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The Impact of the 1997/98 Economic Crisis on Firm Entry in Indonesian Manufacturing

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THE IMPACT OF THE 1997/98 ECONOMIC CRISIS ON FIRM ENTRY IN INDONESIAN MANUFACTURING

Abstract

How did the 1997/98 economic crisis affect the extent of firm entry in Indonesian manufacturing? What can we tell from examining the impact? This paper attempts to provide some answers to these questions, using rich plant-level data of medium and large manufacturing plants over the period 1993-2000. The descriptive analysis shows that while entry rates into the industry significantly declined during the peak of the crisis, they did not seem to have recovered during the early recovery period. Building on this observation, the analysis continues to examine whether there are differences in the determinants of firm entry between the pre-crisis and crisis period. The econometric results indeed show substantial differences. They suggest that higher cost disadvantages faced by entrants and a more competitive economic environment might be responsible for the observation. The results also indicate that the crisis seems to have provided opportunities for some entrants. Nevertheless, these opportunities are unlikely to have been translated into a recovery in the entry rates, simply because they are likely to have been absorbed only by small number of entrants.

Introduction

The 1997/98 economic crisis severely affected Indonesian manufacturing. The industry contracted severely by more than 10 per cent in 1998 after growing rapidly for about a decade leading up to 1996. While many studies have examined the crisis' impact on industry, few examined the impact at micro level. Moreover, among these few studies (e.g. Thee 2000; Dwor-Frecaut et al. 2000), almost all focused on performance impact rather than on demographics impact. This paper address one aspect of demographics impact of the crisis, asking how the crisis affected the extent of firm entry into the industry and how the factors governing the entry changed between the pre-crisis and crisis period.

Answering these questions is important at least for two reasons. First, to have a complete picture on how the crisis affected the industry and second, to understand how industrialisation in Indonesia might have changed in the future. The latter is important in respect to a perceived dramatic change in economic environment during the crisis. As described by Soesastro and Basri (1998), there was an accelerated trade liberalisation over

the period 1997-99, owing to the structural adjustment program attached to the rescue packages of international institutions. In addition, a sharply contracted domestic demand during and shortly after the crisis presumably increased the extent of competitive struggle between firms.

The paper firstly describes the data used in the empirical analysis and defines the measurement of firm entry. It then presents the picture of how the crisis affected the extent of firm entry in the industry. The analysis continues with an assessment of whether there are differences in the determinants of firm entry between the pre-crisis and crisis periods.

Data and Measurements of Entry

The main data are drawn from the annual manufacturing surveys of medium- and large-scale establishments (*Statistik Industry*, or SI) from 1993 to 2000. The surveys were undertaken by the Indonesian Central Board of Statistics (*Badan Pusat Statistik or* BPS) and the establishments are defined as those with 20 or more employees. The data 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.

Although the data are considered one of the best judging by the standard of developing countries, there are some limitations with the surveys. In the context of this paper, the most important one is that the surveys do not include the reasons for plants entering the industry. In practice, there are different types of entry, that is, through acquisition of the established production units or creation of new ones (greenfield entry).

The sample consists of 72 manufacturing industries at the four digit level. The number of industries is smaller than the number of industries available in the data base. Oil and gas industries (ISIC 353 and 354) were excluded because they are largely monopoly state-owned companies. Some other industries were also excluded because of the difficulty in matching the ISIC code with SITC (the classification used in trade statistics) and because of the unavailability of average tariff rates. Despite these

exclusions, the sample still represents a large variety of industries in Indonesian manufacturing.

As commonly adopted in the literature (e.g. Dunne et al. 1988), this paper defines entry rate (*EN*) in terms of the number of plants. For industry j at four-digit ISIC level, it is defined as

$$EN_{j,t} = \frac{NEP_{j,t}}{NTP_{j,t-1}} \ ,$$

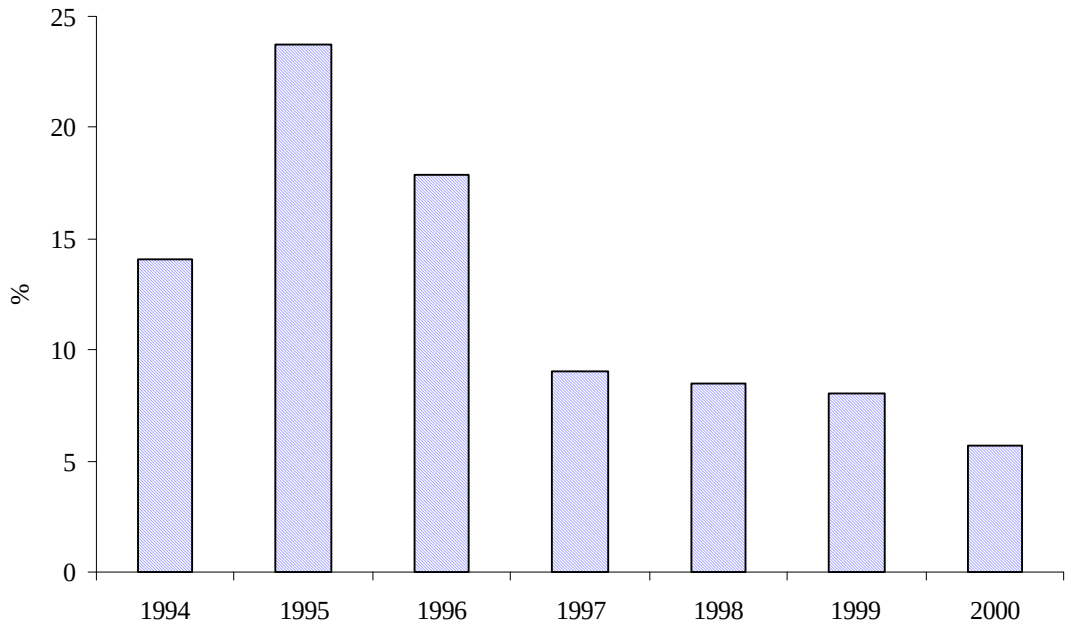
where $NEP_{j,t}$ is the total number of plants that enter the industry t and $t-1$ and $NTP_{j,t-1}$ is the total number of plants in industry j in year $t-1$.

The Impact of the Crisis on Firm Entry

Figure 1 shows the trend of firm entry in Indonesian manufacturing over the period 1994-2000, in terms of the number of plants and employment. The figures clearly show the significant impact the crisis had on the extent to which firms are created. The figure shows entry rates during the period 1997-2000 falling to about half of that during the period 1994-96 (pre-crisis). Another key observation is that the rate of establishment of firms did not seem to have recovered in 2000. This is in contrast to the observation in other studies (e.g. Thee 2000; Narjoko 2006) where, in terms of performance, the industry appeared to have recovered in that year.

The continuously declining pattern in the entry rates can also be observed across broad industry groups. This is shown in Table 1 which presents the entry rates and the percentage difference in the rates between the crisis and pre-crisis periods by two-digit industries. Across the industries, the percentage differences in the rates for 2000 are lower than those for the period 1998-99 (see columns 8 to 10 on the table). Another important observation from the table is that, although the entry rates between 1997 and 2000 declined in all industry groups, the extent of the declines are different between industries. For example, the percentage differences in 1999 range from –56 percent in wood products industry to –80 in basic metal industries.

Figure 1 Entry rates in Indonesian manufacturing (%), 1994-2000



Source: Author's computation from SI data.

The observations on entry rates overall suggest that the behaviour of firm entry during the crisis was significantly different to that before the crisis. More importantly, it did not seem to recover as seen in other performance measures. One possible explanation, of course, is the recovery might have come with a lag, probably because business confidence had not completely recovered in 2000. Nevertheless, the different behaviour might also signal that the factors which govern entry might have changed after the crisis. Empirical studies on firm entry (e.g. Highfield and Smiley 1987; Yamawaki 1991) have found that determinants of firm entry are sensitive to changes in business cycles. The rest of this paper attempts to shed some light on this issue.

The Determinants of Firm Entry During During the Pre-Crisis and Crisis Periods

To understand why firm entry did not recover, this paper examines whether there are some changes in the determinants of firm entry over the pre-crisis and crisis period.

Before outlining the hypotheses, it is important to review first the approaches for analysing the determinants of firm entry, as outlined in the following sub-section.

Table 1 Entry rates by major industry group (%), 1995-2000

	Entry rate					Percentage differences to the period 1995-96			
	1995-96	1997	1998	1999	2000	1997	1998	1999	2000
ISIC/Industry									
31 Food and tobacco products	12.3	5.9	4.9	4.6	4.4	-52	-60	-62	-64
32 Textile, garment and leathers	19.1	7.7	6.3	6.4	4.2	-60	-67	-67	-78
33 Wood products, incl. Furniture	27.7	10.4	13.9	12.3	11.7	-63	-50	-56	-58
34 Paper and paper products	17.9	8.2	8.6	4.1	2.4	-54	-52	-77	-86
35 Chemical, rubber and plastics	11.4	6.8	7.0	5.2	2.2	-40	-39	-54	-81
36 Non-metallic mineral products	22.8	9.1	8.8	6.1	4.3	-60	-61	-73	-81
37 Basic metal industries	15.2	11.7	10.4	3.1	1.6	-23	-32	-80	-89
38 Machinery and equipment	15.9	7.0	10.5	4.8	2.6	-56	-34	-70	-84
39 Other manufacturing	21.4	7.3	14.6	8.6	4.2	-66	-32	-60	-80

Note: See text for the definition of entry rate.

Source: Author's computation.

Brief literature review and empirical model

Early literature on firm entry proposed two major approaches: limit-price model and stochastic-replacement process. The first hypothesises that entry is an equilibrating process where entry attracts and, at the same time, bid away the excess profit, and occurs whenever there is a positive gap between the expected profit and the long-run level of profit (Geroski 1991). This approach adopts the concept of a limit-price model (Bain 1949), which posits that there exists a limit price which is low enough for incumbents to be able to deter entry.

The size of the market and the entrants' average cost are the major factors for the limit price to deter entry. The latter gives rise to a cost advantage for incumbents over new entrants who may have to pay a substantial fixed entry cost, implying a different average cost curve between the two. According to Bain (1956), the cost advantages are determined mainly by economies of scale, product differentiation and some absolute cost advantages.

Stochastic replacement approach considers entry as a stochastic process that does not necessarily respond to profit and may happen even if price equals marginal cost (Baldwin and Gorecki 1987). Baldwin and Gorecki described two situations in which profit is irrelevant to the entry process. The first is related to how easily entrants can enter and capture a market share, which is usually proxied by market demand growth. The *a priori* condition is that additional firms entering the market are unlikely to depress the market price in a growing market. Therefore incumbents are less threatened by entrants and less likely to act aggressively. The second is a situation where entrants simply replace some existing firms, even when long-run profits are zero.

The other approach relates the process of firm entry to firm exit. As in the limit price approach where entry takes place when profit is positive, exit is expected to occur when profit is negative and consequently entry and exit are expected to be negatively correlated. In contrast, however, several studies found the correlation to be positive (e.g. Dunne et al. 1988; Dunne and Roberts 1991; Austin and Rosenbaum 1991; Lay 2003). For example, Dunne and Roberts found that entry and exit are positively correlated with the price-cost margin for US manufacturing, implying that higher profit encourages both entry and exit.

The literature records several explanations for the positive correlation, often termed as "interdependence". Geroski (1995, p.424) argued that entry and exit seem to be part of an evolutionary process in which a large number of new firms displace a large number of existing firms without much changing the total number of firms in an industry. This argument is similar to the 'stochastic-replacement' view of entry which posits that entry can still be expected even when industry's profitability is zero. In this view, entry is seen to simply replace some incumbents.

Shapiro and Khemani (1987) offer two reasons for the interdependence. First, to the extent that cost heterogeneity exists, there might be some high-cost incumbents who can be displaced by low-cost entrants. Second, to the extent that barriers to entry are barriers to exit (Caves and Porter 1976; Eaton and Lipsey 1980), potential displacement is limited and incumbents are deterred from exiting. The symmetrical relationship explained by the second reason arises from investment with sunk cost characteristics, i.e. investment in durable and specific assets. Shapiro and Khemani (1987, p.16) explained that sunk cost creates barriers to entry because it represents a higher opportunity cost that has to be met by entrants and higher risk owing to large losses associated with unsuccessful entry; but at the same time, sunk cost also creates barriers to exit because incumbents are limited by inability to divest, owing to the non-recoverable nature of the assets.

Shapiro and Khemani's displacement effect implies entry is responsible for exit. Fotopoulus and Spence (1998) consider the process could be the other way around. That is, exit creates room for new entry. Thus, if the two directions hold, the interdependence between entry and exit could be the result of a 'displacement-replacement' effect.

The focus of this paper is on entry behaviour during economic expansion and contraction. Accordingly, it is important to briefly review the prevailing views about entry and business cycles.

Highfield and Smiley (1987, p.53) offer two scenarios in which the business climate could result in the birth of a new firm. The first assumes that entrepreneurs prefer favourable economic conditions to start a new business. In this scenario, therefore, the rate of entry is expected to be high when an economy, for example, is growing and experiencing low real interest rate. This scenario is often termed the 'pull' hypothesis.

The alternative scenario is the so called 'opportunistic' scenario, where new business is formed when there is a vacuum in current economic activity. One example

provided by Highfield and Smiley (1987) relates to decreasing rates of new plant and equipment expenditure, which may provide an opportunity for newly equipped firms. In this case, the entry barrier emanating from the level of capital required is decreased. This scenario therefore predicts the association of high entry rate with, for example, low economic growth, low inflation rate and high real interest rate. This scenario is often termed the 'push' hypothesis.

All in all, the relationship between entry and economic growth is positive under the 'pull' hypothesis and negative under the 'push' hypothesis.

While clear in theory, there is no consensus in the empirical literature on which hypothesis holds true. Using a long time series data of about 40 years, Highfield and Smiley (1987) found that new business formation in the US economy tended to occur when macroeconomic conditions were not so favourable. Therefore, their study lends some support for the 'push' hypothesis. In examining the net entry of firms in Greek manufacturing, Fotopoulus and Spence (1997) found some evidence of a 'modified pull' hypothesis, arguing that potential entrants may be over-attracted to a favourable economic condition, which in turn may create an over supply of new firms and hence speed up exits in response to the over supply.

Based on the review above, the model for the determinants of entry can be specified as follows, ignoring the industry and time subscripts:[1]

$$EN = f(PCM, ROOM, SDPCM, ES, KR, CR4, EXP, IMP, TARIFF, EX) \quad (1)$$

The definitions of the independent variables are presented in the Appendix. As discussed that entry and exit processes might be correlated, an exit equation is also specified,

$$EX = f(PCM, GR, ES, KR, CR4, EXP, IMP, TARIFF, EN) \quad (2)$$

where, EN = entry rate

EX = exit rate

PCM = price-cost margin

$ROOM$ = industry room

GR = annual industry growth

SDPCM = standard deviation of PCM

EOS = economies of scale

KR = capital requirement

*CR*4 = seller concentration

EXP = export intensity

IMP = import penetration

TARIFF = trade protection

The ways in which entry is specified as a function of exit and *vice versa* aim to capture the displacement and replacement effects, based on the theory on the interdependence between entry and exit. *EN* in exit equation (i.e. equation 2) represents displacement effect while *EX* in entry equation (i.e. equation 1) represents replacement effect. This modelling approach adopts what is commonly practised in the literature.[2]

Hypotheses

This paper puts forward a general hypothesis that the determining factors of firm entry in Indonesian were not the same between the crisis and pre-crisis period. Pre-crisis and crisis are defined as the periods 1995-96 and 1997-2000, respectively. Based on the views of entry during business cycles, it can be expected that factors determining entry in Indonesian manufacturing will not be the same between these two periods. This is the general hypothesis to be tested, and can be re-stated in more detail with respect to the key determinants of entry summarised by equation 1.

Symmetrical relationship between entry and exit

The symmetrical relationship between entry and exit might not hold in the crisis period. For potential entrants, the opportunity cost of any new investment is likely to have been higher in this period, since the deep demand contraction and generally more competitive business environment should have lowered the profitability of doing business. For established firms, the role of sunk costs as exit barriers may not have been as important if firms suffered so severely from the crisis that they had gone into receivership.

Displacement and replacement entry

Displacement entry should have been more important than replacement entry in the crisis period. Arguably only efficient firms were able to survive, due to the greater competition in the period. This situation would have allowed some low-cost potential entrants to enter and successfully compete over the incumbents. This argument shares the same rationale as the 'push' hypothesis.

Demand situation

Profitability (PCM) and market growth ($ROOM$) are expected to have been more important in attracting entry during the crisis period.

Although expected to be positively related to entry, profitability and market growth may not have been so important in determining entry before the crisis. In a developing country like Indonesia, a situation that warrants a stable expected profit – instead of the expected profit itself – may have been the determining factor. It is often argued in the literature that the existence of imperfect markets, low levels of competition, and trade protection are the major causes of this situation.

Based on this argument, it can be expected that profitability might have been more important in attracting entry during the crisis period. After the crisis, firms could no longer rely on a situation where a stable profit expectation was warranted.

In addition, the effect of market risk ($SDPCM$) in determining entry can be expected to have been more important in this period. The reason is that greater competitive pressure should have significantly increased the risk of doing business.

Entry barriers

This paper includes economies of scale (ES), capital requirement (KR) and seller concentration ($CR4$) as the variables that represent barriers to entry. The first two, in addition to advertising intensity, are the traditional entry barriers variables considered by Bain (1956). This study did not include advertising intensity because the advertising expenditure data required to construct this variable are only available up to 1996.[3] As in other studies, seller concentration was included to capture incumbents' strategic behaviours in deterring entry. These behaviours are likely to occur in the post-entry period and include, for example, predatory pricing, aggressive advertising

campaigns and credible threats to compete hard against new rivals (Evans and Siegfried 1992). Seller concentration, however, may also attract entry. It facilitates collusion that in turn provides a higher survival chance given that entry has occurred.

The effect of economies of scale (ES) in deterring entry might not have changed between the crisis and pre-crisis periods. It is difficult to find any reason why market size and production technology, the factors that determines economies of scale, should have changed in such a short period of time.

In a similar vein, the effect of capital requirement (KR) on entry can also be expected to have been the same between the two periods. The amount of capital required to build a plant at a minimum efficient scale is likely to be industry specific and therefore unlikely to have changed. Nevertheless, a stronger negative effect might be observed for the crisis period because potential entrants could have had difficulty raising investment funds as the extent to which credit was rationed is likely to have been higher for potential entrants.

The difference in the effect of strategic entry deterrence behaviour, proxied by $CR4$, is difficult to predict *a priori*. Before the crisis, strategic behaviour might have been positively related to entry (i.e. it encouraged entry). Retaliatory behaviour is unlikely to occur when demand is growing, which was the situation prior to the crisis.

During and after the crisis, both positive and negative relationships can be observed. Theoretical models of oligopoly behaviour (e.g. Rotemberg and Saloner 1986; Rotemberg and Woodford 1992) hypothesise that the probability of collusion is lower in a high demand situation. This hypothesis thus implies that the effect of industry concentration can be expected to have been negative during the crisis period. However, some foreign and large entrants may not have been affected by strong retaliatory behaviour, and may even have been attracted to enter because of the higher survival chance facilitated by possible collusive behaviour. Therefore, a positive relationship may also be observed.

Other determinants

Export orientation (*EXP*) is expected to have strongly attracted entry during and after the crisis, although its effect before the crisis is rather unclear. The reasoning is clear. To some extent, entry in the crisis period should have been encouraged in export-oriented industries, since the boost in competitiveness from the sharp exchange rate depreciation should have increased the expected profits from exporting.

While the effect of trade protection (*TARIFF*) in attracting entry might not have been clear before the crisis, it can be expected to have been less important during the crisis period. The extent to which incumbents engaged in non-competitive behaviour is likely to have been low in this period due to higher potential competition from imports, owing to an accelerated trade liberalisation from structural reforms program imposed by IMF.[4] Therefore, incentive to enter stemming from trade protection is unlikely to have been important in the crisis period. This reasoning also suggests import competition (*IMP*) may have been negatively related to entry in the period.

Estimation

The estimating equations are given as the following

$$EN'_{j,t} = \alpha_1 PCM_{j,t-1} + \alpha_2 ROOM_{j,t-1} + \alpha_3 SDPCM_{j,t-1} + \alpha_4 ES_{j,t-1} + \alpha_5 KR_{j,t-1} + \alpha_6 CR4_{j,t-1} + \alpha_7 EXP_{j,t-1} + \alpha_8 IMP_{j,t-1} + \alpha_9 TARIFF_{j,t-1} + \alpha_{10} EX_{j,t-1} + \alpha_j + \mu_{j,t} \quad (3)$$

$$EX'_{j,t} = \beta_1 PCM_{j,t} + \beta_2 GR_{j,t} + \beta_3 ES_{j,t-1} + \beta_4 KR_{j,t-1} + \beta_5 CR4_{j,t-1} + \beta_6 EXP_{j,t-1} + \beta_7 IMP_{j,t-1} + \beta_8 TARIFF_{j,t-1} + \beta_9 EN_{j,t-1} + \beta_j + \varepsilon_{j,t} \quad (4)$$

where,

t = { 1995, 1996 (pre-crisis period) period ; 1997, …, 2000 (crisis period) }

j = industry j

α_j = industry fixed effect of industry j

Before outlining the results, some technical issues are worth mentioning. First, the dependent variables in equation 3 and 4 (i.e. EN' and EX') are the logistic transformation of entry and exit rate, defined as $EN' = \ln(EN/1-EN)$ and $EX' = \ln(EX/1-EX)$, respectively. The transformation was made because entry and exit rates in theory and practice are bounded between zero and one, which may lead to bias and inconsistent least square estimates – since it is reasonable to assume that sample is not drawn from normal distribution. While useful, this transformation approach cannot be used when entry and exit rates take the boundary values, of either zero or one. As is commonly done in other cases (e.g. Khemani and Shapiro 1986; Mata 1993), this paper manipulated the boundary values by substituting the value zero with 0.1111 and one with 0.9999.[5]

Second, EX in entry equation and EN in exit equation were introduced in their lagged variables. This follows the approach by some studies (e.g. Sleuwagen and Dehandschutter 1991; Lay 2003) and assumes that the interdependence between entry and exit does not happen instantaneously.[6] Meanwhile, $ROOM$ is assumed to have one lag structure in the entry equation while PCM and GR are assumed to have no lags in the exit equation.[7] This approach follows Shapiro and Khemani (1987, p.19), who assume exit responds more quickly to profit and growth than entry. Their approach, however, does not mean the exit process is instantaneous. Shapiro and Khemani were aware that there are lags between the time when exit is considered and when it actually occurs. The assumption simply tries to capture the idea that entry is likely to be a more well-prepared action than exit.

The third issue relates to specification of entry and exit barriers. Certain types of barriers are likely to be omitted from the regression based on equations 3 and 4. For example, Geroski (1991) noted the difficulty of measuring the control of incumbents over some strategic resources. Further, and as noted, specificity implied by sunk cost suggests that many exit barriers are unlikely to be captured in the structural variables in the equations. To solve this problem, fixed effects – in the form of industry dummy variables – are introduced into the equations to capture the unobserved entry and exit barriers. This introduction is justified because entry and exit barriers tend to be constant over time, at least in the short and medium term.

Finally, this paper assumes all structural variables are exogenous. To secure this assumption, lagged values are used instead of the current ones.

The equations are estimated for two periods: 1995-1996 and 1997-2000, corresponding to the pre-crisis and crisis periods, respectively. Data for each period are pooled to facilitate estimation of the model with fixed effect. The year 1994 was not included because estimating Model I for 1994 requires $EX_{j,1993}$ and $EN_{j,1993}$, and therefore data for 1992 are needed. The equations were estimated by the SURE method to account for the interdependence. The SURE method is considered because it is able to take into account the non-zero contemporaneous correlation in the error terms between the two equations.

Our regressions employ the dummy variables method instead of the first differencing method for the fixed effect regression. The method was adopted for the practical reason that data on tariff rates for the pre-crisis period do not vary over time. The *TARIFF* variable would have to be dropped from estimation if the differencing method were used. Time dummy variables are included to control for the differences that affect all sectors but change over time.

Table 2 present the estimation results. The Breusch-Pagan Lagrange Multiplier (LM) statistics are employed to test whether the error terms of the entry and exit equation in Model I are contemporaneously correlated (the statistics are presented in the table). The null hypothesis of equal error terms in the entry and exit equation is rejected at the 1 and 5 per cent significance level for the pre-crisis and crisis period, respectively.[8] Therefore, it can be concluded that entry and exit in both periods were correlated and the results provide some support to the theory of interdependence between entry and exit.

The results are now examined to see whether the determinants of entry and exit in the crisis period differ from those in the pre-crisis period. The examination is divided into two parts; first, the structural determinants of entry and exit, followed by examination of the determinants of interdependence between entry and exit.

Table 2 The determinants of entry and exit, pre-crisis and crisis period

	Method: SURE			
Time period	Pre-crisis	Crisis	Pre-crisis	Crisis
Dependent variable	$EN1'_{j,t}$	$EN1'_{j,t}$	$EX1'_{j,t}$	$EX1'_{j,t}$
$PCM_{j,t-1}$	-3.689 (1.38)	-0.996 (1.49)		
$SDPCM_{j,t-1}$	0.437 (1.13)	-0.023 (0.29)		
$PCM_{j,t}$			2.463 (0.89)	-2.763 (1.98)*
$ROOM_{j,t-1}$	-0.496 (1.09)	0.655 (3.07)**		
$GR_{j,t}$			0.143 (0.67)	0.064 (0.67)
$ES_{j,t-1}$ (c)	-0.003 (0.04)	-0.016 (0.25)	-0.268 (1.54)	0.106 (1.48)
$KR_{j,t-1}$	0.001 (1.23)	-0.002 (2.68)**	0.002 (1.55)	0.001 (0.80)
$CR4_{j,t-1}$	4.714 (3.96)**	2.127 (1.57)	4.140 (1.64)	0.429 (0.37)
$EXP_{j,t-1}$	1.418 (1.48)	1.110 (2.03)*	0.669 (0.51)	-1.496 (2.40)*
$TARIFF_{j,t-1}$	0.057 (4.00)**	-0.001 (0.02)	-0.031 (1.88)+	-0.004 (0.17)
$IMP_{j,t-1}$	-0.026 (1.84)+	0.010 (0.84)	-0.033 (1.83)+	0.029 (0.73)
$EN1_{j,t-1}$			1.459 (0.97)	1.889 (1.79)+
$EX1_{j,t-1}$	9.965 (2.28)*	-0.105 (0.06)		
Year dummy 1996	-0.100 (1.04)		0.646 (3.38)**	
Year dummy 1998		0.263 (1.28)		-0.117 (0.49)
Year dummy 1999		-0.319 (0.91)		-2.195 (6.33)**
Year dummy 2000		-1.117 (3.18)**		-1.198 (3.19)**
F-statistics	18.05**	36.33**	24.60**	5.65**
Breusch-Pagan (LM) statistics (p-value)	6.67 (0.01)[a]	4.05 (0.04)[b]		
R-squared	0.82	0.76	0.67	0.58

Notes: 1) Fixed industry effects are included.

2) t-statistics in parentheses.

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

a) For the estimation of the entry and exit equation for the pre-crisis period.

b) For the estimation of the entry and exit equation for the crisis period.

c) The coefficients were multiplied by 10^3 to improve presentation.

The structural determinants of entry and exit

Entry

For the pre-crisis period, none of the demand incentive variables appears to explain entry. The coefficient of $ROOM_{t-1}$ is statistically insignificant and the variable sign of PCM_{t-1} does not accord with theoretical predictions. The negative effect of PCM_{t-1} might have been caused by a weakness of this variable in predicting expected profitability, and that is, the variable assumes the profit that an entrant earns after its entry is the same with that it saw before the entry (Geroski 1991).

$CR4_{t-1}$ is the only important entry barrier variable. However, its positive coefficient implies seller concentration induced, rather than impeded, entry. This finding supports the argument that concentrated industries enjoy a higher survival chance once entry has occurred. This comment is further supported by the coefficient of KR_{t-1} which also shows a positive correlation, although it is statistically insignificant.

Of the trade-related variables, $TARIFF_{t-1}$ is positively related to entry and is statistically significant. Therefore, trade protection seems to have attracted entry in this period. Meanwhile, the coefficient of IMP_{t-1} shows a negative sign but is only moderately significant (i.e. significant at the 10 per cent level). This result is consistent with an earlier finding by Anagnostaki and Louri (1995) that import penetration is negatively related to entry and exit.

The picture is completely different for the crisis period. First, demand conditions appear to explain entry, as the coefficient of $ROOM_{t-1}$ is now positive and statistically significant. Second, KR_{t-1} is negatively related to entry and its effect is statistically significant. Meanwhile, industry concentration does not now seem to explain entry, since the coefficient of $CR4_{t-1}$ is statistically insignificant, although it remains positively related to entry. Finally, export orientation now seems to encourage entry, as the positive coefficient of EXP_{t-1} becomes statistically significant. In contrast, trade protection no longer seems to explain entry as the coefficient of $TARIFF_{t-1}$ has a considerably smaller t-ratio.

Exit

For the pre-crisis period, all exit-inducing variables (PCM_t and GR_t) do not seem to explain exit. The estimates of these variables have considerably smaller t-ratios. Similarly, none of the coefficients of exit barriers variables (ES_{t-1}, KR_{t-1} and $CR4_{t-1}$) is statistically significant. Only the coefficient of ES_{t-1} displays the expected sign, but its effect is only marginally supported as it is significant only at the 20 per cent level.

Of the trade-related variables, IMP_{t-1} and $TARIFF_{t-1}$ demonstrate a negative relationship with exit. However, this relationship seems only moderate since the estimated coefficients are only significant at the 10% level. This finding suggests the exit decision in this period was less encouraged by the extent of international competition. Meanwhile, industry sales orientation seems to encourage exit. The coefficient of EXP_{t-1} is positive although is not statistically significant.

The picture is again completely different for the crisis period. Demand conditions now seem to induce exit, although the evidence is only shown by PCM_t. The coefficient of PCM_t, which is about -3, suggests that the effect of the decline in profitability was substantial. Finally, international competition becomes unimportant, while this is not the case for export orientation in deterring exit. In contrast to the coefficient of EXP_{t-1}, that becomes negative and statistically significant, the coefficients of $TARIFF_{t-1}$ and IMP_{t-1} are no longer statistically significant for this period.

The determinants of the interdependence between entry and exit

This sub-section seeks evidence concerning the validity of the displacement-replacement effect and the symmetry hypothesis implied by entry and exit determinants.

Pre-crisis period

The results provide some indications for the symmetry hypothesis. All entry barrier variables (ES_{t-1}, KR_{t-1} and $CR4_{t-1}$) show the same sign in both the entry and exit equations. The estimated coefficients are similar across equations, indicating a similar effect from these variables in inducing or deterring entry and exit.

It is worth noting that the process involved with the symmetry hypothesis is unlikely to be the same as the one originally hypothesised by Caves and Porter (1976). Instead of a discouraging effect, entry barriers seem to encourage both entry and exit at the same time. Two of the entry barriers variables, $CR4_{t-1}$ and KR_{t-1}, show positive sign in both the entry and exit equations.

Some support for the symmetry hypothesis is also displayed by the other variables. IMP_{t-1} appears to moderately prevent both entry and exit. As argued by Fotopoulus and Spence (1997), one reason might be that expansion in markets with high import penetration is not enough to ensure new plant creation or capacity expansion at the minimum efficient scale while, at the same time, lack of expansion in the domestic market tends to sustain collusive behaviour among incumbents. EXP_{t-1} are positively related to entry and exit. This confirms earlier findings (e.g. Anagnostaki and Louri 1995; Sleuwagen and Dehandschutter 1991) that the extent of external market encourages both entry and exit in domestic industries. While it seems to contradict a stylised fact from the micro exporting literature, which suggests exit should have been lower in exporting industries – because firms in these industries tend to be more efficient than those in other industries –, the positive relationship on exit might occur if there was a co-existence of efficient and inefficient firms in the exporting industries (Anagnostaki and Louri, 1995). According to Anagnostaki and Louri, inefficient firms are likely to be displaced by more efficient firms entering the industries, which are most likely be attracted by the profit opportunity provided by export markets.

Despite these findings, the results do not strongly validate the symmetry hypothesis. For example, $CR4_{t-1}$ is only significant in the entry equation and EXP_{t-1} is not statistically significant in either the entry or exit equations. The strongest evidence for the symmetry hypothesis is provided by IMP_{t-1}, which is statistically significant in both equations.

The results provide some indication on displacement and replacement entry. Both $EN1_{t-1}$ and $EX1_{t-1}$ in the exit and entry equation, respectively, are positive. Even so, only the replacement effect seems to explain the interdependence, since $EN1_{t-1}$ is statistically

insignificant. The estimated coefficient of $EX1_{t-1}$, which is about 10, suggests a large effect of replacement under a one-year adjustment structure.

Crisis period

The results provide a completely different picture from that of the pre-crisis period. There is no strong evidence for the symmetry hypothesis. Of the entry barriers variables, only $CR4_{t-1}$ shows the same sign in both entry and exit equations, albeit insignificant. The absence of evidence applies also to the other variables. In the cases where the coefficients do show the same sign in entry and exit equations, such as of IMP_{t-1} and $TARIFF_{t-1}$, they are statistically insignificant. Moreover, the symmetry hypothesis implied by export orientation in the pre-crisis period is no longer evident in this period. EXP_{t-1} is positively related to entry but negatively related to exit in the crisis period.

Displacement entry seems to have been more important. The positive coefficient of $EN1_{t-1}$ is statistically significant in the exit equation, although only at the 10 per cent level. The opposite is observed for replacement entry. The coefficient of $EX1_{t-1}$ changes to negative and moreover, is very statistically insignificant (i.e. the t-ratio is considerably small). This finding suggests that higher entries induced more exits in the crisis period, but higher exits did not necessarily attract more entries.

Discussion

In summary, the results show substantial differences in the factors determining entry between the crisis and pre-crisis periods and provide some support for the hypotheses. In particular, seller concentration and tariff protection, which were important in explaining entry before the crisis, were no longer important during the crisis period. Industry growth and export intensity were the important factors encouraging entry in this period. Entry in this period is also suggested to have been discouraged more by higher market risk. The picture on the exit side is to a large extent consistent. Export intensity becomes important and acts as a factor that deters exit in the crisis period. A change was also observed in the importance of displacement and replacement entry. While entry before the crisis was substantially explained by replacement entry, it was explained more by displacement entry

in crisis period. Meanwhile, the symmetry implied by the entry and exit determinants seems to hold only for the pre-crisis period.

The results provide some answers to the question of why entry in Indonesian manufacturing had not begun to recover in the period 1999-2000. One possible answer is because there was an increase in the extent of cost disadvantages faced by potential entrants. This is reflected in the importance of capital requirement in deterring entry in this period. The cost disadvantage is likely to take the form of higher capital cost, most likely as a result of the collapse of the domestic financial system and more cautious banks after the crisis.

Another possible explanation is that there was a significant increase in the competitive environment. In other words, the competitive struggle is revealed to have been much stronger in the crisis period. This is implied by the results, which indicate much of the entry process before the crisis was driven by the non-competitive nature of industry. This is likely to be due to collusive behaviour, as reflected in the findings that industry concentration ($CR4_{t-1}$) and trade protection ($TARIFF_{t-1}$) had a large and important effect in attracting entry before the crisis.

The stronger competitive process itself is suggested by several results. First, the unimportance of industry concentration ($CR4_{t-1}$) and trade protection ($TARIFF_{t-1}$) in the crisis period suggests the likelihood that collusion was reduced substantially. Second, demand and profit opportunities became more important to induce entry. If the entry process is viewed according to Orr's (1974) model, and provided there was no large increase in expected profitability, this could have indicated some decline in the extent of entry barriers across industries. The decline implies a move to the ideal of perfect competition as entry became less restricted.

Third, the crisis seems to have pushed out some less efficient firms. This inference is supported by the importance of displacement entry in the crisis period. As argued by Shapiro and Khemani (1987), displacement entry may occur because some high-cost incumbents can be displaced by some low-cost entrants. The importance of displacement entry is consistent with the conclusion from what happened in Chile after the 1980s recession. Liu (1993) found firms in Chilean manufacturing were more efficient on average than existing firms before the recession. This supports the general hypothesis in

the literature that a competitive environment is more conducive to higher efficiency.[9] All in all, the importance of displacement entry reflects a more competitive process in the crisis period.

Apart from showing the differences in entry and exit determinants, the results also indicate that the crisis seems to have provided opportunities for some potential entrants despite the unfavourable economic situation. One source of these opportunities was the lack of investment funds, which provides opportunities for entrants less dependent on, or unconnected to, the domestic financial system. Another source was exchange rate depreciation. Real exchange rate depreciation improves the competitiveness of domestic firms *vis-à-vis* those in other countries, and increases the demand for exports. Accordingly, the sharply depreciated exchange rate depreciation in the crisis period should have significantly increased expected profitability and hence entry in export oriented industries. This argument is supported by the finding that the positive impact of sales orientation was significantly larger and more important in the crisis period when compared to the pre-crisis period.

An opportunity may also have been provided by the number of exiting firms. Although the econometric results do not seem to suggest this, it does not necessarily mean no replacement entry occurred in the crisis period. Indeed, the coefficient of $EX1_{t-1}$ in the entry equation for the crisis period is positive, although not statistically significant. An example of replacement entry was reported by Aswicahyono and Hill (2004), namely that major Korean firms entered the consumer electronics industry in the two years following the crisis. These firms were reported to be taking over the market left by two former major firms in the industry (Aiwa and Sony) that having financial difficulties during the peak of the crisis.

Given these opportunities, why was there no sign of recovery in entry? It might have been because the opportunities were taken up by only a small number of entrants. For example, regarding the opportunity presented by the shortage in investment funds, foreign entrants are more likely to have taken this opportunity, since they were less connected to the domestic financial system. The share of foreign entry has always been small in Indonesian manufacturing, so that any entry by foreign firms is not likely to have been translated in to a higher total entry rate.

Do the main findings differ between the peak and the early recovery?

This sub-section focuses more on the crisis period (i.e. the period 1997-2000) and asks whether there are differences in the determinants of entry between the peak of the crisis and the early recovery period. As was shown, the pattern of entry rates in 1999 or 2000, although not yet recovered to their pre-crisis level, was substantially lower than that in 1997 and 1998.

The model was re-estimated for the peak and early recovery crisis period, defined as the period 1997-98 and 1999-2000, respectively. The estimation results are presented in Table 3. For the purpose of the discussion, the results from Table 2 are re-produced in the table.

More detailed information can be extracted from the table. First, the importance of the demand conditions in attracting entry is clear only during the early recovery period. The coefficient of $ROOM_{t-1}$ is statistically significant only in the estimation for this period. This finding highlights the extent of greater competition after the crisis and provides support for the view that a stable profit expectation was no longer warranted.

Second, a clearer picture of the change in the effect of trade protection on entry can be obtained. Although trade protection ($TARIFF_{t-1}$) for the early recovery period is positively related to entry, it is negatively related to entry at the peak of the crisis. Thus, overall, the effect of trade protection had changed considerably from encouraging entry before the crisis to discouraging entry during the crisis peak and then becoming significantly less important during the early stage of recovery. This finding clearly reflects the effect of greater competitive pressure during and after the crisis. Accelerated trade liberalisation and contracting demand combined to eliminate any incentive to entry created by non-competitive behaviour.

Third, the extent of cost disadvantages faced by potential entrants is indicated to have been higher during the peak of the crisis. The negative relationship between capital requirement and entry is clearly shown in the results of the crisis peak rather than the early recovery period. This finding suggests that the effect of higher capital costs in deterring entry weakened as the economy recovered. Nevertheless, the basic finding – and thus the inference – from the earlier results in respect to this variable persists. That is, the

effect of capital requirement on entry changed from positive before the crisis to negative during the crisis period.

Fourth, the positive effect of industry's export orientation on entry is shown to have been higher during the peak of the crisis. The coefficient of EXP_{t-1} is both higher

Table 3 The determinants of entry and exit, crisis period

	Method: SURE					
Time period	Pre-crisis	Peak crisis	Early recovery	Pre-crisis	Peak crisis	Early recovery
Dependent variable	$EN1'_{j,t}$	$EN1'_{j,t}$	$EN1'_{j,t}$	$EX1'_{j,t}$	$EX1'_{j,t}$	$EX1'_{j,t}$
$PCM_{j,t-1}$	-3.689	-0.132	-3.909			
	(1.38)	(0.17)	(2.50)*			
$SDPCM_{j,t-1}$	0.437	0.149	-0.003			
	(1.13)	(0.27)	(0.03)			
$PCM_{j,t}$				2.463	0.313	-1.520
				(0.89)	(0.53)	(0.73)
$ROOM_{j,t-1}$	-0.496	0.208	1.019			
	(1.09)	(0.50)	(4.34)**			
$GR_{j,t}$				0.143	0.205	0.117
				(0.67)	(2.39)*	(0.66)
$ES_{j,t-1}$ [(d)]	-0.003	0.673	-0.101	-0.268	-0.639	0.251
	(0.04)	(3.73)**	(1.25)	(1.54)	(3.97)**	(2.53)*
$KR_{j,t-1}$	0.001	-0.002	-0.001	0.002	-0.001	-0.001
	(1.23)	(2.16)*	(1.36)	(1.55)	(0.22)	(1.21)
$CR4_{j,t-1}$	4.714	1.334	5.075	4.140	-1.379	1.943
	(3.96)**	(1.01)	(2.81)**	(1.64)	(1.20)	(0.84)
$EXP_{j,t-1}$	1.418	2.217	1.518	0.669	-0.642	-3.282
	(1.48)	(2.79)**	(2.13)*	(0.51)	(0.85)	(3.73)**
$TARIFF_{j,t-1}$	0.057	-0.042	0.048	-0.031	-0.025	-0.053
	(4.00)**	(4.24)**	(1.13)	(1.88)+	(3.67)**	(1.09)
$IMP_{j,t-1}$	-0.026	-0.200	0.010	-0.033	-0.240	0.003
	(1.84)+	(1.54)	(0.68)	(1.83)+	(2.04)*	(0.19)
$EN1_{j,t-1}$				1.459	1.803	1.016
				(0.97)	(1.27)	(0.33)
$EX1_{j,t-1}$	9.965	-1.526	-3.602			
	(2.28)*	(0.68)	(1.32)			
Year dummy 1996	-0.100			0.646		
	(1.04)			(3.38)**		
Year dummy 1998		0.296			0.058	
		(1.98)*			(0.34)	
Year dummy 2000			-0.795			1.002
			(3.17)**			(4.15)**
F-statistics	18.05**	35.38**	48.48**	24.60**	6.59**	5.18**
Breusch-Pagan (LM)	6.67	2.12	2.91			
statistics (p-value)	(0.01)[a]	(0.15)[b]	(0.09)[c]			
R-squared	0.82	0.76	0.79	0.67	0.76	0.69

Notes: 1) Peak crisis: 1997-98

2) Early recovery: 1998-99

3) Fixed industry effects are included

4) t-statistics in parentheses

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

a) For the estimation of the entry and exit equation for the pre-crisis period.

b) For the estimation of the entry and exit equation for the peak of the crisis.

c) For the estimation of the entry and exit equation for the early recovery.

d) The coefficients were multiplied by 10^3 to improve presentation.

and statistically significant in the results for the crisis peak compared to those for the early recovery. This finding is consistent with some real exchange rate appreciation in 1999.

Conclusion

The purpose of this paper is to examine the impact of the 1997/98 economic crisis on firm entry in Indonesian manufacturing. The descriptive analysis shows that the crisis severely affected the extent of firm entry in the industry. Entry rates declined significantly in 1998. But unlike the general industry-wide picture, the rates did not seem to have started its recovery in the period 1999-2000.

The econometric analysis sheds some light on why the rates did not seem to have recovered. First, the declining entry pattern might have been caused by an increase in the cost disadvantages faced by potential entrants. The econometric analysis found that the effect of capital requirement as a barrier to entry changed from positive before the crisis to negative during the crisis period. The most important cost disadvantage is likely to have been a higher capital cost, due to the collapse in the domestic financial system and more selective banks after the crisis. The other possible explanation is that there was a dramatic increase in competitive pressures. This inference is mainly driven by the results which indicate the effect of non-competitive behaviour before the crisis became significantly less important during the crisis period.

The results also suggest that the crisis provided opportunities for some foreign entrants and those who are able to compete in export markets. However, these opportunities are not likely to have translated into a higher recovery rate in the entry as the numbers of the favoured firms are usually very small relative to total potential entrants in the industry.

NOTES

1. The models are commonly adopted in empirical literature on firm entry.
2. See for example Evans and Siegfried (1992) and Fotopoulus and Spence (1998).
3. The data on advertising expenditure in SI data may also be unreliable as they were only first reported in 1993.
4. See Soesastro and Basri (1998) for the details of the trade liberalization during the period 1997-99.

5. Another limitation of the logistic transformation approach is that the parameters are difficult to interpret. According to Papke and Wooldridge (1996, p.620), further assumptions on the distribution of errors are needed to obtain the expected value of the dependent variable conditional on the explanatory variables and, even with these assumptions, it is still non-trivial to obtain the expected values. Notwithstanding this limitation, this paper proceeds with the transformation approach, because the focus here is on the change in the effect of the explanatory variables between two periods of time rather than on the magnitude of the effect.
6. This paper also experimented with the alternative approach, that is when the EX and EN were introduced as the current variables (or in other words, EX and EN are assumed to be endogenous in entry and exit equation, respectively). The results, however, were disappointing as renders many of the independent variables insignificant and therefore were not used to base the analysis.
7. Rosenbaum and Lamort (1992) also adopted a similar approach.
8. The degree of freedom for the LM tests is one.
9. See for example Tybout et al. (1991) and Liu (1993) for empirical studies related to the hypothesis.

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Appendix Definitions of the independent variables

- Industry profitability is proxy by price-cost margin (*PCM*). For industry *j*, it is defined as

$$PCM = \frac{output - inputs - wages}{output}$$

Gross profit is computed as the value of output minus inputs, and wages and salary. Included in inputs are raw material, fuel and electricity.

- Seller concentration is proxied by a concentration ratio of the largest four plants in an industry ($CR4$), computed as the following

$$CR4_j = \frac{\sum_{i=1}^{4} VA_i}{\sum_{i=1}^{n} VA_i}$$

where VA_i is the value added of plant i in industry j.

- Import penetration (IMP) for industry j is defined as

$$IMP_j = \frac{M_j}{Q_j}$$

where Q_j and M_j are the domestic production and imports in industry j, respectively. The data on imports are derived from *UN Comtrade* (United Nation Commodity Trade Statistics Database), provided by IEDB (International Economic Data Bank).

- Industry growth (GR) is measured as the percentage change in real value added of industry j between t and $t-1$

$$GR = \frac{RVA_{j,t} - RVA_{j,t-1}}{RVA_{j,t-1}}$$

where VA is the value added of industry j. The industry value added is deflated by the wholesale price index (*WPI*) at the three digit ISIC level.

- Industry room ($ROOM$) is measured as GR divided by MES. MES is defined as the average plant size accounting for 50 percent of industry output (Caves et al. 1975). Plant size is measured by total number of workers.

- Standard deviation of profitability ($SDPCM$) is measured by the standard deviation of PCM, defined at the three-digit level of ISIC.

- Economies of Scale (ES) is defined following (Caves et al. 1975) as a compound variable using *MES* and cost-disadvantages ratio (*CDR*), that is

$$ES = (1 - CDR) * MES$$

CDR is defined as

$$CDR = \frac{(VA/L)^{\text{smallest}}}{(VA/L)^{\text{largest}}}$$

where $(VA/L)^{\text{smallest}}$ is the value added per labour for the smallest plants accounting for 50% of industry output and $(VA/L)^{\text{largest}}$ is the value added per labour for the largest plants accounting for the largest 50% of industry output.

- Capital requirement (KR) is measured following Caves et al. (1980) as

$$KR = \frac{K}{Q} * MES$$

where K/Q is the ratio of capital to labour. In the absence of reliable capital stock estimates, K/Q is proxied by the ratio of energy expenditure to production labour. This proxy follows the approach taken by Globerman et al. (1994), which was motivated by some previous studies which show that capital and energy are complementary inputs in production. Thus,

$$KR = \frac{\text{energy expenditure}}{\text{L}^{\text{prod}}} * MES$$

where L^{prod} is the number of production workers.

- Export intensity (*EXP*) is measured as the ratio of export to industry output.

$$EXP = \frac{\text{EX}}{\text{output}}$$

EX is not reported in SI data and thus, as in previous studies, EX is estimated by multiplying the percentage of exported output in production, which is reported, with the value of output.

- Trade protection (*TARIFF*) uses the average nominal tariff rate to proxy *TARIFF*. Estimates for tariff rate are derived from the *Trade Policy Review* (TPR) series published by the *World Trade Organization* (WTO). For the pre-crisis period (1995-96), the tariff rates are derived from TPR 1994 (WTO 1995) and for the crisis period (1997-2000), the tariff rates are derived from TPR 1998 and 2003 (WTO 1998, 2003).

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