	0.000	0.1044	0.000
DF90ij	0.3563	0.000	0.3435	0.000	0.3000	0.000	0.2959	0.000
SIGMA	0.6054	0.000	0.5830	0.000	0.4804	0.000	0.4757	0.000
Sample size	16,486		16,486		4,733		4,733	
% Positive	18.76		18.76		40.67		40.67	
Log likelihood fn.	-6,352		-91,554		-2,835		-45,796	

Variables are:
AGE=age of the plant (years+1),
DBKPM=a dummy for plants with BKPM-registered investment,
DF1050=a dummy for plants with foreign ownership shares >=10 and <=50,
DF5090=a dummy for plants with foreign ownership shares >50 and <90,
DF90=a dummy for plants with foreign ownership shares >=90,
E=persons engaged (number),
ES=nonproduction workers (number),
K=fixed assets (1000 rupiah),
O=gross output (1000 rupiah),
X=exports (1000 rupiah, estimated as gross output multiplied by the share of production exported),
i=industry i, j=firm j,
nc=estimates could not be calculated with the standard alogrithm.

Table 7: Determinants of Import Propensities (=ln(M/R+1)ij) in Indonesia's Manufacturing Establishments, Tobit Estimates

Independent variables, equation statistics	All plants, unweighted		All plants, weighted by ln(Oij)		Large plants, unweighted		Large plants, weighted by ln(Oij)	
	Coefficients, etc.	Significance level	Coefficients, etc.	Significance level	Coefficients, etc.	Significance level	Coefficients, etc.	Significance level
1990 estimates								
Constant	-1.4389	0.000	nc	nc	-1.0835	0.000	nc	nc
ln((X/O+1)i)	1.9992	0.000	nc	nc	1.8273	0.000	nc	nc
ln((K/E)ij)	0.0010	0.763	nc	nc	-0.0067	0.225	nc	nc
ln((ES/E)ij+1)	-0.0146	0.737	nc	nc	-0.0136	0.824	nc	nc
ln(Oij)	0.0672	0.000	nc	nc	0.0619	0.000	nc	nc
ln(AGEij)	0.0107	0.047	nc	nc	-0.0495	0.000	nc	nc
DBKPMij	0.0567	0.000	nc	nc	0.0517	0.001	nc	nc
DF1050ij	0.2049	0.000	nc	nc	0.1734	0.000	nc	nc
DF5090ij	0.2260	0.000	nc	nc	0.2105	0.000	nc	nc
DF90ij	0.1706	0.000	nc	nc	0.1647	0.000	nc	nc
SIGMA	0.4015	0.000	nc	nc	0.3422	0.000	nc	nc
Sample size	13,698		nc		2,953		nc	
% Positive	24.04		nc		49.00		nc	
Log likelihood fn.	-5,095		nc		-1,370		nc	
1992 estimates								
Constant	-1.5478	0.000	-1.5076	0.000	-1.2201	0.000	-1.1958	0.000
ln((X/O+1)i)	2.0443	0.000	2.0265	0.000	1.9326	0.000	1.9175	0.000
ln((K/E)ij)	0.0022	0.519	0.0033	0.000	0.0054	0.244	0.0055	0.000
ln((ES/E)ij+1)	-0.0524	0.214	-0.0566	0.000	-0.1000	0.061	-0.0987	0.000
ln(Oij)	0.0699	0.000	0.0684	0.000	0.0583	0.000	0.0571	0.000
ln(AGEij)	0.0124	0.013	0.0065	0.000	-0.0268	0.000	-0.0267	0.000
DBKPMij	0.0758	0.000	0.0733	0.000	0.0626	0.000	0.0613	0.000
DF1050ij	0.2064	0.000	0.1943	0.000	0.1577	0.000	0.1544	0.000
DF5090ij	0.2359	0.000	0.2265	0.000	0.1927	0.000	0.1927	0.000
DF90ij	0.2762	0.000	0.2666	0.000	0.2111	0.000	0.2111	0.000
SIGMA	0.4164	0.000	0.4051	0.000	0.3541	0.000	0.3502	0.000
Sample size	14,937		14,937		4,049		4,049	
% Positive	23.34		23.34		47.07		47.07	
Log likelihood fn.	-5,516		-75,736		-1,925		-30,634	

Table 7 (continued)

Independent variables, equation statistics	All plants, unweighted Coeffi- cients, etc.	Sig- nifi- cance level	All plants, weighted by ln(Oij) Coeffi- cients, etc.	Sig- nifi- cance level	Large plants, unweighted Coeffi- cients, etc.	Sig- nifi- cance level	Large plants, weighted by ln(Oij) Coeffi- cients, etc.	Sig- nifi- cance level
1994 estimates								
Constant	-1.7783	0.000	-1.7247	0.000	-1.3594	0.000	-1.3425	0.000
ln((X/O+1)i)	2.1459	0.000	2.1128	0.000	2.0005	0.000	1.9806	0.000
ln((K/E)ij)	0.0030	0.411	0.0031	0.001	0.0024	0.592	0.0023	0.031
ln((ES/E)ij+1)	0.0330	0.419	0.0218	0.035	-0.0396	0.413	-0.0471	0.000
ln(Oij)	0.0817	0.000	0.0804	0.000	0.0684	0.000	0.0679	0.000
ln(AGEij)	0.0076	0.176	0.0008	0.565	-0.0362	0.000	-0.0365	0.000
DBKPMij	0.0420	0.003	0.0397	0.000	0.0272	0.057	0.0271	0.000
DF1050ij	0.2006	0.000	0.1905	0.000	0.1660	0.000	0.1618	0.000
DF5090ij	0.2377	0.000	0.2279	0.000	0.1984	0.000	0.1965	0.000
DF90ij	0.2974	0.000	0.2868	0.000	0.2437	0.000	0.2390	0.000
SIGMA	0.4270	0.000	0.4134	0.000	0.3584	0.000	0.3543	0.000
Sample size	15,949		15,949		4,704		4,704	
% Positive	21.14		21.14		44.60		44.60	
Log likelihood fn.	-5,545		-78,263		-2,205		-35,444	

Variables are:
AGE=age of the plant (years+1),
DBKPM=a dummy for plants with BKPM-registered investment,
DF1050=a dummy for plants with foreign ownership shares >=10 and <=50,
DF5090=a dummy for plants with foreign ownership shares >50 and <90,
DF90=a dummy for plants with foreign ownership shares >=90,
E=persons engaged (number),
ES=nonproduction workers (number),
K=fixed assets (1000 rupiah),
M=imports of raw materials (1000 rupiah).
O=gross output (1000 rupiah),
R=purchase of raw materials (1000 rupiah).
i=industry i, j=firm j,
nc=estimates could not be calculated with the standard alogrithm.

Appendix Table A1: Number of plants reporting export propensities by industry and foreign ownership share in Indonesian manufacturing establishments

	1990				1992				1994			
Industry	Lo-cal	FS >= 10 <= 50	FS > 50 < 90	FS >= 90	Lo-cal	FS >= 10 <= 50	FS > 50 < 90	FS >= 90	Lo-cal	FS >= 10 <= 50	FS > 50 < 90	FS >= 90
All manufacturing	13,622	185	250	97	14,653	265	368	169	15,495	313	443	235
Food	2,922	20	21	9	3,122	25	25	15	3,348	38	40	17
Beverages	129	3	3	0	153	9	3	1	174	15	2	1
Tobacco	836	4	0	1	814	0	2	1	650	2	2	2
Textiles	1,515	8	27	8	1,585	19	44	15	1,652	18	47	21
Apparel	1,364	7	9	11	1,401	17	25	22	1,350	21	29	29
Leather	109	1	1	0	133	5	4	2	170	4	2	2
Footwear	164	2	6	5	225	11	21	11	244	10	26	12
Wood	1,169	22	11	5	1,204	23	17	9	1,384	24	15	12
Furniture	523	4	7	1	638	4	12	2	785	5	12	6
Paper	154	4	2	1	215	6	4	1	246	6	6	3
Printing, publishing	456	1	2	0	420	3	4	2	436	3	4	0
Industrial chemicals	237	16	17	1	224	23	23	2	246	20	29	4
Other chemicals	424	14	45	12	420	19	43	6	436	18	45	9
Oil refineries & gas	0	0	0	0	2	0	0	0	0	0	0	0
Other oil & coal	4	1	0	0	7	2	0	0	8	1	1	0
Rubber	383	7	8	26	376	6	15	21	362	6	15	15
Plastics	531	4	7	1	638	6	5	6	692	11	10	11
Porcelin	52	4	2	1	67	6	3	0	81	6	2	2
Glass	37	0	0	0	47	2	0	0	46	2	2	0
Cement	410	2	4	0	413	5	3	2	468	8	3	0
Clay	520	0	1	0	622	1	1	1	591	1	0	0
Other nonmetallic	150	1	0	0	176	1	2	1	200	1	2	1
Iron, steel	46	7	4	0	59	6	4	1	67	5	7	1
Nonferrous metals	27	1	2	2	38	1	3	2	47	1	6	1
Metal products	513	14	18	6	558	8	29	4	608	16	39	12
Nonelectrical mach.	159	9	12	3	195	10	17	2	209	15	16	6
Electric machinery	207	13	19	1	234	24	24	22	245	28	32	41
Transport machinery	342	10	14	0	357	15	15	2	425	17	20	5
Precision machinery	45	3	1	0	56	2	3	2	49	0	5	4
Miscellaneous	194	3	7	3	254	6	17	14	276	11	24	18

FS=foreign ownership share.
These samples include only plants that report positive values for employment, fixed, capital, output, and value added.

Source: Biro Pusat Statistik (various years).

Appendix Table A2: Number of plants reporting import propensities by industry and foreign ownership share in Indonesian manufacturing establishments

Industry	1990 Local	1990 FS >= 10 <= 50	1990 FS > 50 < 90	1990 FS >= 90	1992 Local	1992 FS >= 10 <= 50	1992 FS > 50 < 90	1992 FS >= 90	1994 Local	1994 FS >= 10 <= 50	1994 FS > 50 < 90	1994 FS >= 90
All manufacturing	13,171	181	250	97	14,148	264	364	161	14,976	308	439	226
Food	2,886	19	21	9	3,082	25	25	15	3,315	38	40	17
Beverages	128	3	3	0	151	9	3	1	165	15	2	1
Tobacco	832	4	0	1	813	0	2	1	647	2	2	1
Textiles	1,370	8	27	8	1,441	19	43	14	1,487	18	47	21
Apparel	1,222	7	9	11	1,238	17	25	20	1,201	19	29	28
Leather	107	1	1	0	130	5	4	2	166	4	2	2
Footwear	163	2	6	5	219	11	21	11	236	10	26	12
Wood	1,110	22	11	5	1,134	23	17	9	1,311	24	15	12
Furniture	520	4	7	1	633	4	12	2	783	5	12	6
Paper	149	4	2	1	211	6	4	1	239	6	6	3
Printing, publishing	447	1	2	0	413	3	4	2	432	3	4	0
Industrial chemicals	231	16	17	1	211	23	23	2	233	20	29	4
Other chemicals	424	14	45	12	419	19	43	6	434	18	45	9
Oil refineries & gas	0	0	0	0	2	0	0	0	0	0	0	0
Other oil & coal	4	1	0	0	7	2	0	0	8	1	1	0
Rubber	381	7	8	26	374	6	15	20	360	6	15	15
Plastics	530	4	7	1	637	6	5	6	686	11	10	11
Porcelin	52	4	2	1	67	6	3	0	81	6	2	2
Glass	36	0	0	0	47	2	0	0	46	2	2	0
Cement	409	2	4	0	413	5	3	2	468	8	3	0
Clay	519	0	1	0	622	1	1	1	591	1	0	0
Other nonmetallic	144	1	0	0	168	1	2	1	200	1	2	1
Iron, steel	46	6	4	0	59	6	4	1	67	4	7	1
Nonferrous metals	27	1	2	2	38	1	3	2	47	1	6	1
Metal products	511	13	18	6	556	8	29	3	601	16	39	11
Nonelectrical mach.	153	9	12	3	188	9	17	1	204	14	16	5
Electric machinery	201	12	19	1	225	24	24	20	237	27	29	37
Transport machinery	339	10	14	0	350	15	13	2	416	17	20	4
Precision machinery	45	3	1	0	55	2	3	2	49	0	5	4
Miscellaneous	185	3	7	3	245	6	16	14	266	11	23	18

FS=foreign ownership share.
These samples include only plants that report positive values for employment, fixed, capital, output, value added, and purchases of raw materials

Source: Biro Pusat Statistik (various years).

Appendix B: Some Notes on Indonesia's Industrial Survey Data Base

B1. Introduction

This appendix outlines some of the major characteristics in the industrial survey data compiled by the Biro Pusat Statistik (BPS, the Central Bureau of Statistics) in Indonesia. It should be emphasized that I am not an expert with regard Indonesia's industrial survey data and that I have only recently begun to use these data intensively. Correspondingly, there are probably important characteristics of the data set that I do not know about and it is better to view this appendix as the observations of one user rather than a definitive description. Nonetheless, I am an economist who has worked with several similar data sets in the past, and these observations may be of some assistance to others who attempt to use this data set. This appendix thus proceeds to outline the basic characteristics of the industrial survey data and to detail the contents of related data bases.

B2. Characteristics of the Industrial Survey Data

This section seeks to describe the nature of the industrial survey data and how they differ from other common economic data. There are three important issues here, the accounting unit or basis of classification, definitions, and coverage.

First and foremost, it must be stressed that these data are compiled from questionnaires submitted by plants (i.e., factories). As such the basic accounting unit is the plant, not the commodity or the firm (i.e., enterprise), involved. There are thus important differences between the plant-based industrial survey data on the one hand, and data utilizing commodity-based classifications or firm-based classifications on the other.

For example, commodity-based classifications are used in many compilations of trade statistics or price statistics and firm-based classifications are commonly used in enterprise statistics or tax records. Indeed, differences between these kinds of classifications and the plant-based classification in the industrial survey data can be so large as to make the industrial survey data fundamentally incompatible with these other data.

A simple example of incompatibility can be seen by comparing a compilation of total imports classified by plant from the industrial survey data and compilations of imports classified by commodity from customs statistics. Even if industries are defined in exactly the same way, these two classifications will reveal very different import patterns by industry. This is because, for example, steel plants don't just import steel but a whole range of commodities. In contrast, differences in industry-wise patterns between exports or production classified by plant and exports or production classified by commodity are generally much less pronounced, provided of course that industry definitions are the same in the two data sets. This is because, for example, steel plants do generally produce and export steel.

However, there can be important differences between commodity classifications and plant classifications, even in terms of production or exports, especially when industries are narrowly defined. These differences result from the existence of multi-product plants. For example, a firm may produce metal products, electronic parts, and automobile parts in the same plant. Such plants are very difficult to classify by industry, especially when none of the commodities produced constitutes a majority of the value of production. Moreover, a plant must be classified in only one industry because the plant is the basic accounting unit, while each commodity could be classified in a different industry if necessary in a commodity-based classification. Accordingly, there are often large differences between plant-based classifications and

commodity-based classifications, even in the case of production or exports. These differences tend to be relatively small when industries are broadly defined (e.g., a 2-digit classification) and relatively large when industries are narrowly defined (e.g., a 5-digit classification).

It is also important to be cognizant of differences between plant-based and firm-based classifications, the major cause of these differences being the existence of multi-plant firms. The best example I know of this is in Japan where the large general trading companies (sogo shosa) own a large number of plants in manufacturing and services. Accordingly, if one calculates the ratio of value added in the trade industry to value added in all industries, the ratio is extremely large if a firm-based classification is used but much smaller if a plant-based classification is used (e.g., 29 percent versus 13 percent in 1992).[15] Of course this is an extreme example, but nonetheless a very important one.

Second, there are important differences between the definitions used in the industrial survey data and other common economic data. Perhaps the most important of these differences are the differences between definitions of industries used in the industrial survey data and definitions of industries used in data using commodity-based classifications, for example commonly used definitions of industries in data on international trade. The industrial survey data use Indonesia's Standard Industrial Classification (SIC) to define industries. The Indonesian SIC is very similar to version 2 of the International SIC (ISIC) but it is important to note that many countries now use a somewhat different classification based on version 3 of the ISIC. All of these industrial classifications share the trait of implying a markedly broader definition of manufacturing than commonly used definitions of manufacturing in commodity-based

[15]Data from Robert E. Lipsey, Magnus Blomström, and Eric D. Ramstetter, 1995, "Internationalized Production in World Output", NBER Working Paper 5385, Appendix Table A5.

classifications of international trade. Specifically, many food product and raw material-producing industries are classified as manufacturing in the Indonesian SIC as well as the ISIC, but are not classified as manufacturing in commodity-based classifications.

Another problem with definitions occurs with respect to exports because exports are not reported directly in the industrial surveys. Rather, exports can only be approximated as the product of the export-to-production ratio reported by plants and total production by those plants. This is the only variable for which I know this kind of indirect estimation to be necessary. However, my experience with these data is still very limited and this means I may be unaware of other potential problems. In any case, users of any data must always exercise due caution to make sure they precisely understand the definitions of the variables they are using.

The third and final issue of importance here is that of coverage. Here it is important to recognize that these data are cross sectional samples taken at different points in time. Although the sample in principle covers all plants with 20 or more employees, the reality is that many plants do not respond to the survey. However, according to BPS and many researchers who have worked with these data in the past, the coverage of the industrial surveys has tended to improve over time. My initial experience with the data also suggests this is the case. This means that these data must be used with caution when analyzing changes over time. Unfortunately, I do not know of anyone who has investigated precisely how coverage has changed over time. For example, it might be expected that the coverage of larger plants always been relatively good while the coverage of smaller plants has been relatively poor, but I know of no evidence suggesting that this is actually true. However, BPS is aware of the coverage problem, and has constructed a special backcast data set to attempt to compensate for changing coverage over time. Yet, the backcast data set contains only a limited number of indicators (see section 3

below). Moreover, it is clear that, while these data can facilitate very powerful cross section analysis, they must be used with caution when examining changes over time.

B3. Contents of the Industrial Survey Data

To my knowledge, the industrial survey data consists of three types of data sets that are maintained separately by BPS, (1) the raw data sets, (2) data sets on the type of raw materials used and the type of goods produced, and (3) the backcast data sets.

The raw data sets (this terminology is that used by BPS personnel) include a large number of industrial indicators that were gathered from the plants (i.e., factories) that responded to the industrial surveys. In the electronic versions, there is one field for each indicator and one record for each plant, with the number of indicators and plants generally increasing over time.

Here it is important to note that I have been told by BPS personnel that there should be a factory identification field, called PSID, in each raw data set. This field can then be used to link files for different years and to link the backcast data (see below) to the raw data. However, this variable is not included in the raw data sets for 1975-1993 that I have been able to access through the Ministry of Industry and Trade, but that it apparently included in the 1994 data set that I have accessed from the same source.

In addition to the indicators included in the raw data, detailed data on the quantities and values of raw materials by item (both for domestic purchases and imports), as well as the quantities and values of goods produced, are also collected as part of the industrial surveys. However, these data are not included in the basic raw data sets. The detailed data

on raw materials and production by commodity are published in print and I understand that these data can also be obtained from BPS in electronic form.[16] These data have the advantage of including both quantities and values for a large number of commodities and could potentially facilitate detailed analysis of imports, domestic purchases, and production at the factory level. However, these data sets are very large, probably much larger than the raw data sets described above, and I believe it would be quite expensive to acquire them.

The third data set is called the backcast data set by BPS personnel and it consists of estimates of a few of the most basic industrial indicators (e.g., output, input, value added, employment) for all years the survey has been conducted (1975 forward) and all plants included in the surveys in these years. As with the raw data, variables (e.g., value added in 1975) constitute fields and factories constitute records. Cognizant of the problems presented by improvements in survey coverage over time, BPS created the backcast data sets in order to adjust estimates of these basic indicators to compensate for changes in coverage over time. The underlying principle of these data sets is to use information submitted by plants in recent years but that did not submit information in earlier years to estimate the missing information for the earlier years. New backcast data sets are prepared annually so as to incorporate additional information from the newest industrial survey. As indicated above, the backcast data sets can also be tied to the raw data sets through the variable PSID. However, also as noted above, this variable is apparently missing from the 1975-1993 data sets that I have acquired, though it is present in the 1994 data set that I have access to.

[16]For recent years, the printed publications are Biro Pusat Statistik, *Statistik Industri Besar Dan Sedang*, volumes IIIA and IIIB.