Firms' export-supply response: learning from the Indonesian experience during the 1997/98 economic crisis

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***Abstract**: This study examines the export-supply response of plants in Indonesian manufacturing during the 1997/98 economic crisis. It is motivated by the findings of other studies which highlight the weak export performance of the crisis-affected countries, despite the increase in competitiveness from the sharp exchange rate depreciation during the crisis.*

It shows a picture of the response and investigates which characteristics determined the success of plants in responding to the crisis in terms of export. The empirical analysis points to the characteristics of firms and industry as the determinants of the firm success in their export response. The descriptive in particular shows a strong trend for plants that were non-exporters before the crisis to remain so during and after the crisis. The econometric analysis reveals the significant role of sunk-costs into exporting activities in determining the export response. Some variables which are related to sunk-costs - such as exporting history, an industry's export intensity, and an industry's prior export competitiveness - are positively related to the probability to export during and after the crisis. In addition to the sunk-costs, the ability to compete in international markets and foreign ownership are the other important determinants. In particular, non-exporters before the crisis found it easier to become exporters in the crisis period if they are more efficient, able to produce goods to international standards and have some foreign ownership share. Finally, the analysis reveals that access to credit is important for successful switching by non-exporters.

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1 Introduction

The sharp exchange rate depreciation that was a feature of the 1997/98 Asian crisis was expected to have improved export performance of countries affected by the crisis. As reviewed, several studies (e.g. Dwor-Frecaut et al. 2000; Duttagupta and Spilimbergo 2004) have demonstrated that the evidence conflicts with this prediction. For Indonesia, export growth in terms of value contracted in 1998 by 4 per cent. Although explanations have been offered in the literature, those which focus on firm or plant behaviour are scarce. This study aims to fill the gap by examining the export supply response of plants in Indonesian manufacturing. In particular, two questions are asked. First, what is the picture of plants' export-supply response to the crisis? To date, very little is known about the response of firms in Indonesia and other crisis affected countries. Second, which characteristics determined this export-supply response of plants.

This study attempts to answer these questions and examines the export participation and adjustment in export propensity of manufacturing plants during the period 1997-2000. In addition, the study explores the general hypothesis concerning the impact of credit contraction on export supply response.

The study is organised as follows. Section 2 briefly reviews relevant literature. Section 3 presents the hypotheses related to the determinants of plant export supply response to the crisis. Section 4 describes the data, statistical framework, and measurements of variables. Section 5 presents the empirical analysis, while the last section summarises the main findings of the study.

2 Theoretical consideration and literature review

In the empirical literature, the neoclassical Heckscher-Ohlin model has long been adopted to explain the determinants of international trade across countries or industries. It was not until recently that research expanded to topics related to company export behaviour or performance, as a result of a greater accessibility to firm- or plant-level data.

One of the key findings from the empirical literature on micro export behaviour is that exporters are superior to non-exporters in some respects. For developed countries, Bernard et al. (1995) and Bernard and Jensen (1999), for example, documented that exporters in US manufacturing are larger, more productive, more capital intensive, pay higher wages, and employ more skilled workers. A similar finding was observed by Aw and Hwang (1995) and Berry (1992) for developing countries. For Indonesian manufacturing, Sjoholm and Takii (2003) observed that exporting plants are larger and more productive. They found that labour productivity of these plants was about twice as high as non-exporting plants and this difference seems to have increased over time during the 1990s.

The finding is attributed to the difference in productivity between exporters and non-exporters. However, the exact mechanism linking exporting and productivity is not clear. Two explanations have been put forward. The first, which is commonly referred to as the 'self-selection' hypothesis, argues that only the most productive firms are able to survive in the highly competitive export markets. The hypothesis is based on the presumption that there are additional costs involved in participating in export markets. These costs, which usually involve high fixed costs, include transport costs and expenses related to establishing distributional channels and production costs in adapting products for foreign tastes (Bernard and Jensen 1999). The alternative explanation argues that there is a learning effect from participating in exporting activities which will result in productivity improvement. One example is that exporters are often argued to be able to gain access to technical expertise, including product design and method, from their foreign buyers (Aw et al. 2000, p.67). This explanation is often termed as a 'learning-by-exporting' hypothesis. According to Aw et al., this kind of explanation might be particularly relevant for East Asian exporters.

While there has not been a consensus, some empirical studies (e.g. Bernard and Jensen 1999; Clerides et al. 1998; Aw et al. 2000; Hallward-Driemeier et al. 2002) give some support for the self-selection hypothesis. Bernard and Jensen found that exporters in US manufacturing are more efficient, larger and grow faster several years before they become exporters. Aw et al. found for manufacturing industry in Taiwan and Korea that the average productivity of continuing exporters and new entrants as exporters are significantly higher than exiting exporters and non-exporters. Nevertheless, for several industries, they were not able to strongly conclude there was a wide gap in productivity difference between exporters and non-exporters. Using firm-level data of manufacturing industries in some South East Asian countries, Hallward-Driemeier et al. (2002, p.25) observed a substantial productivity difference between domestic firms that were established as exporters and domestic firms that were not. They interpret this finding as indicating that firms participating in export markets make a conscious decision to operate differently from ones that focus on the domestic market.

Supporting this interpretation, they show that domestic exporters indeed bear a resemblance to foreign exporters. In particular, they are more capital intensive and use more equipment of recent vintage than domestic non-exporters.

The presumption that exporting requires additional costs, which can naturally be thought of as sunk costs (Bernard and Wagner 1998), has an important implication. That is, it produces persistence in export participation. Once a firm decides to service an export market in a period of time, it tends to stay an exporter in the next period of time. The role of sunk costs in affecting a firm's decision to export has been another important topic in the empirical literature. While there has not been much study on this topic, a few studies do agree that sunk costs are a large and significant source of persistence in exporting. For example, Roberts and Tybout (1997) found that exporting experience in the previous year had a strong and positive effect in determining export participation in the current year for plants in Colombian manufacturing. Similar findings can also be observed in Campa (2004) and Bernard and Jensen (2004) for Spain and US manufacturing plants, respectively.

If entering foreign markets is costly, there might be localised spillovers associated with exporting by one firm that reduces the cost of foreign market access for nearby firms. This idea was put forward by Aitken et al. (1997). In particular, they test the hypotheses that any exporting activity, and especially exporting activities by multinationals, generates export spillovers. The first hypothesis is based on the argument that the geographic concentration of exporters may make it feasible to construct facilitates that are able to support export activities. The second hypothesis is based on the presumption that foreign firms are the natural conduit for information about foreign markets, export marketing channels and technology. The extent to which foreign firms provide this information may enhance the likelihood of domestic firms becoming exporters. Using plant-level data for Mexican manufacturing for 1986-1990 they found robust results supporting the second hypothesis. The probability of a domestic plant exporting is positively correlated with the proximity of multinationals. As for the first hypothesis, they found that the probability of exporting is positively correlated with the local concentration of overall export activity. However, this finding is not robust to changes in sample size. Their results suggest the lack of robustness is related to large differences in specific industry characteristics. The positive export spillovers effect from multinationals was confirmed by Greenaway et al. (2004) using a panel of firms in the UK. They found that multinationals not only increase the decision of domestic firms to export, but also export intensity.

The review so far considers the general literature on micro export behaviour performance. The rest of this section reviews the literature to gain some knowledge on the export supply response to a crisis.

Exchange rate depreciation is expected to improve export performance of the countries affected by the crisis. However, several studies (e.g. World Bank 2000; Duttagupta and Spilimbergo 2004) have demonstrated that the evidence conflicted with this prediction. Several possible explanations for the sluggish export response have been popularised in the Asian crisis literature. The most common is the decline in demand for exports during the few years before the crisis. Decomposing the source of export growth in the period 1995-96, the ADB (2002) revealed that 86 per cent of decline can be attributed to a weakening export demand. Several factors underlie the weakened demand. First, these countries specialised in trading among themselves. According to World Bank (2000), intra-regional exports accounted for about 40 per cent of East Asia's total exports. Therefore, when a region-wide export shock hits, as occurred in 1995 and 1996, these countries are likely to experience some decline in their exports because they are not able to diversify their exports to other markets. In addition to the high trade intensity within the region, many product sectors in which these countries specialised, such as textiles, garments and footwear, experienced a slump in 1995 and 1996 (World Bank 2000; ADB 2002). Finally, the depreciation of the Japanese yen against the US dollar contributed to lower price-competitiveness of these countries' exports, since their currencies were effectively pegged to the US dollar. The effect of weakened export demand was mostly manifested through the decline in prices, instead of volume. According to the ADB (2002), about two-thirds of the decline in export value (in US dollars) was due to a decline in export prices (also in US dollar terms).

The other explanations for the sluggish export response during the crisis include the contraction in credit to private sectors (credit crunch hypothesis) and the impact of competitive depreciation. That is, the export decline in a country which experienced sharp exchange rate depreciation during the crisis might have been due to currency depreciation by its competitors. Duttagupta and Spilimbergo (2004) tested these explanations by estimating the short- and long-run export demand and supply equations of several Asian countries (Indonesia, Malaysia, Thailand, Korea, Singapore and Hong Kong). Their results provide only weak support for the credit-crunch hypothesis, primarily because there was mixed evidence about the relationship between the domestic credit variable and export supply price.

In addition to this, they found a relatively quick adjustment in export supply, ranging between 1.5 and 2 years. As one would expect, the adjustment would have been longer than what was found if the credit-crunch hypothesis was true.

Duttagupta and Spilimbergo's findings on the credit-crunch hypothesis, as they also noted, are consistent with findings in other studies (Dwor-Frecaut et al. 2000; Gosh and Gosh 1999; Krueger and Tornell 1999). Drawing on the Mexican currency and banking crisis in 1994, Krueger and Tornell showed that firms in tradable sectors were not significantly affected by of credit crunch. They attributed the success of exporting firms in the tradable sector to the fact that, since the early 1990s, most of these firms had been able to obtain trade financing from the international capital market.

Duttagupta and Spilimbergo provide some evidence supporting the competitive devaluation explanation. From the supply side, they found that nominal depreciation resulted in lower export prices, suggesting that exchange rate depreciation should increase the export demand in a country. However, from the demand side they found that the export demand elasticity with respect to competitors' price was positive and large. Thus, export demand in a country would be reduced substantially if the country's export competitors also reduced their export price.

In the case of Indonesia, there were additional factors contributing to the sluggish export response. First, the social and political instability in 1998 caused international buyers to cancel export orders and shift to other countries. Rosner (2000) provides some support for this. He shows that exports of manufactured goods declined sharply during the second half of 1998 and, more importantly, his interviews with several textile, garment and footwear manufacturers confirmed that many companies suffered severe cutbacks in orders after the 1998 riots. The second factor causing the poor export performance was the rejection of Indonesian letters of credit from the beginning of 1998, which severely affected imports of some crucial products (Johnson 1998). The fall in imports would have been expected to affect the export performance of manufacturers who use a great deal of imported intermediate inputs or raw materials in their production. Finally, the poor export performance was also caused by the shortage of containers (Johnson 1998), since the collapse of imports greatly reduced the number of containers entering the country.

Empirical studies examining how firms or exporters responded to an economic crisis have been sparse, but two are worth reviewing – Blomstrom and Lipsey (1993) and Lipsey (2001). Both examine the export response of US affiliates in some Latin America countries to the 1980's debt crisis. Lipsey (2001) extended the analysis in the context of the Asian 1997/98 crisis.

The studies focus on the role of foreign ownership as an important determinant in a successful response to the crises. They argue that it is easier for multinationals to redirect sales from domestic to export markets (Blomstrom and Lipsey 1993, p.109). The capacity to switch from domestic to external markets, being well connected to the latter through global distribution channels and better knowledge than local firms in terms of international marketing skills, are the reasons behind the argument.

Blomstrom and Lipsey showed that both export growth and the propensity of US affiliates in some Latin American countries increased dramatically during the 1980's crisis. However, they noted that these increases could partly be attributed to the decrease in domestic sales rather than an increase in production. Any increase from production is suggested to have happened over a longer time period after the crisis.

Lipsey (2001) shows that exports of US and Japanese affiliates increased at a higher rate than the rate of the total host countries' export in 1997 and 1998, resulting in an increase in the affiliates' share in the countries' exports.[2] Providing more evidence on sales redirection, Lipsey shows the ratio of exports to total sales of US manufacturing affiliates in East Asia increased significantly in 1998. For the crisis-affected countries, the largest change is observed for Indonesia and Malaysia. Between 1997 and 1998, the ratio increased from 17 to 32 per cent for Indonesia and from 68 to 85 per cent for Malaysia.

9.3 Hypotheses

This section identifies and presents the hypotheses related to the determinants of the export-supply response of firms in Indonesian manufacturing during the crisis period, drawing on the discussion of the previous section and the general literature on Indonesian manufacturing. The crisis period is defined as 1997-2000.

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[2] The figure for Japanese manufacturing was limited only until 1997.

Exporting history

Exporting history is hypothesised to positively increase the probability to export in the crisis period. Models of probability to export with sunk-export costs postulate that a current decision to export affects future decision or, in other words, there is a "persistence" in export participation. Export history is captured by introducing a dummy variable for exporting status during the period 1995-96 (EP_{9596}).

Plant level labour productivity and factor intensity

Fiercer competition in export markets means firms need to be efficient in order to survive, i.e., "self-selection hypothesis". This suggests a positive relationship between plant level labour productivity (LP) and export supply response. Plant level factor intensity, capital intensity (PCI) and skill intensity (PSI), are also expected to be positively related to export response. The argument is that plants using advanced technology and employing skilled workers are able to be more cost-efficient. Despite this, a negative relationship might be observed for skill intensity. Along with high inflation, higher labour quality implies higher wage expenses which could have mitigated the increase in competitiveness unless labour was willing to take lower real wages and salary during the crisis.

In addition to reflecting differences in costs, plant level factor intensity is also able to capture the difference in product quality. Product quality is another important factor as it is often asserted that the foreign market requires a more sophisticated quality of goods than domestic markets.

Firm Size

Size of firm ($SIZE$) is expected to affect the export-supply response, although the direction of the relationship is unclear. For a given industry, only larger firms have a higher survival chance in competitive foreign markets if economies of scale exist. This argument suggests a positive relationship between $SIZE$ and the export-supply response. In addition, it is often asserted that the more sophisticated management and better resources of large firms allow them to be more responsive than small firms in responding to any increase in export demand (Calof 1994). Despite this, a negative relationship may also occur. This is because there are some channels that allow some small and medium firms in Indonesian manufacturing to successfully perform in export markets, including sub-contracting schemes, clustering, trading in foreign market niches and access to informal sources of financing (Berry et al. 2001; Sandee and van Diermen 2004).

Firm Age

The effect of firm age (AGE) on the export-supply response is ambiguous. On the one hand, older firms tend to be more experienced. Related to this, the theory on firm learning (e.g. Jovanovic's (1982) selection model) suggests older firms are likely to be more productive and larger. On the other hand, adjustment is also likely to be more difficult for older firms. The learning theory also suggests younger firms have more dynamism. Apart from this, a positive relationship might also be observed simply because younger firms in Indonesia tend to be export more oriented than older ones, owing to the liberalized export oriented trade and investment policies from the mid 1980s (Ramstetter 1999).

Foreign ownership

Foreign ownership (FOR) is expected to be positively related to the export-supply response. As argued by Blomstrom and Lipsey (1993), it is easier for multinationals to redirect sales from domestic and foreign markets. The expected difference, however, may depend on the extent of the foreign share in MNEs. It is often argued that parent companies may not completely transfer the full extent of specific assets if the ownership share of the parent companies is small (Ramstetter 1999). To take this argument into account, an interaction variable $DFOR * FOR$ is introduced. It is hypothesised that the extent to which multinationals responded better is higher for those multinationals with a higher foreign share.

Share of imported input

The extent to which exchange rate positively affects the profitability of exporting firms depends on the share of imported input they use in production. The positive impact is only minimal if production involves a large share of imported input, since higher expenditure on imported input counteracts the relative lower labour costs (Forbes 2002). Accordingly, the share of imported input to total input ($IMDEP$) is expected to be negatively related to export-supply response.

Export spillovers

This study considers two forms of export spillover: industry-specific and region-specific. The latter is introduced because exporters are usually concentrated in a region with export-supporting facilities. Guided by the theory reviewed in the previous section, both forms of spillover are expected to positively affect the export-supply response. Two variable specifications are considered for each form of export-spillover: on the basis of the number of exporting plants ($INEXP_j$ and $RNEXP_k$), and exported output ($IEXP_j$ and $REXP_k$). j and k denote industry and region, respectively.

Industry competitiveness prior to the crisis

If export expansion can be thought of as an activity introducing a new product to a market, industry competitiveness should be important in determining export response during the crisis. The natural choice to proxy this effect would be some variables reflecting an industry's factor intensity. Two variable specifications are considered. First, it is specified based on some categorisation of industrial sectors by their factor intensity. Included in this specification are dummy variables for resource intensive sectors (DRI), labour intensive sectors (DLI) and capital intensive sectors (DCI).The second specification is based on some continuous-variable measures. These are industry resource intensity (IRI), industry capital intensity (ICI) and industry skilled-labour intensity (ISI). The second specification was introduced mainly to reflect industry in Indonesian manufacturing that relate to export.

According to the Heckscher-Ohlin model, plants in resource- and labour-intensive industries should have responded better in terms of export than plants in capital-intensive industries. The coefficients of DRI and DLI are expected to be positive in the regressions, with DCI as the base dummy variable. As for the second specification, IRI is expected to be positively related to the export-supply response while ICI and ISI are expected to be negatively related.

The factor intensity variables, although useful, may not perfectly capture the industry competitiveness effect. This is because there is a large variation over time before the crisis in the trade competitiveness within groups of industries classified by their factor intensity. The variation is illustrated in Table 1 which gives the dynamics of a Revealed Comparative Advantage (RCA) index in Indonesian manufacturing over the period 1985-1996. First, some sectors in these industries experienced a decline in comparative advantage over the last few years prior to the crisis. Included are a few sectors which propelled the export boom in the 1980s. For example, the RCA index for wood and wood products (ISIC 331) and wearing apparel (ISIC 322) declined during the period 1989-1996. For this period, exports of these industries alone accounted for about 30 percent of Indonesia's manufacturing export. Second, it was also revealed that some other resource- and labour- intensive sectors had actually moved up to the class of high RCA sectors during the same period.

To deal with this dynamism, a dummy variable indicating industry competitiveness before the crisis (*COMP*) was introduced interchangeably with the factor intensity variables. The hypothesis is that plants in competitive industries before the crisis are expected to have performed better than plants in other industries.

Other determinants

The inclusion of the determinants outlined above does not necessarily mean it has incorporated all factors deemed important for explaining the export supply response of firms in Indonesian manufacturing during the crisis period. Other determinants may significantly affect the response. The first group of these determinants are those related to external factors. Some of the most important are the sharp exchange rate depreciation, the downward cycle in demand of some of Indonesia's major export products and the trade financing problem during the crisis. In principle these factors should have affected all Indonesian firms equally, although some may have been affected differently across industries. In the regressions, these factors are accounted for by including dummy variables for years and industries.

The other group of determinants is the group of unobserved firm-level characteristics. Included in these characteristics are those such as managerial capability, product attributes and special access to production input.

Table 1 Dynamics in Revealed Comparative Advantage (RCA) index of Indonesian manufacturing, 1985-1996

a. The 1985-1989 period

RCA 1985	ISIC	Industry	Change in RCA, 1985-89
High	331	Wood and wood products	(+)
	322	Wearing apparel	(+)
	321	Textiles	(+)
	314	Tobacco	(+)
	353	Petroleum refineries	(-)
	372	Nonferrous metal	(-)
	311	Food	(-)
Low	351	Industrial chemical	(+)
	371	Iron and steel	(+)
	355	Rubber products	(+)
	381	Fabricated metal product	(+)
	341	Paper and paper product	(+)
	390	Other manufacturing	(+)
	356	Plastic products	(+)
	323	Leather and leather products	(+)
	362	Glass and glass products	(+)
	369	Non-metallic mineral products	(+)
	384	Transport equipment	(+)
	332	Furniture	(+)
	385	Profesional and scientific equipment	(+)
	361	Porcelain	(+)
	342	Printing and publishing	(+)
	382	Non-electrical machinery	(+)
	324	Footwear	(+)
	313	Beverages	(+)
	383	Electrical machinery	(-)
	352	Other chemical products	(-)
	312	Other food products	(-)

Table 1 continued

Table 1 (concluded)

b. The 1989-1996 period

RCA 1989	ISIC	Industry	Change in RCA, 1989-1996
High	321	Textiles	(+)
	311	Food	(+)
	355	Rubber products	(+)
	356	Plastic products	(+)
	390	Other manufacturing	(+)
	332	Furniture	(+)
	361	Porcelain	(+)
	324	Footwear	(+)
	331	Wood and wood products	(-)
	322	Wearing apparel	(-)
	353	Petroleum refineries	(-)
	372	Nonferrous metal	(-)
	314	Tobacco	(-)
Low	383	Electrical machinery	(+)
	351	Industrial chemical	(+)
	381	Fabricated metal product	(+)
	341	Paper and paper product	(+)
	382	Non-electrical machinery	(+)
	384	Transport equipment	(+)
	385	Profesional and scientific equipment	(+)
	342	Printing and publishing	(+)
	371	Iron and steel products	(-)
	352	Other chemical products	(-)
	362	Glass and glass products	(-)
	312	Other food products	(-)
	323	Leather products	(-)
	369	Other non-metallic mineral products	(-)
	313	Beverages	(-)

Source: Aswicahyono and Pangestu (2000)

4 Statistical framework, measurements of variables and data

4.1 Data

The main data set for the quantitative analysis is the annual manufacturing surveys of medium- and large-scale establishments (*Statistik Industry*, or *SI*), from 1995 to 2000. The period covers the pre-crisis (1995-96), peak crisis (1997-99), and early recovery (2000). In addition to the *SI* data, Wholesale Price Index (WPI) data at two- and three-digit industry level, provided by BPS.

The establishments are defined as those with 20 or more employees. The surveys are undertaken by the Indonesian Central Board of Statistics (*Badan Pusat Statistik or* BPS) and, as noted in many studies, the *SI* data are considered one of the best by the standard of developing countries. They cover a wide range of information on the establishments, including some basic information (ISIC classification, year of starting production, location), ownership (share of foreign, domestic and government), production (gross output, stocks, capacity utilisation, share of output exported), material costs and various type of expenses, labour (head-count and salary and wages), capital stock and investment, and sources of investment funds.

The data, however, have several limitations. First, they do not include information which can identify whether an establishment is a single-unit or a part of a multi-plant firm. As a result, establishments owned by an enterprise can not be linked up, and hence the number of enterprises is over-numerated: some plants may have been counted as firms whereas in practice they are not. Unfortunately, the extent of the over-numeration is unknown. Nevertheless, there are two reasons which suggest it might not have been large. First, a separate BPS publication that lists the surveyed firms reveals that the number of multi-plant firms is not large, i.e. about 500 to 1,000 firms out of more than 15,000 firms surveyed each year by BPS in the early 2000s. Second, each plant might be run as an independent business, as plants owned by a multi-plant firm are not necessarily interconnected. However, this is likely to occur if each of the plants produces different goods.

The other limitation is that the surveys produce only annual data. In the study on firm behaviour, the ideal situation is to have high-frequency data, either monthly or quarterly, because firms' adjustment could happen within a short period of time.

Finally, a few variables relevant to this study are not available. For example, the variable that identifies whether or not plants are owned by business groups (conglomerates) is not available. Being part of a business group might be important in shaping the firm's response because the group might support the financially-distressed firms during the peak of the crisis, owing to its business operation in diverse markets.

It is important to make a clarification here related to the unit of observation. That is, throughout this study, the terms of 'firm', 'company' and 'plant' are used interchangeably. In principle, the unit of observation of interest is firm (company), but, because of the data limitations, plant is used as the unit of observation. In other words, a single plant is considered as a firm. While this assumption clearly has a limitation – as it does not acknowledge the existence the multi-plant firms – it is still reasonable to accept the assumption, for the two reasons outlined above.

Oil and gas refining sectors (ISIC 353 and 354) are excluded. They were only included in the survey in the 1990s and, by comparing their aggregate figures between SI and other data sources (i.e. National Income Statistics published by BPS), it is clear that the data are still weak.

A plant-level unbalanced panel is constructed from 1995 to 2000. The panel is constructed by matching the plants according to the plant-code variable ($PSID$). While there is a possibility of mistakes in data-entry for each survey year, data examination suggests the extent of mistakes is low. Moreover it shows that the entry for $PSID$ is highly consistent, at least for the period covered in this study.

Plants recorded in 1996 but not recorded in any year between 1997 and 2000 were excluded. Retaining these plants would complicate an analysis required to model firm survival during the crisis period. Meanwhile, new recorded plants during the period 1997-2000 were retained, because export response may involve a group of new firms. The sample consists of 7,962 plants, 2,316 of which are exporting plants in 1995-96.

4.2 Statistical framework

The determinants of export supply response to the crisis are examined by way of some statistical regressions. Two dependent variables are considered to represent the response: (1) change in export participation, and (2) change in export propensity. The choice of the variables is motivated by the empirical literature, where export supply response is often examined by evaluating the change in some measures of export performance between two points of time. The measures used most often are the value or volume of exports and the propensity to export. Calculating these measures is straightforward at the aggregate level, but not at the firm level. This is because aggregate change in export is a result from two different, but related, firm behaviours. First, existing exporters can increase or decrease their exported output. They may increase by redirecting output to foreign markets or by expanding exports. Included in this mechanism are exporters that switch from exporting to non-exporting. The second behaviour is where non-exporters that have been domestically oriented switch to participate in foreign markets. The second mechanism can also be achieved by new firms entering the industry.

The two points of time are the crisis (1997-2000) and the pre-crisis (1995-96) periods. There are four points of observation for the crisis period, i.e., 1997, …, 2000, since the data base are enumerated annually. As for the pre-crisis period, the point of observation is considered to be one, and is defined slightly differently for the export participation and propensity variables. The former is defined as the exporting status in 1995 or 1996, while the latter is defined as the average of the export propensity in 1995 and 1996. The use of 'or' in the pre-crisis export participation definition is motivated by the empirical regularity that exporting is not a once-and-forever phenomenon. Overall, the change in the dependent variables is defined broadly as of the change in export participation or export propensity between the crisis and pre-crisis periods.

The empirical models in their general form are given as the following:

$$EP_{it} = \alpha_0 + \alpha_1 ' X_i + \alpha_2 ' Y_j + \varepsilon_{it} \qquad (1)$$

$$\frac{EXP_{i,t} - EXP_{i,9596}}{EXP_{i,9596}} \times 100 = \% \Delta EXP_{it} = \beta_0 + \beta_1 ' X_i + \beta_2 ' Y_j + \mu_{it} \qquad (2)$$

where (1) and (2) are export participation and export propensity adjustment equations, respectively. i represent plant i, t represents the crisis period (i.e. t=1997, …, 2000). EP_{it} is a binary variable which takes the value of 1 if the plant was exporting in the crisis period and 0 otherwise. EXP_{it} is a plant's export intensity and is defined as the ratio of exports to total output. X_i, and Y_j are sets of explanatory variables capturing the pre-crisis plant and industry characteristics, respectively. Unless otherwise stated, all explanatory variables are defined as their average value between 1995 and 1996, in recognition that 1996 may not be a 'normal' year to represent the pre-crisis period. Year, industry, and regional dummies are included to control for differences across years, industries and region, respectively. The year dummy variables should capture the other determinants which exogenously affect the dependent variables. The estimations use pooled cross-section data drawn from the data of continuously operating plants during the period 1997-2000.

Equation (1) was estimated within the framework of a binary choice model (i.e. probit or logit), instead of a linear probability model (LPM). This is mainly because the predicted probability derived from LPM may lie outside the 0-1 region, which is clearly not reasonable in practice. Despite this, a binary response model also has a number of shortcomings. One important one is that the potential for bias arising from neglected heterogeneity (i.e. omitted variables) is larger in a binary choice model than in a linear model. Nevertheless, Wooldridge (2002) points out that estimating a binary response model by a binary choice model still gives reliable estimates, particularly if the estimation purpose is to obtain the direction of the effect of explanatory variables.

To facilitate hypothesis testing and organise the empirical analysis, estimations were done in three steps. In the first step, equation (1) was estimated for the full sample, which consists of exporting and non-exporting plants in the pre-crisis period. The emphasis here is on export participation response and the hypothesis testing on exporting history. In the second step, equation (1) was estimated for two different samples. The first includes only exporting plants while the second includes only non-exporting plants. For the purpose of discussion, these samples are labelled exporting and non-exporting sample, respectively. Finally in the third step, equation (2) was estimated only for the exporting sample. The emphasis here is on export propensity response.

Two reasons motivate the estimations in the second step. First, the estimation is necessary because the assumption imposed by the estimation for the full sample, of no fundamental difference between exporters and non-exporters, is too strong. As reviewed, the empirical literature has shown that they are indeed different. Second, the crisis provides a suitable experiment to learn more about switching behaviour from non-exporting to exporting.

For the estimation in the first step, the empirical model can be rewritten as

$$EP_{it} = \alpha_0 + \alpha_1 EP_{9596} + \alpha_2 ' X_i + \alpha_3 ' Y_j + \varepsilon_{it} \qquad (3)$$

There is a potential endogeneity problem in estimating equation (3), with exporting history (EP_{9596}) being the endogenous variable. EP_{9596} is likely endogenous because there is strong persistence in the variable correlates with ε_{it}. As was reviewed, previous studies (e.g. Roberts and Tybout 1997; Campa 2004) found a very strong effect from the previous years' exporting status on the current decision to export. To correct for this problem, the instrumental variable approach was adopted.

In this situation, two alternative estimation methods can be used: joint estimation and two-step procedure. The two-step procedure is more attractive because of its computational advantage. The equation for endogenous variable (as a function of the instrumental variables) is not estimated jointly with the equation of interest (i.e. equation (3)), which computationally can be very complicated. Mimicking the standard 2SLS approach, the two-step procedure firstly estimates the endogenous variable, by LPM, before estimating equation (3) by the binary choice model. Despite the advantage, the two-step procedure often gives less consistent and efficient estimates than maximum likelihood estimation (MLE) estimates (Wooldridge 2002, p.476). For this reason, the equation was estimated using the joint estimation method.

It is important to note the assumption of strong persistence in equation (3) might not be relevant for the later years of the crisis period (i.e. 1998-2000). In other words, a plant decision to participate in export during, for example, 1999-2000 would not necessarily have been affected by the plant's exporting history in 1995 or 1996, as modelled in equation (3). The reason being that the impact of the previous exporting experience can depreciate once exporters cease participating in export markets. For example, Roberts and Tybout (1997) found for Colombian manufacturing that the previous year's exporting status strongly and positively affected the current year's export participation, but the exporting status of two or three years earlier only had small a positive affect on current export participation.

It can nevertheless be argued that the assumption is still relevant, at least in the context of this study. This is because the crisis period was definitely not a ‘normal’ period, in contrast to the Roberts and Tybout finding that should be more appropriately applied in the context of a normal business cycle. With such a deep contraction in 1998, it is possible to observe that an exporter discontinued exporting during the peak of the crisis but resumed exporting during the early recovery period. Thus, being out of the export market in 1998 or 1999 does not necessarily mean the plant would permanently be in a non-exporting state.

An important statistical issue regarding estimation of equation (2) is “sample censoring”. The dependent variables, $\%\Delta EXP_{it}$, can only be calculated for pairs of plants that remained as exporters in 1995 or 1996 and in any year between 1997 and 2000. About 50 percent of exporting plants in the period 1995-96 were no longer recorded as exporters in any year between 1997 and 2000 except for 1998. Therefore the sample is truncated and estimating equation (2) on the selected sample may lead to biased estimates. Heckman’s (1976) two-step estimation method was used to correct this problem. In the first step, equation (1) was estimated using the probit model and the inverse Mills ratio was computed for every observation. In the second step, equation (2) was estimated on the selected sample, adding the computed inverse Mills ratio as another explanatory variable.

4.3 Measurements of variables

The following variables are employed to account for the dependent variables and firm characteristics discussed earlier. Unless otherwise stated, the variables are defined in their pre-crisis values, i.e. the average values of 1995 and 1996.

EXP for plant i is defined as the ratio of export to total output, or

$$EXP_i = \frac{EX_i}{Output_i}$$

where EX_i is export of plant i. EX_i is not reported in SI data. As in previous empirical studies, EX_i is estimated by multiplying the percentage of exported output in production.

Size ($SIZE_i$) is proxied by number of employees. The other common alternatives, such as output or profits, are not used as they tend to be more sensitive to changes in the business cycle. Age of plant (AGE) is proxied by the number of years the plant has been in commercial production. Meanwhile, import dependence ($IMDEP_i$) is proxied by the intensity of imported input in total input.[3] For plant *i*, it is defined as

$$IMDEP_i = \frac{(value\ of\ imported\ input)_i}{(value\ of\ imported\ +\ domestic\ input)_i}$$

LP is constructed by taking the ratio between real value added to employment. Price ratio at the three-digit ISIC level is used as the price deflator to compute the real value added. It is important to note here that LP tends to overstate the true real labour productivity, since the ideal denominator is hours of work – instead of number of working labour. The data on hours of work, however, are not available in the *SI* data, and therefore, this study proceeds with employment as the denominator.

Plant-level capital intensity is measured in two ways ($PCI1$ and $PCI2$). For plant i, $PCI1$ is defined as the ratio of non-wage value added to labour:

$$PCI1_i = \frac{(non-wage\ value\ added)_i}{(total\ number\ of\ employee)_i}$$

$$= \frac{(value\ of\ output)_i - (inputs)_i - (wages\ and\ salary)_i}{(total\ number\ of\ employee)_i}$$

$PCI2$ is defined as the ratio of energy costs to production labour, motivated by previous studies showing that capital and energy are complementary inputs in production (Globerman et al. 1994). For plant i,

$$PCI2_i = \frac{(energy\ costs)_i}{(total\ numbers\ of\ production\ employee)_i}$$

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[3] The domestic input here is defined as the domestically produced input, which is different to the concept of domestic input in Input-Output Table sense.

$$= \frac{(fuel\ costs)_i + (electricity\ costs)_i}{(total\ numbers\ of\ production\ employee)_i}$$

Similarly, plant-level skilled labour intensity is measured in two ways ($PSI1$ and $PSI2$). For plant i, $PSI1$ is defined as the average of wages and salary per employee

$$PSI1_i = \frac{(total\ expenditure\ on\ wages\ and\ salary)_i}{(total\ numbers\ of\ employee)_i}$$

The major limitation of $PSI1$ is that it might be distorted by imperfection in the labour market, although the Indonesian labour market was generally competitive before the crisis. Therefore, an alternative measure of the variable ($PSI2$) is employed. For plant i, $PSI2$ is defined as the ratio of non-production to production labour

$$PSI2_i = \frac{(total\ numbers\ of\ non\text{-}production\ employee)_i}{(total\ numbers\ of\ production\ employee)_i}$$

Two types of variables were created to facilitate the empirical analysis: continuous and dummy ownership variables. A continuous ownership variables were created for every plant i: the percentage share of foreign ownership (FOR_i). Three dummy variables were created for every plant plant i: domestic-private ($DPRI_i$), foreign ($DFOR_i$) and state-owned plants ($DGOV_i$). $DPRI_i$ and $DFOR_i$ are defined as

$$DPRI_i \begin{cases} =1 \text{ if the share of domestic-private ownership in plant } i \text{ is equal to 100 per cent} \\ = 0 \text{ otherwise.} \end{cases}$$

$$DFOR_i \begin{cases} =1 \text{ if } FOR_i > 0 \text{ per cent} \\ = 0 \text{ otherwise.} \end{cases}$$

Three joint venture groups of plants, which are foreign-government, foreign-domestic and foreign-government-domestic, are considered foreign plants (i.e. $DFOR_i = 1$). This consideration is based on previous empirical studies which suggest the share of foreign ownership does not necessarily reflect the extent of control (Aswicahyono and Hill 1995).

The other groups of plants not considered are state-owned plants and the group of government-domestic private. Following a similar argument as for $DFOR_i$, the government-domestic group is classified as 'government' and hence, $DGOV_i$ is defined as

$$DGOV_i \begin{cases} =1 \text{ if } GOV_i > 0 \text{ per cent} \\ = 0 \text{ otherwise.} \end{cases}$$

This study considers two specifications for each of the two export spillovers (i.e. industry- and region-specific): on the basis of number of plants ($INEXP_j$ and $RNEXP_k$) and industry export intensity ($IEXP_j$ and $REXP_k$). $INEXP_j$ and $RNEXP_k$ are defined as the ratio of exporting to total plants of industry j and region k, respectively. $IEXP_j$ and $REXP_k$ are defined as the ratio of exports to total output of industry j and region k, respectively. Output is defined in terms of value added, j is defined at the four digit ISIC level and k at the district level.

Following Koo and Martin (1984), industry resource intensity (IRI) is measured by the ratio of direct and indirect purchases of input from agriculture, fisheries, forestry and mining industries to the total value of purchased input. This study uses the 1995 Input-Output Table.

In principal, the definition of industry capital and skilled-labour intensity (ICI and ISI) follows that of plant capital and skilled-labour intensity. The only difference is in the level of aggregation. ICI and ISI are defined at industry level while PCI and PSI are defined at plant level, and here, the industry level is defined at the four digit ISIC level. Similiarly to the their plant-level variables, ICI and ISI are defined in two ways, and therefore, there are two definitions for each of these variables (i.e., $ICI1$, $ICI2$, $ISI1$, and $ISI2$).

$COMP_{j,89}$ is defined to be equal to 1 if the corresponding three-digit ISIC industry of an industry *j* is classified with a high RCA index in 1989 and zero otherwise. This study uses the RCA index computed by Aswicahyono and Pangestu (2000), presented in Table 1. In the table, an industry with a high RCA index is defined as an industry with a RCA index greater than unity, implying Indonesia has a comparative advantage in the industry product.

The complete list of variables included in the models is given in Table 2, together with their description and expected signs.

Table 2 Variable description and the expected signs

Variable	Description	Expected sign
$EP_{i,9596}$	Dummy variable for exporting history of plant *i* during 1995-96	+
$LP_{i,9596}$	Labour productivity of plant *i*, average 1995-96	+
$CI_{i,9596}$	Capital intensity of plant *i*, average 1995-96	+
$SI_{i,9596}$	Skill intensity of plant *i*, average 1995-96	+/-
$SIZE_{i,9596}$	Size of plant *i*, average 1995-96	+/-
$AGE_{i,96}$	Age of plant *i* in 1996	+/-
$DFOR_{i,9596}$	Dummy variable for MNE status of plant *i* in 1996	+
$DFOR_{i,9596}*FOR_{i,9596}$	Interaction variable between DMNE9596 and FOR9596. FOR_{9596} is the share of foreign ownership in plant *i*, average 1995-96	+
$IMPORT_{i,9596}$	Share of imported input for production in plant *i*, average 1995-96	-
$INEXP_{j,9596}$	Relative number of exporting firms in industry *j*, average 1995-96	+
$IEXP_{j,9596}$	Export intensity of industry *j*, average 1995-96	+
$RNEXP_{k,9596}$	Relative number of exporting firms in region *k*, average 1995-96	+
$REXP_{k,9596}$	Export intensity of region *k*, average 1995-96	+
$IRI_{j,95}$	Resource intensity of industry *j* in 1995	+
$ICI1_{j,9596}$	Capital intensity of industry *j*, average 1995-96	-
$ISI2_{j,9596}$	Skill intensity of industry *j*, average 1995-96	-
$DRI_{j,9596}$	Dummy variable for resource intensive industry in 1995 and 1996	+
$DLI_{j,9596}$	Dummy variable for labour intensive industry in 1995 and 1996	+
$COMP_{j,89}$	Dummy variable for competitive industry in 1989-96	+

5 Empirical analysis

5.1 The plant export supply response to the crisis: a descriptive analysis

The empirical analysis starts with a descriptive analysis to gauge the picture of the export-supply response of firms in Indonesian manufacturing between 1997 and 2000. To assist the discussion, some descriptive tables are presented in Tables 3 to 13. Unless otherwise stated, they have been computed by the author from the data.

Before analysing the response at plant level, it is useful to get a perspective on the response at the aggregate level. This is given in Table 3.[4] Focusing first on industry export intensity and participation rate, the table does not seem to show any positive effect for the response. In 2000, both export intensity and participation rates were about the same as the pre-crisis rates. One possible explanation is that it simply reflects a 'time-lag' effect where the structure of firm and industry were adjusted. Thus, a substantial increase in intensity and participation rate – if any – should be observed in more recent years. Unfortunately this study does not cover any of these years. Despite this, the finding shares a similarity to the pattern of Latin America's debt crisis experience in the mid 1980s. Blomstrom and Lipsey (1993) pointed out that the increase in export propensities of US affiliates in the countries only began to come from rising production – rather than from a reduction in domestic sales – in a longer time period after the crisis. Turning to the annual growth rates of export intensity and export participation rate, the extent of recovery is very clear. First, export intensity and participation rate recovered almost immediately in 1999 after severely contracting in 1998. The growth rates were about 106 and 487 per cent, respectively. The magnitude of the growth rates seems to suggest a kind of 'catching-up'. This continued in 2000, albeit at a much slower rate and the growth rates in this year were significantly higher than the pre-crisis rates. This finding is consistent with a region wide recovery in 2000, since intra-regional exports accounted for a large share of the region's total exports (World Bank 2000).

Table 3 also indicates the deep export contraction in 1998 originated from a large number of exporters discontinuing exports. The export participation rate in the year was virtually zero and can perhaps be attributed to the large cancellation of export orders due to the political and social turmoil.

Table 3 Summary of Indonesian manufacturing export, 1993-2000

[4] In this table, the export participation rate is proxied by the ratio of exporting plants over total plants in the industry for the corresponding year. The pre-crisis rates are defined by the average of the rates over the period 1993-96.

	1993-96	1997	1998	1999	2000
Nominal value of export[1] (million $, indexed, 1993=100)	117.37	124.9	116.7	140.5	186.4
Annual growth (%)	*0.12*	*-8.4*	*-6.5*	*20.4*	*32.7*
Export intensity[2]	0.25	0.26	0.09	0.19	0.24
Annual growth (%)	*0.12*	*-2.0*	*-63.0*	*105.6*	*22.8*
Export participation rate[3]	0.18	0.14	0.02	0.14	0.17
Annual growth (%)	*0.02*	*-28.3*	*-83.0*	*486.8*	*21.2*
Real Effective Exchange Rate (REER) index[4]	115.24	114.4	57.2	81.8	76.0

Notes:
1. Source: BPS, Trade statistics, 1993-2000.
2. The ratio of exports to total output.
3. The ratio of exporting to total plants.
4. Source: Bank Indonesia, Indonesian Financial Statistics, various issues.

The first micro-level fact is given in Table 4, which puts together transition matrices that describe the movement of the exporting status of continuously operating plants between the pre-crisis and crisis period. The matrices strongly indicate a persistence in the change of export participation. About 95 per cent of total non-exporting plants in the pre-crisis period stayed as they were in 1999 and 2000. The remaining 5 per cent are plants that were able to switch to exporting in 1999 and 2000. This picture is also shown by the firm-level survey conducted by the World Bank (Dwor-Frecaut et al. 2000, p.148). In particular, they found that about five per cent of Indonesian manufacturing exporters in 1998 were newcomers to the category. They interpreted this as evidence that a few firms were able to shift sales from domestic to international markets.

Table 4 Distribution of plants by exporting status (%), the period 1995-96 to 2000

1995-96	1997		1998	
	Non exporting	Exporting	Non exporting	Exporting
Non exporting	95.7	4.3	99.6	0.4
Exporting	48.7	51.3	90.9	9.1

Table 4 continued

Table 9.4 concluded

1995-96	1999		2000	
	Non exporting	Exporting	Non exporting	Exporting
Non exporting	95.6	4.4	94.8	5.2
Exporting	50.9	49.1	43.7	56.3

However, the persistence is less for the other direction of the response. About half of the plants exporting in the pre-crisis period were no longer recorded as exporting in 1999 and 2000. Compared to related studies on firm export participation, this is a striking result as a large number of firms tend to remain exporting in a short period of time. While they might have been caused by a poor quality of the BPS survey response during the peak of the crisis, these statistics might simply point to the severity of the crisis and subsequent recovery. This argument is supported by looking at the relative frequency of the number of exporting plants in the crisis period that remained exporting in 1999 and 2000, which increased from 49.1 to 56.3 per cent. The increase implies the number of exporting plants in the pre-crisis period that returned to exporting had been increasing during those years.

Within the group of plants that become exporters in the crisis period, there is a strong indication that these firms became export oriented plants. This is shown in Table 5 which describes the export intensity distribution of these plants by classes of export intensity. The table shows about 60 to 70 percent were classified as plants with high export intensity (export intensity of greater than 0.5) and only 10 percent or less were classified as plants with low export intensity (plant export intensity less than 0.1).[5] This finding supports the observation from The World Bank's study mentioned earlier on the success of some firms in switching their sales orientation.

Table 5 Distribution of the new exporting plants in the crisis period (%) by exporting status

	1997	1998	1999	2000
Export intensity class:				
Low	7.6	8.5	11.4	11.8
Medium	15.5	21.3	30.1	27.7
High	76.9	70.2	58.5	60.6

Notes:

1. EXP_i is defined as the ratio of exports to output in plant *i* .
2. Definition of export intensity groups:

Low: $0 < EXP_i < 0.1$

Medium: $0.1 \leq EXP_i < 0.5$

High: $EXP_i \geq 0.5$

[5] The definition of the export intensity classification is given in Table 5.

The next two tables derive the facts related to the change in export intensity of existing exporters in the crisis period. In these tables, the sample of plants that exported continuously for every two points of time (e.g. 1996 and 1999 or 1996 and 2000) was assembled. Therefore, the numbers of plants for each pair of years are different to the number of plants continuously exporting during the period 1997-2000.

Table 6 gives the transition matrices that describe the movement in export intensity of these plants. It suggests large numbers of exporting plants in the pre-crisis period increased export intensity in the crisis period. About 70 percent of plants with low export intensity in the pre-crisis period moved to the class of plants with higher export intensity in 1999 and 2000. Similarly, almost 50 percent of plants with medium export intensity in 1996 moved to the class of plants with high export intensity. Table 6 also suggests that, for a given export intensity class, there is some degree of persistence in which plants are unlikely to have been downgraded to lower export intensity classes. For example, less than 10 percent of exporting plants with high export intensity in the pre-crisis period were downgraded to medium class export intensity in all years between 1997 and 2000.

Table 6 Distribution of continuously operating plants (%) by export intensity classes, the period 1995-96 to 2000.

1995-96	1997			1998		
	Export intensity class:			Export intensity class:		
	Low	Medium	High	Low	Medium	Large
Export intensity class:						
Low	59.1	27.0	13.9	65.5	31.0	3.4
Medium	10.7	54.8	34.4	4.3	46.4	49.3
High	0.6	8.4	91.0	0.6	8.3	91.2

Table 6 continued

Table 9.6 concluded

1995-96	1999			2000		
	Export intensity class:			Export intensity class:		
	Low	Medium	Large	Low	Medium	Large
Export intensity class:						
Low	30.0	34.0	36.0	26.2	38.9	34.9
Medium	10.4	41.7	47.9	8.4	45.3	46.3
High	1.4	8.3	90.3	0.9	7.8	91.2

Note: See Table 5 for the definition of export intensity classes.

Table 7 shows the percentage difference in export intensity of continuously exporting plants during the crisis and pre-crisis periods. Plants with all output exported in the periods (i.e. plants with export intensity equal to 1) were excluded from the sample because retaining them would have been likely to understate the statistics. The mean and median of the difference are -14 and -10 per cent for the peak of the crisis (period 1997-98), reflecting the severity of the impact on exports. However, the average becomes positive for the early recovery period (1999-2000). This positive average mostly reflects the rapid export recovery in this period referred to above.

Table 7 Percentage difference in plant export propensity (%ΔEXP_{it}) between periods 1997-2000 and 1995-96: descriptive statistics

Statistics	Percentage differences in plant export intensity (%ΔEXP_{it})	
	Between 1997-98 and 1995-96 (Peak of the crisis)	Between 1999-2000 and 1995-96 (Early recovery)
Mean	-14.5	3.8
Median	-9.8	1.0
Standard deviation	69.1	89.5
Interquartile range	50.3	44.3
Percentiles:		
10%	-73.4	-84.2
25%	-43.1	-21.3
75%	7.3	22.9
90%	44.4	91.6

The table shows very a large variation in the difference, even in the early recovery period. The percentage difference for about 50 percent of the observations is bounded between -21 and 23 percent (i.e. the difference between the 75th and 25th percentiles). The bounding spread widens significantly, to between -84 and 92 percent, when another 30 percent of observations are added (i.e. the difference between the 90th and 10th percentiles). The description that many exporting plants sharply contracted their exported output is in line with the general perception that an export-led recovery did not materialise despite the large boost to competitiveness. The other part of the picture, which indicates a large expansion in export performance, suggests there are factors which allowed some plants to avoid the constraints of the export-led recovery. As indicated at the beginning, the results from the econometric analysis should shed some light on this.

Finally, the response of new plants entering the industry is outlined in Tables 8 and 9. Table 8 compares the share of exporting plants to total new entrants between the crisis and pre-crisis periods. The table suggests more export-oriented plants entered the industry after the crisis. The proportion of exporting entrants to total entrants increased from 14 per cent before the crisis to 21 per cent in 2000. This suggestion is supported by Table 9 which shows that the relative frequency of exporting entrants classified as plants with high export intensity increases in 2000 compared to before the crisis.

Table 8 Distribution of entrants (%) by type of exporting plants, 1995-2000

	1995-96	1997	1998	1999	2000
Non exporting	86.3	85.5	100.0	87.0	78.7
Exporting	13.7	14.5	0.0	13.0	21.3

Table 9 Distribution of exporting entrants (%) by the classes of export intensity, 1995-2000

	1995-96	1997	1998	1999	2000
Export intensity classes:					
Low	6.8	5.7	0.0	5.8	3.3
Medium	16.7	9.0	0.0	9.9	13.3
High	75.0	85.2	0.0	84.3	83.3

Note: see Table 5 for the definition of export intensity classes.

In summary, all tables seem to point to five basic facts about the export supply response of firms in the crisis period.

First, in contrast to the unclear indication on a positive export supply response to the crisis, the extent of the recovery in micro export behaviour is very clear. The export participation rate recovered immediately in 1999 and continued in the following year. As suggested by other studies, one important factor that propelled the recovery in 2000 was the demand recovery of other Asian countries from the region wide crisis of 1997/98.

Second, while there is evidence of switching status from exporting to non-exporting, the number of plants that switched was very small relative to the total non-exporting plants.

Third, there is evidence to suggest a large number of exporting plants increased their propensity to export during the crisis period. Moreover, exporting plants are unlikely to have been less export oriented.

Fourth, there is a large variation in the impact of the crisis on export performance across plants. This indicates there are some factors which allowed some plants to overcome the constraints of an export-led recovery.

Finally, there is evidence to suggest more export-oriented plants entered the industry after the crisis.

5.1.1 Did foreign plants in the industry respond better than their domestic counterparts?

As noted, Blomstrom and Lipsey (1993) demonstrated that multinationals in Latin America responded better to the debt crisis in the region in terms of export performance. It is useful to examine whether the same picture can be found for Indonesia in the case of the 1997/98 crisis. Therefore the analysis is extended based on several tables presented earlier.

Table 10 presents the distribution of the number of non-exporting plants in the pre-crisis period that switched to exporting during the crisis period by ownership status (foreign, private domestic and government). The table seems to suggest an increased importance of foreign ownership in determining switching behaviour. Excluding the distribution of 1998, the table shows an increasing trend in the number of foreign plants – relative to the total – that switched during this period. Confirming this suggestion, it is observed that there was a declining trend in the relative number of switching domestic-private plants in this period.

Table 10 Distribution of new exporting plants during the crisis period (%) by status of plant ownership

	1997	1998	1999	2000
Foreign	9.4	23.4	12.5	14.6
Domestic-private	83.2	72.3	81.3	77.6
Government	7.4	4.3	6.2	7.8
Total	100	100	100	100

However, the picture painted by Table 10 does not perfectly match the other direction of switching, i.e., from exporting to non-exporting. This is shown in Table 11, which presents the distribution of the number of exporting plants in the pre-crisis period that became non-exporting plants in the crisis period by the plants' ownership status. To strongly confirm the suggestion from Table 10, a robust indication of declining trend in the relative number of foreign plants that became non-exporting plants over the period should be expected. Table 11 either does not show this trend, or only weakly supports it. The relative number of foreign exporting plants becoming non-exporting ones in this period exhibits an inverted U-shaped pattern, which peaked in 1999.

Table 11 Distribution of the switched plants from exporting to non-exporting during the crisis period (%) by status of plant ownership

	1997	1998	1999	2000
Foreign	19	20.7	22.9	22.6
Domestic-private	75.3	73.9	72.6	72.3
Government	5.7	5.4	4.5	5.1
Total	100	100	100	100

To get a picture regarding the change in export intensity, Tables 6 and 7 were disaggregated by plant ownership status with the results presented in Tables 12 and 13. First, consider Table 12, which displays the transition matrices of export intensity of the continuously exporting plants by plant ownership status. There is a picture that foreign plants were more successful in increasing export intensity during the crisis period, particularly compared with domestic private plants. The percentage of plants able to move to a higher class of export intensity during the period in general is higher for the group of foreign plants, relative to the group of domestic private plants. For example, focusing on the transition matrix of 1999, about 57 per cent of foreign plants in the pre-crisis period moved from the medium export intensity class, to the high export intensity class compared with 43 per cent for the group of domestic private plants.

Table 12 Distribution of continuously exporting plants (%) by export intensity classes and ownership status, period 1995-96 to 2000

1995-96	1997			1998			1999			2000		
	Export intensity classes			Export intensity classes			Export intensity classes			Export intensity classes		
	Low	Medium	High	Low	Medium	Large	Low	Medium	Large	Low	Medium	Large
Export intensity classes:												
Low												
Foreign	47.8	30.4	21.7	50.0	25.0	25.0	17.4	47.8	34.8	24.1	48.3	27.6
Private domestic	64.7	23.5	11.8	68.0	32.0	0.0	31.9	29.0	39.1	28.4	35.2	36.4
Government	28.6	57.1	14.3	n.a	n.a	n.a	50.0	37.5	12.5	11.1	44.4	44.4
Medium												
Foreign	6.8	48.6	44.6	5.3	31.6	63.2	9.4	34.0	56.6	3.2	49.2	47.6
Private domestic	12.6	57.0	30.4	4.3	51.1	44.7	11.8	45.5	42.8	10.6	45.4	44.0
Government	5.6	55.6	38.9	0.0	66.7	33.3	0.0	26.3	73.7	0.0	26.7	73.3
High												
Foreign	0.4	6.7	92.9	0.0	13.1	86.9	0.9	6.6	92.6	0.7	4.5	94.8
Private domestic	0.7	8.5	90.8	0.9	6.0	93.2	1.5	8.3	90.2	0.9	8.8	90.3
Government	0.0	17.4	82.6	0.0	0.0	100.0	1.7	15.0	83.3	1.5	7.7	90.8

Notes: 1) The number of exporting plants is not the same for every pair of the plants distribution in respect to 1996 (e.g. 1996 and 1998 or 1996 and 2000). This is to take into account that exporting is not a once-and-forever phenomenon (see text for more details).
2) n.a. = not applicable.

The superior response of foreign plants can also be observed in Table 13, which displays the summary statistics of the percentage difference in export intensity between the crisis and pre-crisis periods of the continuously exporting plants. The average contraction in export intensity during the peak of the crisis is lowest for the group of foreign plants. As for the early recovery period, the average expansion in export intensity is higher for the group of foreign plants.

However, the statistics for the variation in the differences do not really suggest a superiority of foreign plants. While the variation during the peak of the crisis is similar across the group of plants, it changes significantly in the early recovery. The variation is significantly higher for the group of foreign plants, relative to the other groups of plants. This picture suggests foreign plants did not necessarily respond better than other plants in terms of export intensity.

Table 13 Percentage difference in plant export intensity (%ΔEXP_{it}) between periods 1997-2000 and 1995-96 by status of plant ownership: descriptive statistics

Statistics	Percentage differences in plant export intensity (%ΔEXP_{it})	
	Between 1997-98 and 1995-96 (Peak of the crisis)	Between 1999-2000 and 1995-96 (Early recovery)
Mean		
Foreign	-6.97	21.80
Private domestic	-17.03	-1.26
Government	-12.60	8.00
Median		
Foreign	-7.69	5.13
Private domestic	-10.50	0.00
Government	-10.97	1.00
Standard deviation		
Foreign	67.10	102.10
Private domestic	70.28	87.89
Government	60.64	65.30
Interquartile range		
Foreign	54.90	48.90
Private domestic	49.10	44.62
Government	68.00	28.87

All in all, the last five tables give an impression that foreign ownership is one of the important determinants of the export response supply in Indonesian manufacturing. In particular, the extent of switching to exporting increased during the crisis period and the expansion in export intensity is highest for foreign owned plants.

5.2 Regression results and discussion

5.2.1 Regression results

Export participation equations

Table 14 reports the maximum likelihood estimation results of the export participation equation (i.e. equation (1)) for the full sample, which consists of all continuously operating plants during the period 1997-2000. Some experimented specifications were reported in the table. The table reports the robust standard error since data examination revealed that the variance is heteroscedastic. The Wald test for overall significance in all specifications passes at the 1 per cent level. The Wald test for exogeneity of EP_{9596} was rejected at the 1 percent level in all specifications, confirming the prediction that the variable is endogenous. The instruments used were two year lags of the EP variable, EP_{93} and EP_{94}, and a one year lag of all explanatory variables representing plant characteristics.

$PCI2_{9596}$ and $PSI2_{9596}$ were used because these variables gives better results than those derived from their alternative variables, namely $PCI1_{9596}$ and $PSI1_{9596}$,. The industry factor intensity variables $ICI2$ and $ISI1$ yielded similar results to $ICI1$ and $ISI2$. Based on overall significance tests (the Wald test), only $ICI1$ and $ISI2$ based estimates are reported.

Table 14 Determinants of export participation in the crisis period: regressions results

Dependent variable	$EP_{i,t}$							
Specification	1	2	3	4	5	6	7	8
$EP_{i,9596}$	1.755 (53.79)**	1.755 (53.79)**	1.889 (65.21)**	1.667 (47.73)**	1.696 (49.63)**	1.696 (49.58)**	1.666 (47.49)**	1.688 (49.53)**
$\log(LP_{i,9596})$	0.035 (3.45)**	0.035 (3.49)**	0.048 (4.78)**	0.036 (3.54)**	0.039 (3.78)**	0.031 (3.12)**	0.036 (3.49)**	0.036 (3.60)**
$PCI2_{i,9596}$ [(a)]	0.010 (2.60)**	0.010 (2.64)**	0.010 (2.85)**	0.041 (1.99)*	0.010 (2.58)**	0.044 (2.25)*	0.040 (1.92)+	0.010 (2.60)**
$PSI2_{i,9596}$ [(a)]	0.029 (1.87)+	0.028 (1.88)+	0.033 (2.17)*	0.025 (1.67)+	0.031 (2.02)*	0.028 (1.80)+	0.041 (1.63)	0.032 (2.01)*
$FOR_{i,9596}$	0.062 (1.39)		0.074 (1.63)	0.035 (0.78)	0.049 (1.08)	0.021 (0.48)	0.034 (0.75)	0.024 (0.54)
$DFOR_{i,9596}$		-0.074 (0.93)						
$DFOR_{i,9596}*FOR_{i,9596}$		0.159 (1.44)						
$\log(SIZE_{i,9596})$	0.128 (13.37)**	0.128 (13.41)**		0.129 (13.49)**	0.129 (13.40)**	0.127 (13.75)**	0.130 (13.53)**	0.123 (13.29)**
$SIZE_{i,9596}$ [(a)]			0.005 (3.40)**					
$(SIZE_{i,9596})^2$ [(b)]			-0.008 (1.47)					
$\log(AGE_{i,96})$	-0.075 (5.96)**	-0.075 (5.96)**	-0.050 (4.02)**	-0.061 (4.82)**	-0.065 (5.14)**	-0.014 (4.76)**	-0.062 (4.86)**	-0.056 (4.47)**
$IMDEP_{i,9596}$	-0.035 (0.82)	-0.034 (0.79)	0.017 (0.41)	-0.037 (0.88)	-0.022 (0.51)	-0.111 (2.73)**	-0.035 (0.81)	-0.093 (2.31)*
$INEXP_{j,9596}$				1.087 (9.51)**		1.017 (14.07)**	1.102 (9.58)**	0.254 (12.98)**
$RNEXP_{j,9596}$				0.613 (6.12)**		0.547 (5.60)**	0.612 (6.10)**	0.558 (5.74)**

Table 14 continued

Table 14 concluded

Dependent variable	EP_t							
Specification	1	2	3	4	5	6	7	8
$IEXP_{j,9596}$					0.496 (6.54)**			
$REXP_{j,9596}$					0.442 (6.42)**			
$DRI_{j,9596}$						0.027 (0.94)		
$DLI_{j,9596}$						0.004 (0.16)		
$IRI_{j,95}$							0.438 (1.82)+	
$ICI1_{j,9596}^{(b)}$							-0.087 (0.84)	
$ISI2_{j,9596}$							0.087 (1.19)	
$COMP_{j,89}$								0.084 (3.77)**
Year Dummy 1998	-1.343 (34.71)**	-1.343 (34.71)**	-1.325 (34.63)**	-1.354 (34.76)**	-1.352 (34.60)**	-1.351 (34.63)**	-1.354 (34.75)**	-1.352 (34.69)**
Year Dummy 1999	-0.023 (0.97)	-0.023 (0.97)	-0.018 (0.77)	-0.024 (0.98)	-0.023 (0.94)	-0.023 (0.98)	-0.023 (0.98)	-0.023 (0.98)
Year Dummy 2000	0.115 (0.00)	0.115 (5.00)**	0.118 (5.17)**	0.117 (5.01)**	0.116 (5.03)**	0.115 (4.98)**	0.117 (5.01)**	0.116 (5.00)**
Dummy variables for industries	Included	Included	Included	Included	Included	Not included	Included	Not included
Dummy variable for provinces	Included	Included	Included	Included	Included	Included	Included	Included
Constant	-2.565 (14.87)**	-2.568 (14.60)**	-2.122 (12.60)**	-2.932 (16.21)**	-2.908 (15.54)**	-2.930 (15.98)**	-3.276 (13.69)**	-2.956 (16.44)**
Wald chi2	10429.5	10379.6	10383.0	10256.1	10304.86	10231.5	10264.4	10172.4
Wald exogeneity test	484.8	391.5	392.1	317.7	339.97	332.6	315.3	331.5

Notes: 1) Robust Z statistics in parentheses

2) Significance level: ** significant at 1%; * significant at 5%; + significant at 10%

a) The coefficient was multiplied by 100 to improve presentation

b) The coefficient was multiplied by 10^5 to improve presentation

Three variables, LP_{9596}, $SIZE_{9596}$ and AGE_{96}, were experimented with in logarithmic forms to capture the possible non-linear relationship to the dependent variables. Based on the overall significance test, we decided to specify the variables in their logarithmic forms. Industry and region dummy variables were defined at four-digit ISIC level and provinces.

The coefficients on year dummy variables reconfirm much of what was derived from the descriptive results. The probability to export was significantly low at the peak of the crisis (i.e. 1998) but began to improve in 2000. The statistical insignificance of the coefficients for the year dummy variable 1999 suggests that year marked the early stage of the recovery.

In specification 1, the export participation response in the crisis period is specified only as a function of all firm level variables.

The coefficient of EP_{9596} is large, positive and statistically very significant. Therefore, being exporting plants in the pre-crisis period had a strong and positive impact on the likelihood of continuing to export. This confirms the earlier observation in the descriptive analysis where only a very small fraction of non-exporting plants in the crisis period switched to exporting. The magnitude of the variable suggests exporting history is economically important. Exporting before the crisis increased the probability of continuing to export during the crisis period by 35 per cent.

In addition, EP_{9596} is one of the strongest variables affecting export participation. Examining the correlation matrix in Appendix 1, the partial correlation coefficient between EP_{9596} and EP is 0.4. This is substantially large compared with the correlation coefficient of the other explanatory variables.

All in all, the findings support the theoretical models of export decision with sunk-export costs.

The coefficients of $\log(LP_{9596})$, $PCI2_{9596}$, $PSI2_{9596}$ are positive and statistically significant, although $PSI2_{9596}$ is only moderately significant at the 10 per cent level. This finding strongly supports the self-selection hypothesis, where firms need to be efficient to compete in competitive export markets. Despite this, the coefficients of $PCI2_{9596}$, $PSI2_{9596}$ are very small, indicating that the positive effect of plant level factor intensity is not economically important.

Although positive, the coefficient of FOR_{9596} is not statistically significant (even at the 10 per cent level). Thus, foreign ownership does not guarantee a positive response in export participation. This is a surprising finding, particularly in light of the earlier results, and those from other studies (e.g. Blomstrom and Lipsey 1993). One possible explanation is that the positive effect might have applied only to plants with a very high foreign ownership share. In other words, it essentially implies the hypothesis that parent companies could restrict the flow of their firm-specific resources, depending on the foreign share in the affiliates. Therefore, testing this hypothesis means seeking validity for this possible explanation. This was done in specification 2, by substituting FOR_{9596} for $DFOR_{9596}$ and $DFOR_{9596} * FOR_{9596}$. The coefficient of the interaction variable is positive but is not statistically significant. Therefore, the results only weakly validate the possible explanation, despite providing some support for the hypothesis. Before speculating further, it is important to examine whether the results would change if the equation was estimated on the separate sample of exporting and non-exporting plants. The insignificant coefficient, both on FOR_{9596} and $DFOR_{9596} * FOR_{9596}$, may have been affected simply by the structure of the sample.

The results show that the specification of foreign ownership in specification 2 can be used as an alternative specification to FOR_{9596} in specification 1. The coefficients of the other variables in these two specifications are the same. However, based on the overall specification test, only the latter is considered as the basis of estimation in the other specifications.

The coefficient of $\log(SIZE_{9596})$ is positive and statistically very significant, suggesting larger plants had a higher probability of participating in export during the crisis period.[6] In addition, the correlation matrix in Appendix 1 shows the positive relationship was strong in comparison to those of the other explanatory variables. The finding supports the general hypothesis that the probability of being an exporter increases with size. More importantly, it

[6] Linear specification of $SIZE_{9596}$ was experimented with at the experimental stage, but did not perform very well compared to its logarithm specification in terms of the overall significance test.

provides additional evidence to support the self-selection hypothesis, since one possible reason for the observed positive relationship is the cost advantage derived from economies of scale.

It is worth commenting here on the experimental result with the quadratic term of $SIZE_{9596}$ (specification 3). The quadratic specification is of particular interest to an established proposition in the exporting literature, namely that the effect of size on firms' exporting behaviour and performance may be positive but diminishes (Bonaccorsi 1992). The results only weakly support this proposition. The coefficient of the quadratic term, although negative as proposed, was statistically insignificant. Further, this specification performed less well in terms of the overall significance test compared with specification 1. For this reason, the log specification is the preferred specification.

The result indicates younger firms had a higher chance of participating in export during the crisis period. The coefficient of $log(AGE_{96})$ is negative and statistically significant, not only in specifications 1 to 3, but also in the other specifications. The finding points to the 'dynamism' argument of younger firms and the assertion that younger firms in Indonesia tend to be more export orientated than older firms.

$IMDEP_{9596}$ is negatively related to export participation during the crisis period. This finding supports the theoretical prediction that the positive impact of exchange rate depreciation on performance can be mitigated if a firm uses a large share of imported input in their input mix (Forbes 2002). It also supports the finding from The World Bank's firm-level survey (as reported in Bappenas et al. (2000), that manufacturing exporters in Indonesia rated the rising costs caused by the sharp exchange rate depreciation as one of the major causes for their declining performance during the crisis. Despite the relationship, the coefficients are often statistically insignificant across the specifications. Therefore, being dependent on imported inputs does not necessarily mean a lower chance of participating in export during the crisis period.

Specifications 4 and 5 introduced the variables representing the export spillover effect. The results of these specifications clearly point to the importance of spillovers, either for industry or region. All export spillover variables ($INEXP_{9596}$, $RNEXP_{9596}$, $IEXP_{9596}$ and $REXP_{9596}$) are positive and statistically very significant. Thus, a plant's export participation response is likely to have been higher if located in either an export oriented industry or a region with a high density of exporters. The finding supports the theoretical prediction that externalities arising from local export activities help to reduce the cost of entry into export markets.

Specifications 6, 7 and 8 introduce the variables representing industry competitiveness prior to the crisis. DCI_{9596} was used as the base dummy variable (in specification 6). The export spillover variables included in these specifications were $INEXP_{9596}$ and $RNEXP_{9596}$, based on the overall significant test.[7]

Of all the variables used to proxy factor intensity, only the coefficient of IRI_{9596} was statistically significant – albeit only at the 10 per cent level. However, this does not mean industry competitiveness prior to the crisis was not important. As mentioned, the factor intensity variables may hide much over time variation in industry competitiveness. For this reason, $COMP_{89}$ was introduced, substituting for the other factor intensity variables (i.e. specification 8).[8] This specification gives a better result as now the coefficient of $COMP_{89}$ is very statistically significant.

Therefore, the results support the hypothesis of the Heckscher-Ohlin model. The coefficient of all considered industry factor intensity variables shows the expected sign. From the results, it is suggested that the probability of participating in the export market during the crisis period may have been higher for plants in industries which had a high RCA index previously and, to some extent, resource intensive industries.

Table 15 presents the maximum likelihood estimation results of equation (1) for the exporting sample. Obviously, EP_{9596} was not included because the sample contains only exporting plants,.

[7] At the experimental stage, specifications with $IEXP_{9596}$ and $REXP_{9596}$ were tried and the results were similar.

[8] Industry dummy variables were not included in the specifications where the industry factor intensity variables are the dummy variables (i.e. DRI_{9596} and DLI_{9596}) and $COMP_{89}$. This is to minimise the collinearity problem between the industry factor intensity variables and the industry dummies.

Table 15 Determinants of export participation in the crisis period, sample of all exporting plants: regressions results

Dependent variable	$EP_{i,t}$									
Specification	9	10	11	12	13	14	15	16	17	18
$\log(LP_{i,9596})$	0.016 (1.11)	0.017 (1.18)	0.030 (2.28)*			0.021 (1.42)	0.016 (1.10)	0.01 -0.67	0.029 (1.99)*	0.011 -0.79
$PCI2_{i,9596}$ [(a)]	-0.002 (0.09)	-0.002 (0.08)		0.027 (1.01)		-0.001 (0.35)	-0.003 (0.11)	0.001 -0.05	0.004 -0.15	0.007 -0.27
$PSI2_{i,9596}$	0.002 (2.19)*	0.002 (2.27)*			0.002 (2.96)**	0.002 (2.21)*	0.002 (2.48)*	0.002 (2.30)*	0.002 (2.14)*	0.002 (2.55)*
$FOR_{i,9596}$	0.150 (3.17)**		0.164 (3.50)**	0.180 (3.87)**	0.155 (3.28)**	0.121 (2.52)*	0.120 (2.52)*	0.123 (2.62)**	0.123 (2.56)*	0.122 (2.60)**
$DFOR_{i,9596}$		-0.106 (1.29)								
$DFOR_{i,9596}*FOR_{i,9596}$		0.280 (2.52)*								
$\log(SIZE_{i,9596})$	0.097 (8.45)**	0.098 (8.51)**	0.098 (8.49)**	0.099 (8.60)**	0.098 (8.52)**	0.097 (8.40)**	0.092 (7.89)**	0.092 (8.32)**	0.098 (8.49)**	0.088 (7.93)**
$\log(AGE_{i,96})$	-0.050 (3.25)**	-0.050 (3.25)**	-0.047 (3.10)**	-0.045 (2.99)**	-0.049 (3.22)**	-0.043 (2.74)**	-0.038 (2.46)*	-0.042 (2.80)**	-0.035 (2.24)*	-0.039 (2.57)*
$IMDEP_{i,9596}$	-0.004 (0.07)	-0.005 (0.08)	0.009 (0.17)	0.018 (0.33)	-0.001 (0.01)	-0.013 (0.23)	-0.003 (0.05)	-0.097 (1.94)+	-0.022 -0.41	-0.079 -1.59
$INEXP_{j,9596}$						0.959 (6.17)**		0.821 (8.77)**	0.927 (5.89)**	0.781 (8.32)**
$RNEXP_{j,9596}$						0.322 (2.60)**		0.245 (2.06)*	0.3 (2.42)*	0.249 (2.09)*
$IEXP_{j,9596}$							0.647 (6.12)**			
$REXP_{j,9596}$							0.536 (5.72)**			

Table 15 continued

Table 15 concluded

Dependent variable	$EP_{i,t}$									
Specification	9	10	11	12	13	14	15	16	17	18
$DRI_{j,9596}$								0.068 -1.52		
$DLI_{j,9596}$								0.049 -1.18		
$IRI_{j,95}$									0.636 (2.32)*	
$ICI1_{j,9596}^{(b)}$									-0.286 (1.91)+	
$ISI2_{j,9596}$									-0.297 (2.65)**	
$COMP_{j,89}$										0.106 (3.25)**
Year Dummy 1998	-1.415 (35.38)**	-1.416 (35.39)**	-1.414 (35.35)**	-1.414 (35.34)**	-1.415 (35.37)**	-1.418 (35.34)**	-1.420 (35.32)**	-1.413 (35.29)**	-1.419 (35.33)**	-1.415 (35.31)**
Year Dummy 1999	-0.047 (1.48)	-0.047 (1.48)	-0.047 (1.48)	-0.047 (1.49)	-0.047 (1.48)	-0.047 (1.48)	-0.047 (1.48)	-0.047 -1.48	-0.047 -1.48	-0.047 -1.48
Year Dummy 2000	0.135 (4.27)**	0.135 (4.27)**	0.135 (4.27)**	0.135 (4.27)**	0.135 (4.27)**	0.136 (4.30)**	0.136 (4.29)**	0.135 (4.27)**	0.136 (4.30)**	0.135 (4.27)**
Dummy variables for industries	Included	Included	Included	Included	Included	Included	Included	Not included	Included	Not included
Dummy variable for provinces	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included
Constant	-0.878 (3.62)**	-0.879 (3.63)**	-0.882 (3.65)**	-0.761 (3.23)**	-0.820 (3.46)**	-1.258 (5.08)**	-1.367 (5.41)**	-1.224 (5.01)**	-1.554 (4.99)**	-1.221 (5.07)**
Pseudo R-squared Wald chi2	0.16 1965.8	0.16 1961.7	0.16 1953.8	0.16 1948.6	0.16 1957.3	0.16 1989.0	0.16 1983.1	0.16 1985.2	0.16 1934.8	0.16 1945.6

Notes: 1) Robust Z statistics in parentheses

2) Significance level: ** significant at 1%; * significant at 5%; + significant at 10%

a) The coefficient was multiplied by 100 to improve presentation

b) The coefficient was multiplied by 10^5 to improve presentation

Although most of the results derived from the estimation for the full sample hold, a few differences are observed. First, there seems to be weaker evidence for the self-selection hypothesis. In the first specification, only $PSI2_{9596}$ is statistically significant among the relevant variables ($\log(LP_{9596})$, $PCI2_{9596}$, $PSI2_{9596}$). Moreover, $PCI2_{9596}$ shows a negative sign. While this might be showing the underlying behaviour, these results may have been affected by strong collinearity between the relevant variables. Because of this, each of the variables was included separately in specifications 11 to 13 and the results improved. Now $\log(LP_{9596})$ is statistically significant and $PCI2_{9596}$ shows the expected sign, although it is statistically insignificant. Therefore in conclusion, the results still provide some support for the self-selection hypothesis.

Much stronger evidence is observed for the positive effect of foreign ownership. The coefficients of FOR_{9596} are positive across all specifications and very statistically significant. Therefore, foreign plants are likely to have continued to export during the crisis. A 10 per cent increase in foreign share increases the probability of survival in exporting during the crisis by 27 per cent.

The coefficient of $DFOR_{9596} * FOR_{9596}$ is now statistically significant (see specification 10). Along with a positive sign, the coefficient shows the probability of surviving as exporters during the crisis period was higher for foreign plants with a higher foreign share. This suggests the channels provided by parent companies that allowed affiliates to continue exporting, such as marketing networks and financial support, could only have been beneficial if there was a substantial degree of foreign control in the affiliates. Therefore, this finding gives more convincing evidence on the hypothesis that parent companies might restrict the transfer of their firm specific assets (Ramstetter 1999), since the channels are usually part of the firm specific assets transferred to affiliates.

Finally, more convincing evidence is also observed for the impact of industry factor intensity. IRI_{9596} and $COMP_{89}$ are now more statistically significant compared with the results for the full sample. Moreover, $ISI2_{9596}$ is negatively related to export participation during the crisis period, suggesting that the probability to remain exporting in the period was higher for plants in low-skilled labour intensive industries.

Table 16 presents the maximum likelihood estimation results for the export participation equation for the non-exporting sample. As with the previous estimations, there are only a few differences compared to the results for the full sample. First, there is much stronger evidence supporting the self-selection hypothesis. The coefficients of $\log(LP_{9596})$ and $PCI2_{9596}$ are very statistically significant. These results hold even when the variables are included individually to minimize collinearity between $\log(LP_{9596})$, $PCI2_{9596}$, $PSI2_{9596}$ (specifications 21 to 23).

Table 16 Determinants of export participation in the crisis period, sample of the non-exporting plants: regressions results

Dependent variable	$EP_{i,t}$									
Specification	19	20	21	22	23	24	25	26	27	28
$\log(LP_{i,9596})$	0.048 (3.26)**	0.048 (3.23)**	0.059 (4.17)**			0.041 (2.79)**	0.057 (3.82)**	0.037 (2.48)*	0.044 (2.92)**	0.037 (2.52)*
$PCI2_{i,9596}$	0.001 (2.68)**	0.001 (2.62)**		0.001 (3.86)**		0.001 (2.10)*	0.001 (2.67)**	0.001 (1.83)+	0.001 (2.13)*	0.001 (2.15)*
$PSI2_{i,9596}$ [(a)]	-0.001 (0.09)	-0.001 (0.10)			0.020 (1.45)	-0.006 (0.46)	0.001 (0.07)	-0.005 (0.37)	-0.006 (0.43)	-0.002 (0.16)
$FOR_{i,9596}$	0.378 (4.08)**		0.379 (4.09)**	0.429 (4.71)**	0.442 (4.91)**	0.325 (3.51)**	0.347 (3.75)**	0.318 (3.47)**	0.325 (3.52)**	0.324 (3.55)**
$DFOR_{i,9596}$		0.031 (0.18)								
$DFOR_{i,9596}*FOR_{i,9596}$		0.336 (1.34)								
$\log(SIZE_{i,9596})$	0.281 (21.26)**	0.281 (21.25)**	0.283 (21.36)**	0.292 (22.95)**	0.296 (23.31)**	0.272 (20.45)**	0.285 (21.39)**	0.268 (21.27)**	0.272 (20.34)**	0.265 (21.01)**
$\log(AGE_{i,96})$	-0.107 (6.92)**	-0.106 (6.92)**	-0.106 (6.89)**	-0.107 (6.94)**	-0.106 (6.90)**	-0.085 (5.42)**	-0.098 (6.28)**	-0.084 (5.35)**	-0.087 (5.52)**	-0.082 (5.25)**
$IMDEP_{i,9596}$	0.188 (2.92)**	0.187 (2.90)**	0.188 (2.91)**	0.213 (3.35)**	0.219 (3.44)**	0.129 (1.96)+	0.175 (2.69)**	0.060 (0.95)	0.131 (1.99)*	0.056 (0.89)
$INEXP_{j,9596}$						1.494 (9.01)**		1.686 (17.44)**	1.518 (9.04)**	1.628 (16.38)**
$RNEXP_{j,9596}$						1.353 (8.52)**		1.301 (8.38)**	1.351 (8.49)**	1.260 (8.15)**
$IEXP_{j,9596}$							0.618 (5.57)**			
$REXP_{j,9596}$							0.659 (6.45)**			

Table 16 continued

Table 16 concluded

Dependent variable	$EP_{i,t}$									
Specification	19	20	21	22	23	24	25	26	27	28
$DRI_{j,9596}$								0.104 (2.57)*		
$DLI_{j,9596}$								0.051 (1.28)		
$IRI_{j,95}$									0.038 (0.12)	
$ICI1_{j,9596}^{(b)}$									-0.277 (1.70)+	
$ISI2_{j,9596}$									0.126 (1.16)	
$COMP_{j,89}$										0.069 (2.22)*
Year Dummy 1998	-0.980 (15.53)**	-0.980 (15.53)**	-0.979 (15.52)**	-0.979 (15.50)**	-0.977 (15.48)**	-0.996 (15.62)**	-0.984 (15.47)**	-0.990 (15.55)**	-0.996 (15.60)**	-0.989 (15.59)**
Year Dummy 1999	-0.094 (2.67)**	-0.094 (2.67)**	-0.094 (2.67)**	-0.092 (2.61)**	-0.091 (2.59)**	-0.097 (2.73)**	-0.092 (2.62)**	-0.094 (2.65)**	-0.096 (2.71)**	-0.094 (2.65)**
Year Dummy 2000	0.015 (0.45)	0.015 (0.45)	0.015 (0.46)	0.017 (0.50)	0.018 (0.52)	0.012 (0.35)	0.016 (0.47)	0.014 (0.42)	0.013 (0.37)	0.015 (0.43)
Dummy variables for industries	Included	Included	Included	Included	Included	Included	Included	Not included	Included	Not included
Dummy variable for provinces	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included
Constant	-3.045 (15.13)**	-3.045 (15.12)**	-3.079 (15.32)**	-2.908 (14.84)**	-2.914 (14.86)**	-3.498 (16.53)**	-3.449 (16.57)**	-3.583 (16.81)**	-3.567 (11.97)**	-3.512 (16.76)**
Pseudo R-squared Wald chi2	0.15 1354.4	0.15 1355.2	0.15 1348.5	0.15 1342.3	0.15 1342.4	0.16 1368.3	0.17 1439.1	0.16 1361.1	0.17 1449.5	0.16 1323.2

Notes: 1) Robust Z statistics in parentheses

2) Significance level: ** significant at 1%; * significant at 5%; + significant at 10%

a) The coefficient was multiplied by 100 to improve presentation

b) The coefficient was multiplied by 10^5 to improve presentation

Second, as with the estimation for the exporting sample, stronger evidence for the positive effect of foreign ownership is also observed. The coefficients of FOR_{9596} are statistically very significant across all specifications. Moreover, the coefficients suggest an economically important effect for foreign ownership. Based on specification 19, a 10 per cent increase in foreign share increases by 29 per cent the probability of non-exporting plants before the crisis becoming exporting plants in the crisis period.

The third difference is that the coefficients of $IMDEP_{9596}$ are positive and often statistically significant across all specifications. This is in contrast to the earlier finding for full and exporting samples and hence does not support our earlier comment. Despite this, the results are consistent with the self-selection hypothesis. The intensive use of imported inputs is often thought to be positively related to product quality. As mentioned, it is often asserted in the literature that one factor determining success in the export market is the ability to produce high quality products.

Finally, similar to the results for the exporting sample, there is more convincing evidence on the effect of industry factor intensity. $COMP_{89}$ and DRI_{9596} become statistically significant, although the opposite is observed for IRI_{9596}. This finding supports the earlier comment made based on the results for the full sample.

Export propensity adjustment equation

Table 17 reports the results from the OLS estimations of some alternative specifications for the export propensity adjustment equation (i.e. equation (2)). The corresponding results of the maximum likelihood estimations for the export participation equation were presented and discussed earlier in Table 15. The estimated coefficients of the inverse Mills ratio are positive and significant in all specifications, suggesting a positive correlation in the disturbance between the export participation equation and the export propensity adjustment equation. Therefore, neglecting this correlation would likely give biased estimates in the export propensity adjustment equation.

Specification 29 in the table includes all plant level variables. Two coefficients of variables representing superior characteristics ($\log(LP_{9596})$, $PSI2_{9596}$) have the expected signs and the coefficient of $PSI2_{9596}$ was statistically very significant. In contrast, the coefficient of

$PCI2_{9596}$ does not show the expected sign. Again, this may be due to collinearity between the three variables. Therefore, each of these variables was introduced individually in specifications 31 to 33 and the result improved. The coefficient of $PCI2_{9596}$ in specification 32 changes to positive and is now statistically very significant.

The results show the importance of foreign ownership. The coefficients of FOR_{9596} are positive, large and statistically very significant across all specifications. This finding confirms the earlier observation in the descriptive analysis and is in line with the finding from the estimation of export participation equations for both exporting and non-exporting samples. The results in specification 30 also show a positive coefficient of $DFOR_{9596} * FOR_{9596}$, providing more support for the hypothesis that parent companies might restrict the transfer of firm specific assets to affiliates. This finding is also consistent with the finding from the export participation equation.

Table 17 Determinants of adjustment in export propensity during the crisis: regression results

Dependent variable	$\Delta EXP_{i,t}$										
Specification	29	30	31	32	33	34	35	36	37	38	39
$\log(LP_{i,9596})$	0.131	0.135	0.270			0.160	0.161	0.123	0.100	0.218	0.110
	(5.74)**	(5.89)**	(12.01)**			(6.88)**	(6.94)**	(5.40)**	(4.45)**	(8.90)**	(4.89)**
$PCI2_{i,9596}$ [(a)]	-0.041	-0.041		0.020		-0.016	-0.010	-0.043	0.043	0.014	0.010
	(0.86)	(0.85)		(5.01)**		(0.33)	(1.68)+	(0.88)	(0.88)	(0.26)	(1.82)+
$PSI2_{i,9596}$	0.016	0.016			0.018	0.016	0.016	0.016	0.017	0.015	0.018
	(11.92)**	(11.99)**			(14.35)**	(12.39)**	(12.08)**	(12.22)**	(13.08)**	(11.86)**	(13.43)**
$FOR_{i,9596}$	0.741		0.908	1.066	0.783	0.909	0.573	0.525	0.569	0.582	0.568
	(8.24)**		(9.88)**	(11.28)**	(8.65)**	(9.67)**	(6.73)**	(6.20)**	(6.64)**	(6.82)**	(6.66)**
$DFOR_{i,9596}$		-0.442									
		(3.22)**									
$DFOR_{i,9596}*FOR_{i,9596}$		1.276									
		(6.31)**									
$\log(SIZE_{i,9596})$	0.653	0.655	0.676	0.696	0.659		0.650	0.597	0.604	0.651	0.583
	(18.08)**	(18.05)**	(18.68)**	(18.98)**	(18.09)**		(18.52)**	(17.76)**	(17.32)**	(18.50)**	(17.42)**
$SIZE_{i,9596}$						0.001					
						(14.89)**					
$(SIZE_{i,9596})^{2}$ [(b)]						-0.002					
						(14.91)**					
$\log(AGE_{i,96})$	-0.257	-0.255	-0.242	-0.230	-0.253	-0.122	-0.224	-0.177	-0.210	-0.170	-0.190
	(8.67)**	(8.63)**	(8.30)**	(7.98)**	(8.55)**	(4.62)**	(7.87)**	(6.36)**	(7.40)**	(6.15)**	(6.85)**
$IMDEP_{i,9596}$	-0.085	-0.089	0.040	0.120	-0.063	0.180	-0.127	-0.085	-0.580	-0.204	-0.520
	(0.98)	(1.02)	(0.45)	(1.37)	(0.72)	(2.05)*	(1.46)	(0.97)	(6.71)**	(2.32)*	(6.16)**
$INEXP_{j,9596}$							5.794		4.494	5.437	4.300
							(14.74)**		(14.45)**	(14.20)**	(14.46)**
$RNEXP_{j,9596}$							1.472		1.050	1.307	1.023
							(6.70)**		(5.11)**	(6.04)**	(5.00)**

Table 17 continued

Table 17 concluded

Dependent variable	$\Delta EXP_{i,t}$										
Specification	29	30	31	32	33	34	35	36	37	38	39
$IEXP_{j,9596}$								3.558 (13.39)**			
$REXP_{j,9596}$								3.239 (14.38)**			
$DRI_{j,9596}$									0.376 (5.08)**		
$DLI_{j,9596}$									0.176 (2.63)**		
$IRI_{j,95}$										4.531 (10.67)**	
$ICI1_{j,9596}$ (a)										-0.002 (7.10)**	
$ISI2_{j,9596}$										-2.158 (10.95)**	
$COMP_{j,89}$											0.476 (7.56)**
Mills ratio	8.842 (19.36)**	8.811 (19.36)**	9.116 (19.98)**	9.271 (20.12)**	8.860 (19.26)**	9.540 (19.75)**	8.839 (20.08)**	8.489 (19.36)**	8.938 (19.19)**	8.732 (20.04)**	8.913 (19.34)**
Year Dummy 1998	-11.080 (22.87)**	-11.050 (22.88)**	-11.363 (23.50)**	-11.522 (23.62)**	-11.099 (22.74)**	-11.791 (23.08)**	-11.093 (23.71)**	-10.737 (23.00)**	-11.170 (22.65)**	-10.988 (23.70)**	-11.150 (22.84)**
Year Dummy 1999	-0.281 (5.23)**	-0.280 (5.22)**	-0.289 (5.39)**	-0.294 (5.47)**	-0.282 (5.24)**	-0.300 (5.57)**	-0.280 (5.23)**	-0.271 (5.07)**	-0.284 (5.26)**	-0.277 (5.18)**	-0.283 (5.25)**
Year Dummy 2000	1.015 (16.33)**	1.013 (16.32)**	1.037 (16.70)**	1.050 (16.85)**	1.016 (16.30)**	1.071 (16.93)**	1.019 (16.61)**	0.990 (16.09)**	1.023 (16.33)**	1.011 (16.55)**	1.022 (16.39)**
Dummy variables for industries	Included	Included	Included	Included	Included	Included	Included	Included	Not included	Included	Not included
Dummy variable for provinces	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included
Constant	-15.494 (20.90)**	-15.456 (20.90)**	-15.924 (21.44)**	-15.030 (21.24)**	-15.050 (20.76)**	-13.190 (20.72)**	-17.723 (21.26)**	-17.807 (20.66)**	-17.371 (20.24)**	-19.648 (20.72)**	-17.268 (20.34)**
R-squared	0.19	0.19	0.18	0.18	0.19	0.19	0.19	0.19	0.18	0.19	0.18
F-statistics	69.09	67.92	71.6	71.66	71.09	68.33	68.52	67.4	107.89	66.39	112.47

Notes: 1) Robust t statistics in parentheses

2) Significance level: ** significant at 1%; * significant at 5%; + significant at 10%

a) The coefficient was multiplied by 100 to improve presentation

b) The coefficient was multiplied by 10^5 to improve presentation

To be consistent with earlier estimations, the variable that represents foreign ownership in the other specifications is specified by FOR_{9596} instead of $DFOR_{9596}$ and $DFOR_{9596} * FOR_{9596}$.

The result in specification 29 also found a positive and statistically significant coefficient of $\log(SIZE_{9596})$. The coefficient suggests the effect of firm size is large. A 10 percent increase in plant size causes export intensity in the crisis period to increase by 6.5 percentage points.

A clearer picture on the hypothesised diminishing marginal effect of size is given by the result of specification 34. The quadratic term is positive and statistically significant, implying the elasticity of ΔEXP with respect to $SIZE_{9596}$ decreases as size increases. However, the coefficient is very small which suggests that for all practical purposes the quadratic term can be ignored. Nevertheless, as the underlying relationship of $SIZE_{9596}$ was non-linear in this sample, the logarithm specification of $SIZE_{9596}$ as in specification 29 was adopted.

For the other firm level variables in specification 29, which are $\log(AGE_{96})$ and $IMDEP_{9596}$, the results show results similar to those of the estimation of the export participation equation for the full sample. Therefore, exporting plants which were old and use large imported inputs tend to have exported less in the crisis period.

The coefficients of export spillover variables in specifications 35 and 36 are positive and statistically significant. The coefficients of $INEXP_{9596}$ and $RNEXP_{9596}$ show the effect of industry-specific export spillovers is much larger than the effect of region-specific export spillovers. This suggests that, for any exporting plant, having similarities in product is more important than being located in a region with good export-supporting facilities.

The results from the last three specifications show the importance of industry competitiveness in determining export performance during the crisis period and support the prediction of the Heckscher-Ohlin model. The coefficients of variables that represent industry factor intensity show the expected signs and are statistically very significant. Exporting plants in resource- and labour- intensive industries are suggested to have been more successful in increasing export performance during the crisis period, compared with exporters in other industries.

5.2.2 Discussion

While the above results have provided a picture of the determinants of the export supply response, several other points are worth discussing.

First, the strong and positive effect for exporting history (EP_{9596}) highlights the presumption that exporting is a costly and sometimes slow commercial activity to initiate. This is also confirmed by the strong and positive effect of export spillover variables ($INEXP_{9596}$, $RNEXP_{9596}$, $IEXP_{9596}$ and $REXP_{9596}$). If exporting was not costly, we should have been observed an insignificant effect for these variables.

This implication is important. The increase in competitiveness from the sharp exchange rate depreciation is likely to have been captured only by plants which had been exporting prior to the crisis. In Indonesian manufacturing, these plants are relatively small compared with the entire population of plants. This inference can perhaps explain the low switching rate from non-exporting to exporting as observed in the descriptive analysis. The inference further implies the common view that firms in crisis affected countries should have been able to redirect sales to the export market should be treated with caution. The finding suggests it is reasonable to observe a quick adjustment for firms that have had some exporting experience, but this is not necessarily so for firms that sell their entire output to the domestic market. For the latter, while the redirection is still possible, it is likely to happen with a lag.

Differences in efficiency and ability to produce export quality are also the key factors in shaping export response. This is implied by the results related to the $\log(LP_{9596})$, CI_{9596}, SI_{9596} and $log(SIZE_{9596})$ variables. They strongly support the self-selection hypothesis that firms need to have some cost advantages to be able to survive in competitive international markets. The strongest evidence supporting these factors is given by the estimation results of the export participation equation for the non-exporting sample. In this respect, non-exporting plants in industry that were able to switch to exporting in the crisis period are large, more productive, more capital intensive and use a higher share of imported inputs.

This finding also provides another reason for the low switching rate from non-exporting plants to exporting. The low switching rate might be because most non-exporting plants were either not ready or not prepared to switch. In the empirical literature on the self-selection hypothesis, it is often observed that new exporters exhibit similar characteristics to established exporters. Bernard and Jensen (1999) found that new US exporters show similar characteristics two or three years before they actually begin to export. Hallward-Driemeier et al. (2002) found many domestic-private exporters in some Asian countries closely resembled foreign exporters, which was interpreted as an indication that the focus of exports is the likely intent right from when firms are first created.

While it is reasonable to observe efficiency differences for the group of non-exporting plants, it is rather puzzling that the results indicate the differences for the group of exporting plants. From the perspective of the self-selection hypothesis, similar behaviour should not have been observed, as those joining export markets are presumed to be efficient and therefore there should not be large differences in efficiency across exporters. Nonetheless, the differences might be related to market characteristics in developing countries. As argued by Hallward-Driemeier et al. (2002), less integrated product markets – as a result of poor economic infrastructure – and, in some cases, trade protection, could allow the co-existence of productive and non-productive producers.

The last important point to consider is the strong and positive effects of foreign ownership in determining export response. This finding strongly supports the argument made by Blomstrom and Lipsey (1993) that it is easier for foreign firms to redirect sales. The results also show that the positive impact of foreign ownership is not limited to exporting plants. In particular, the probability of non-exporting plants switching during the crisis period was higher for the group of non-exporting plants with a high foreign ownership share.

This finding reinforces the view that foreign firms are likely to have been financially supported by their parent companies and were able to take advantage of the increase in competitiveness from the sharp exchange rate depreciation. The former reflects the observation made by several other studies (e.g. Fukao 2001; Urata, 2002). In particular, Urata observed that Japanese parent companies increased capital subscription to many foreign affiliates in crisis affected countries. For the latter, the finding highlights the strong export orientation of FDI in Asian countries and the ability of parent companies to provide market access for their affiliates. The evidence of easier sales redirection by foreign plants further implies they paid much lower costs for export expansion compared with the other plants. To a large extent, if, as is considered likely, the plants were established with an export focus, or were provided with access to foreign markets through their parent companies, this explains why their costs would have been lower.

The results from the field survey undertaken by Feridhanusetyawan et al. (2000) give an excellent example for the discussion above. They found that some private-domestic firms in the consumer and component electronics industry, which were domestically oriented, quickly entered a joint-venture agreement to gain access to export and intermediate input markets. A similar example was also found in the automotive component industry, where firms with some foreign ownership share were rescued, either in terms of financial support or market access.

This field survey also highlights the comment made earlier about the readiness of non-exporting plants. In particular, firms in the electronics industry that had established trade and production networks – irrespective of their ownership status – could easily redirect output to export markets when domestic demand was low. Thus, for these firms, access to export markets had been achieved long before the crisis, despite their domestic orientation. Furthermore, these networks tend to discipline firms, to force them to always produce to international standards. This discipline mechanism should make the process of sales redirection a lot easier. The experience of PT Great River International (GRI) – one of the largest garment producers in Indonesia – highlights this point. The fact that GRI had long been producing garments under licence from some 20 international fashion brands seems to have smoothed its sales redirection. This is reflected in a sharp increase in export earnings share from 25 per cent in 1997 to 70 per cent in 1999 (Tanudjaja 1999).

5.3 Did liquidity constraints affect the export supply response?

We have argued that the credit contraction to the private sector was one possible explanation for the sluggish export performance in crisis affected countries. The usual argument is that the lack of loanable funds increases this financial constraint, reduces investment and hence undermines the boost to competitiveness from the sharp exchange rate depreciation. To date, there is no clear evidence to support this theory and very a few studies address this issue. Accordingly, it is worthwhile examining the data to shed some light on the issue. In particular, this section asks whether the extent of financial constraint negatively affects the export response.

Equations (1) and (2) were re-estimated for the exporting and non-exporting sample by adding two variables representing a plant's liquidity position. The first variable is interest coverage (LEV_{9596}), which is included to proxy a plant's financial leverage. In this study, it is defined as, for plant *i*,

$$LEV_i = \frac{1}{(\text{Interest Coverage})_i},$$

where

$$(\text{Interest coverage ratio})_i = \frac{(\text{EBIT})_\text{i}}{(\text{interest payments})_\text{i}}$$

and $EBIT_i$ is equal to sales (or earnings) before deduction of interest payments and income taxes. Interest coverage ratio measures the number of times a firm's earnings exceed debt payments. In other words, it indicates how well a firm's earnings can cover interest payments. LEV_{9596} is expected to be negatively related to the export supply response during the crisis. Higher financial leverage implies lower net worth, lower ability to obtain a loan and hence a higher likelihood of financial constraint.

The second variable is the percentage change in investment financed by bank loans between the crisis and pre-crisis period ($\%\Delta LOAN\_INV$). For plant i, it is defined as

$$\%\Delta LOAN\_INV_{i,t} = \frac{(LOAN\_INV_{i,t}) - (LOAN\_INV_{t,9596})}{(LOAN\_INV_{i,9596})} \times 100$$

where $LOAN\_INV_{i,t}$ is loan investment financed by plant i in time t, $t = 1997,\ldots,2000$ and $LOAN\_INV_{t,9596}$ is the average investment in 1995 and 1996. $LOAN\_INV$ is included to proxy the size of the loan the plant was able to obtain. Low $LOAN\_INV$ implies a high extent of financial constraint and hence $LOAN\_INV$ is expected to be positively related to the export supply response.

Table 18 presents the maximum likelihood estimation results of equation (1) for the exporting sample. The results of the two groups of specifications were reported, each consist of three specifications that use different variables for industry factor intensity. All specifications use $INEXP_{9596}$ and $RNEXP_{9596}$ as export spillover variables. The first group includes only LEV_{9596} while the second adds $\%\Delta LOAN\_INV$.

Financial leverage does not seem to have increased the probability of exporting plants switching from the exporting state in the crisis period. The coefficients of LEV_{9596}, although showing the expected sign, were statistically insignificant across all specifications.

In contrast, a clearer picture can be obtained from the coefficients of $\%\Delta LOAN\_INV$. They are positive and statistically very significant across the specifications with this variable. Therefore, exporting plants which were able to obtain external financing were likely to continue exporting during the crisis period. This finding supports the hypothesis that financial constraints negatively affected the export supply response.

Table 19, which presents the MLE results of equation (1) for the non-exporting sample, displays a similar picture. The only difference is that the magnitude of the negative impact of financial constraint is shown to have been higher for non-exporting plants. The coefficients of $\%\Delta LOAN\_INV$ are almost two times higher than those of the previous estimations, implying substantially higher additional credit needed by non-exporting plants if they were to enter export markets during the crisis period. Krueger and Tornell (1999) observed a similar pattern for Mexican exporters during the 1990s crisis. As they argued, the difference in the magnitude is likely because exporters are able to offer banks a more certain cash flow projection owing to their involvement in export markets.

Table 18 Test for liquidity constraint hypothesis: regressions results, export participation equation, exporting only

Dependent variable	$EP_{i,t}$					
Specification	40	41	42	43	44	45
$\log(LP_{i,9596})$	0.011 (0.74)	0.031 (2.06)*	0.013 (0.87)	0.010 (0.69)	0.030 (2.01)*	0.012 (0.82)
$PCI2_{i,9596}$ [(a)]	0.002 (0.09)	0.009 (0.30)	0.011 (0.42)	-0.025 (0.02)	-0.020 (0.23)	-0.015 (0.35)
$PSI2_{i,9596}$	0.002 (2.31)*	0.002 (2.14)*	0.002 (2.55)*	0.002 (2.27)*	0.002 (2.09)*	0.002 (2.51)*
$FOR_{i,9596}$	0.121 (2.58)**	0.121 (2.52)*	0.120 (2.56)*	0.122 (2.60)**	0.123 (2.55)*	0.121 (2.57)*
$\log(SIZE_{i,9596})$	0.092 (8.34)**	0.098 (8.51)**	0.088 (7.95)**	0.092 (8.27)**	0.098 (8.46)**	0.087 (7.88)**
$\log(AGE_{i,96})$	-0.043 (2.83)**	-0.036 (2.29)*	-0.039 (2.61)**	-0.042 (2.82)**	-0.036 (2.26)*	-0.039 (2.59)**
$IMDEP_{i,9596}$	-0.095 (1.91)+	-0.020 (0.37)	-0.077 (1.55)	-0.091 (1.83)+	-0.016 (0.29)	-0.073 (1.46)
$INEXP_{j,9596}$	0.819 (8.75)**	0.922 (5.85)**	0.778 (8.29)**	0.819 (8.74)**	0.920 (5.84)**	0.777 (8.28)**
$RNEXP_{j,9596}$	0.247 (2.07)*	0.302 (2.44)*	0.251 (2.11)*	0.248 (2.08)*	0.302 (2.43)*	0.252 (2.12)*
$DRI_{j,9596}$	0.067 (1.50)			0.068 (1.52)		
$DLI_{j,9596}$	0.048 (1.16)			0.049 (1.19)		
$IRI_{j,95}$		0.639 (2.33)*			0.645 (2.36)*	
$ICI1_{j,9596}$ [(b)]		-0.286 (1.92)+			-0.2.14 (1.92)+	
$ISI2_{j,9596}$		-0.299 (2.67)**			-0.300 (2.67)**	
$COMP_{j,89}$			0.106 (3.26)**			0.108 (3.30)**
$LEV_{i,9596}$ [(b)]	-0.011 (0.57)	-0.001 (0.69)	-0.001 (0.66)	-0.001 (0.37)	-0.001 (0.47)	-0.001 (0.45)
$\%\Delta LOAN\_INV_{i,t}$				0.027 (1.96)+	0.031 (2.18)*	0.028 (2.02)*
Year Dummy 1998	-1.413 (35.29)**	-1.419 (35.33)**	-1.415 (35.31)**	-1.418 (35.31)**	-1.424 (35.37)**	-1.419 (35.34)**
Year Dummy 1999	-0.047 (1.48)	-0.047 (1.48)	-0.047 (1.48)	-0.053 (1.68)+	-0.054 (1.70)+	-0.054 (1.68)+
Year Dummy 2000	0.135 (4.27)**	0.136 (4.30)**	0.135 (4.27)**	0.127 (3.98)**	0.127 (3.97)**	0.127 (3.97)**
Dummy variables for industries	Not included	Included	Not included	Not included	Included	Not included
Dummy variables for provinces	Included	Included	Included	Included	Included	Included
Constant	-1.226 (5.03)**	-1.558 (5.00)**	-1.225 (5.08)**	-1.222 (5.01)**	-1.556 (5.00)**	-1.221 (5.06)**
Pseudo R-squared Wald chi2	0.16 1934.5	0.16 1984.7	0.16 1945.2	0.19 661.9	0.19 713.0	0.19 673.1

Notes: 1) Robust Z statistics in parentheses

2) Significance level: ** significant at 1%; * significant at 5%; + significant at 10%

a) The coefficient was multiplied by 100 to improve presentation

b) The coefficient was multiplied by 10^5 to improve presentation

Table 19 Test for liquidity constraint hypothesis: regressions results, export participation equation, non-exporting only

Dependent variable	$EP_{i,t}$					
Specification	46	47	48	49	50	51
$\log(LP_{i,9596})$	0.037 (2.50)*	0.044 (2.94)**	0.037 (2.53)*	0.037 (2.53)*	0.045 (2.96)**	0.037 (2.56)*
$PCI2_{i,9596}$	0.001 (1.84)+	0.001 (2.14)*	0.001 (2.16)*	0.001 (1.79)+	0.001 (2.08)*	0.001 (2.13)*
$PSI2_{i,9596}$ [(a)]	-0.005 (0.37)	-0.006 (0.44)	-0.002 (0.16)	-0.002 (0.40)	-0.003 (0.46)	-0.003 (0.18)
$FOR_{i,9596}$	0.318 (3.47)**	0.326 (3.52)**	0.325 (3.55)**	0.316 (3.45)**	0.323 (3.49)**	0.323 (3.53)**
$\log(SIZE_{i,9596})$	0.268 (21.27)**	0.272 (20.34)**	0.265 (21.01)**	0.268 (21.21)**	0.272 (20.30)**	0.265 (20.95)**
$\log(AGE_{i,96})$	-0.084 (5.36)**	-0.087 (5.52)**	-0.082 (5.26)**	-0.083 (5.31)**	-0.086 (5.48)**	-0.081 (5.21)**
$IMDEP_{i,9596}$	0.060 (0.96)	0.132 (2.00)*	0.056 (0.89)	0.056 (0.89)	0.129 (1.95)+	0.052 (0.82)
$INEXP_{j,9596}$	1.686 (17.44)**	1.519 (9.04)**	1.628 (16.38)**	1.685 (17.42)**	1.521 (9.06)**	1.625 (16.33)**
$RNEXP_{j,9596}$	1.301 (8.38)**	1.351 (8.49)**	1.259 (8.14)**	1.309 (8.41)**	1.360 (8.53)**	1.266 (8.17)**
$DRI_{j,9596}$	0.104 (2.57)*			0.108 (2.67)**		
$DLI_{j,9596}$	0.050 (1.27)			0.053 (1.34)		
$IRI_{j,95}$		0.039 (0.13)			0.064 (0.21)	
$ICI1_{j,9596}$ [(b)]		-0.027 (1.69)+			-0.064 (1.71)+	
$ISI2_{j,9596}$		0.127 (1.17)			0.131 (1.21)	
$COMP_{j,89}$			0.069 (2.21)*			0.072 (2.29)*
$LEV_{i,9596}$ [(b)]	-0.003 (0.73)	-0.002 (0.80)	-0.002 (0.65)	-0.005 (0.34)	-0.007 (0.41)	-0.002 (0.24)
$\%\Delta LOAN\_INV_{i,t}$				0.056 (2.43)*	0.057 (2.48)*	0.055 (2.41)*
Year Dummy 1998	-0.990 (15.55)**	-0.996 (15.60)**	-0.989 (15.59)**	-0.997 (15.63)**	-1.003 (15.69)**	-0.996 (15.68)**
Year Dummy 1999	-0.094 (2.65)**	-0.096 (2.71)**	-0.094 (2.65)**	-0.103 (2.88)**	-0.105 (2.94)**	-0.102 (2.88)**
Year Dummy 2000	0.014 (0.42)	0.013 (0.37)	0.015 (0.43)	0.003 (0.09)	0.001 (0.04)	0.004 (0.11)
Dummy variables for industries	Not included	Included	Not included	Not included	Included	Not included
Dummy variable for provinces	Included	Included	Included	Included	Included	Included
Constant	-3.584 (16.82)**	-3.569 (11.97)**	-3.513 (16.77)**	-3.587 (16.81)**	-3.587 (12.00)**	-3.514 (16.74)**
Pseudo R-squared Wald chi2	0.16 1361.3	0.17 1450	0.16 1323.6	0.16 1365.7	0.18 1453.6	0.16 1326.6

Notes: 1) Robust Z statistics in parentheses

2) Significance level: ** significant at 1%; * significant at 5%; + significant at 10%

a) The coefficient was multiplied by 100 to improve presentation

b) The coefficient was multiplied by 10^5 to improve presentation

Table 20 presents the estimation results of equation (2) for the exporting sample, after taking into account the possible selection bias (i.e. by including the inverse Mills ratio produced by the estimations reported in Table 18).

The relationship regarding the relevant variables does not change in principle. LEV_{9596} and $\%\Delta LOAN\_INV$ are negatively and positively related to the adjustment in export propensity, respectively. The notable difference is that now the coefficients of LEV_{9596} are statistically significant. This finding provides stronger support for a negative impact from financial constraints on the export response.

Overall, the results suggest financial constraints negatively affected plants' export supply response during the crisis. Despite this, it does not necessarily mean the sluggish export performance during the crisis was caused by a contraction in credit. There are two reasons for this. First, the empirical analysis can not cleanly test this proposition as it only reflects the demand side of credit. Second, even if a contraction did occur, the impact is likely to have been different on exporters and non-exporters. In general, exporters tend to be favoured by banks, for the reason argued by Krueger and Tornell (1999), and hence would have been less financially constrained. The results indeed support this argument. In particular, the negative impact of financial constraints on export participation during the crisis period was higher for non-exporting plants. Access to credit is therefore another key factor for successful switching by non-exporters, in addition to being efficient and ready for competition in the international market. Exporters could also more easily find alternative sources of fund in the presence of a credit contraction. This is mainly because many of them have some share of foreign ownership. As pointed out by Blalock and Gertler (2005) and Krueger and Tornell (1999), exporters were likely to have been able to obtain trade financing from the international capital market, through the access provided by their parent companies.

Table 20 Test for liquidity constraint hypothesis: regressions results, export propensity adjustment equation, exporting only

Dependent variable	$\Delta EXP_{i,t}$					
Specification	52	53	54	55	56	57
$\log(LP_{i,9596})$	0.111 (4.88)**	0.231 (9.29)**	0.122 (5.35)**	0.105 (4.64)**	0.225 (9.11)**	0.116 (5.12)**
$PCI2_{i,9596}$	0.001 (1.67)+	0.001 (1.21)	0.001 (2.67)**	0.001 (1.34)	0.001 (0.85)	0.001 (2.34)*
$PSI2_{i,9596}$	0.017 (13.03)**	0.015 (11.77)**	0.018 (13.39)**	0.017 (13.00)**	0.015 (11.70)**	0.017 (13.39)**
$FOR_{i,9596}$	0.549 (6.42)**	0.558 (6.55)**	0.547 (6.43)**	0.560 (6.57)**	0.575 (6.76)**	0.557 (6.57)**
$\log(SIZE_{i,9596})$	0.604 (17.29)**	0.651 (18.46)**	0.583 (17.38)**	0.601 (17.52)**	0.648 (18.66)**	0.580 (17.60)**
$\log(AGE_{i,96})$	-0.216 (7.54)**	-0.177 (6.37)**	-0.196 (7.01)**	-0.216 (7.58)**	-0.174 (6.31)**	-0.195 (7.03)**
$IMDEP_{i,9596}$	-0.562 (6.52)**	-0.183 (2.09)*	-0.500 (5.92)**	-0.531 (6.19)**	-0.143 (1.64)	-0.465 (5.54)**
$INEXP_{j,9596}$	4.462 (14.37)**	5.370 (14.06)**	4.261 (14.35)**	4.487 (14.62)**	5.367 (14.18)**	4.278 (14.60)**
$RNEXP_{j,9596}$	1.066 (5.18)**	1.329 (6.13)**	1.041 (5.08)**	1.082 (5.26)**	1.327 (6.14)**	1.059 (5.17)**
$DRI_{j,9596}$	0.368 (4.98)**			0.378 (5.13)**		
$DLI_{j,9596}$	0.166 (2.48)*			0.178 (2.65)**		
$IRI_{j,95}$		4.546 (10.69)**			4.607 (10.87)**	
$ICI1_{j,9596}$ [(a)]		-0.002 (7.11)**			-0.002 (7.18)**	
$ISI2_{j,9596}$		-2.172 (11.00)**			-2.185 (11.08)**	
$COMP_{j,89}$			0.478 (7.58)**			0.495 (7.86)**
$LEV_{i,9596}$ [(b)]	-0.094 (3.70)**	-0.110 (4.40)**	-0.101 (3.92)**	-0.055 (2.61)**	-0.106 (3.19)**	-0.061 (2.82)**
$\%\Delta LOAN\_INV_{i,t}$				0.231 (9.74)**	0.252 (10.57)**	0.235 (9.89)**
Mills ratio	8.913 (19.12)**	8.704 (19.94)**	8.889 (19.27)**	8.966 (19.53)**	8.735 (20.28)**	8.938 (19.68)**
Year Dummy 1998	-11.143 (22.59)**	-10.958 (23.60)**	-11.124 (22.77)**	-11.236 (23.06)**	-11.032 (23.99)**	-11.215 (23.25)**
Year Dummy 1999	-0.283 (5.26)**	-0.277 (5.17)**	-0.282 (5.24)**	-0.340 (6.21)**	-0.338 (6.21)**	-0.340 (6.21)**
Year Dummy 2000	1.021 (16.28)**	1.009 (16.49)**	1.019 (16.34)**	0.955 (15.55)**	0.935 (15.59)**	0.952 (15.58)**
Dummy variables for industries	Not included	Included	Not included	Not included	Included	Not included
Dummy variable for provinces	Included	Included	Included	Included	Included	Included
Constant	-17.352 (20.18)**	-19.634 (20.64)**	-17.259 (20.28)**	-17.399 (20.55)**	-19.670 (20.94)**	-17.300 (20.64)**
R-squared F-statistics	0.18 105.1	0.19 65.4	0.18 109.46	0.18 53.25	0.19 36.28	0.18 55.06

Notes: 1) Robust t statistics in parentheses

2) Significance level: ** significant at 1%; * significant at 5%; + significant at 10%

a) The coefficient was multiplied by 100 to improve presentation

b) The coefficient was multiplied by 10^5 to improve presentation

6 Summary

The purpose of this study has been to examine the export-supply response of plants in Indonesian manufacturing. It shows a picture of the response and investigates which characteristics determined the success of plants in responding to the crisis in terms of export. The empirical analysis provides some insights into the observed aggregate export performance during the crisis period and indicates the importance of plant and industry characteristics in determining the response.

The descriptive analysis shows some evidence of sales redirection. First, some plants changed status from non-exporting to exporting, albeit only a very small number relative to the total number of non-exporting plants in the industry. Second, a large number of exporting plants became more export oriented while those which had been export oriented were unlikely to have become less export oriented. Despite this evidence, the analysis shows a large variation in impact of the crisis on export performance, suggesting some exporting plants were able to exploit the increase in competitiveness while others were not.

The main findings from the econometric analysis can be summarised as follows. First, exporting history significantly determined export participation in the crisis period. Exporting before the crisis significantly increased the probability of continuing to export during the crisis. The finding emphasises the presumption that exporting is a costly economic activity to initiate. This indicates that most of the increase in competitiveness from the sharp exchange rate depreciation is likely to have been captured only by plants which had been exporting just prior to the crisis.

Second, the ability to compete in the international market – by being efficient and able to produce international-standard goods – is another key factor. The results show the effect of this factor was particularly large for non-exporting plants. This suggests the low switching rate from non-exporting to exporting observed is likely to have been because most non-exporting plants were not ready to compete in the international market. While this factor is evidently important for the group of non-exporting plants, the results also suggest it was important for the group of exporting plants.

Third, the role of foreign ownership in affecting the response is clear. It is positively related to both the change in export propensity and export participation. Foreign ownership is also suggested to have played an important role in helping non-exporting plants become exporters during the crisis.

Finally, the results show the export-supply response was negatively affected by the extent of financial constraint faced by plants. The negative relationship is observed for both exporting and non-exporting plants. Nevertheless, the results suggest the magnitude of the impact is likely to have been higher for non-exporting ones.

Appendix 1 Correlation matrix

	EP	EP_{96}	$\log(LP_{9596})$	$PCI2_{9596}$	$PSI2_{9596}$	$\log(SIZE_{9596})$	$\log(AGE_{96})$	$DMNC_{9596}$	$DMNC_{96}*FOR_{95}$	$IMPORT_{9596}$
EP	1.00									
$EP95_{96}$	0.48	1.00								
$\log(LP_{9596})$	0.17	0.27	1.00							
$PCI2_{9596}$	0.05	0.07	0.34	1.00						
$PSI2_{9596}$	0.06	0.10	0.35	0.19	1.00					
$\log(SIZE_{9596})$	0.31	0.48	0.40	0.14	0.18	1.00				
$\log(AGE_{96})$	-0.07	-0.10	-0.03	0.02	0.00	0.07	1.00			
$DFOR_{9596}$	0.18	0.29	0.33	0.13	0.21	0.31	-0.09	1.00		
$DFOR_{96}*FOR_{9596}$	0.18	0.29	0.30	0.10	0.19	0.29	-0.10	0.93	1.00	
$IMPORT_{9596}$	0.12	0.23	0.31	0.11	0.18	0.32	-0.04	0.38	0.39	1.00
$INEXP_{9596}$	0.29	0.41	0.16	0.00	0.05	0.24	-0.17	0.13	0.14	0.08
$RNEXP_{9596}$	0.24	0.35	0.29	0.08	0.11	0.22	-0.17	0.20	0.22	0.19
$IEXP_{9596}$	0.25	0.35	0.02	-0.10	-0.04	0.18	-0.14	0.05	0.06	-0.04
$REXP_{9596}$	0.18	0.25	0.16	0.04	0.04	0.13	-0.10	0.10	0.12	0.07
IRI_{95}	0.00	-0.04	-0.12	0.04	-0.07	-0.14	0.07	-0.10	-0.10	-0.26
$ICI1_{9596}$	0.00	0.01	0.31	0.20	0.14	0.14	0.01	0.12	0.11	0.17
$ISI2_{9596}$	-0.01	-0.02	0.28	0.23	0.12	0.07	0.12	0.05	0.03	0.02
DRI_{96}	-0.04	-0.10	-0.18	0.05	-0.08	-0.15	0.11	-0.11	-0.10	-0.24
DLI_{96}	0.09	0.15	-0.02	-0.10	-0.02	0.13	-0.11	0.03	0.05	0.11
$COMP_{89}$	0.13	0.17	-0.10	-0.12	-0.09	0.13	-0.05	-0.04	-0.03	-0.10

Appendix 1 continued

Appendix 9.1 (concluded)

	$INEXP_{9596}$	$RNEXP_{9596}$	$IEXP_{9596}$	$REXP_{9596}$	IRI_{95}	$ICI1_{9596}$	$ISI2_{9596}$	DRI_{96}	DLI_{96}	$COMP_{89}$
$INEXP_{9596}$	1.00									
$RNEXP_{9596}$	0.28	1.00								
$IEXP_{9596}$	0.84	0.19	1.00							
$REXP_{9596}$	0.24	0.68	0.20	1.00						
IRI_{95}	-0.09	-0.10	-0.05	0.00	1.00					
$ICI1_{9596}$	0.03	0.07	-0.19	0.02	-0.17	1.00				
$ISI2_{9596}$	-0.04	0.04	-0.14	0.06	0.25	0.25	1.00			
DRI_{96}	-0.20	-0.17	-0.13	-0.05	0.85	-0.16	0.18	1.00		
DLI_{96}	0.32	0.12	0.41	0.06	-0.57	-0.21	-0.32	-0.68	1.00	
$COMP_{8996}$	0.40	0.06	0.58	0.12	0.10	-0.25	-0.16	-0.08	0.48	1.00

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