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ECONOMETRIC ANALYSIS OF THE EFFECTS OF KRISMON SHOCKS ON INDONESIA'S INDUSTRIAL SUBSECTORS

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INTRODUCTION

THIS paper analyzes the impacts of the economic crisis on the industrial sector during the Krismon period[1] based on the monthly time-series data (January 1996–December 1998) of the Indonesian economy. In Section I, I define the chronology of the three subperiods of Krismon.[2] In Section II, I construct a surrogate variable of political (or noneconomic) shocks based on the disturbance term of the exchange rate equation. In Section III, I describe the changing trends of production levels of nine subsectors during the Krismon period. In Section IV, I analyze the impacts of the economic and noneconomic variables on these production indices and evaluate the damage caused by Krismon. Section V includes some simulation studies based on the estimated equations. In Section VI, I discuss the changes of the employment situation during the Krismon period. Section VII shows a tentative forecast until December 1999. Section VIII concludes the paper.

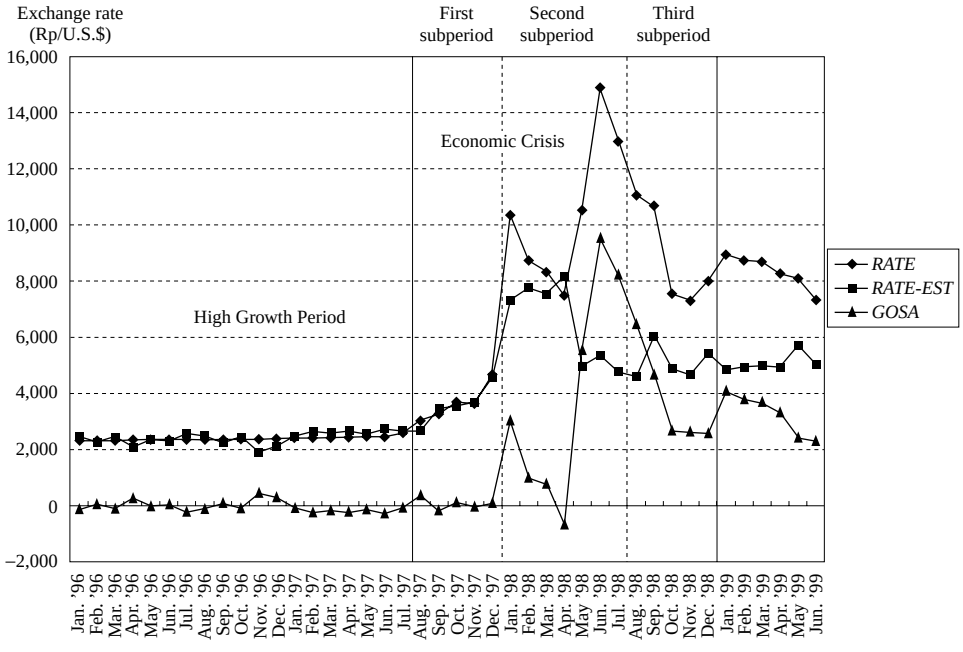
I. STAGES OF KRISMON

In July 1997 the Asian currency crisis (ACC) occurred. First the Thailand baht rapidly depreciated, and then the Indonesian rupiah faced a strong selling pressure as a result of the bandwagon effect from Thailand. Finally the Indonesian government decided to change the exchange rate regime from managed float to a free float system. Figures 1 and 2 show the changing trends of exchange rate and industrial production index during the Krismon period, respectively. Because the food and beverage subsector (ISIC 31) showed a different trend, this subsector was omitted

[1] The data of the industrial production indices until the fourth quarter of 1998 were used for the estimation and the additional data until the third quarter 1999 were used for the projection. Fukuchi (1994a) analyzed the changes in the industrial subsectoral pattern based on some aggregate indices. This paper analyzes the trends of the subsectors explicitly.

[2] Krismon is the term coined for the economic crisis in the Indonesian language. Originally it applied to the "monetary crisis," but was also used to cover the economic crisis in a wider sense.

Fig. 1. Impact of Noneconomic Disturbances on the Exchange Rate



Note: *RATE*, actual data; *RATE-EST*, estimated by the exchange rate equation based on the data of sustained growth period (May 1996–August 1997); *GOSA*, residuals between actual and estimated values.

in Figure 3 and the figure only depicts the patterns of other subsectors to provide a rapid overview. Based on these figures, the whole Krismon period can be aptly divided into three subperiods:

(1) Bandwagon period (August–December 1997). The exchange rate doubled within five months from Rp 2,450/U.S.$ to Rp 4,650/U.S.$, but the impact was still limited to the monetary aspect and the real economy (GDP) continued to grow until November.

(2) Free-fall period (January–July 1998). The political and social situation became very unstable, and eventually the Soeharto regime collapsed. The exchange rate showed volatile changes and reached a value of Rp 14,900/U.S.$ in June. The impact of Krismon extended to the whole economy, and the real economic activity showed a rapid contraction. Real monthly GDP fell by 19 per cent in six months.

(3) Stagnation period (August–December 1998). The contraction ceased, but the real economic activity stagnated and showed a very weak recovery during this period.

Fig. 2. Trend of Industrial Production Indices, January 1995–December 1998

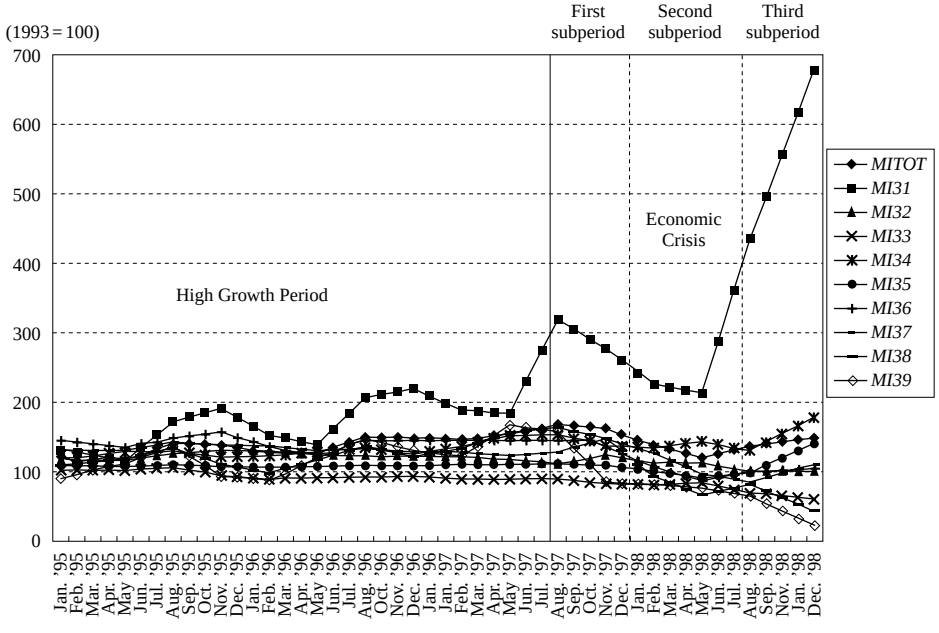


Fig. 3. Trend of Industrial Production Indices (Except MI31), January 1995–December 1998

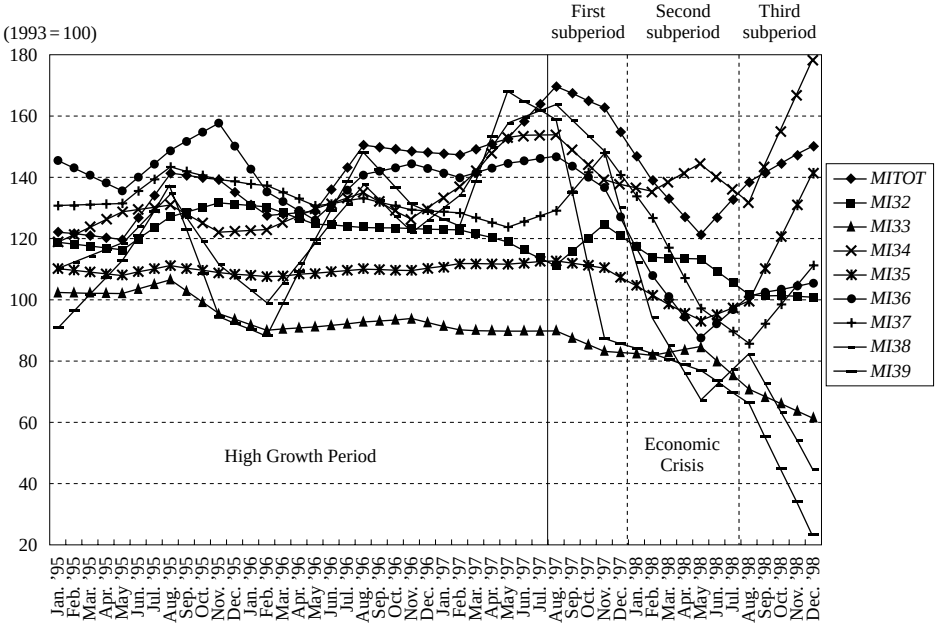


TABLE I

TREND OF GDP AND PER CAPITA GDP

Period	GDP Nominal (Rp Billion)	GDP 1997 Price (Rp Billion)	Exchange Rate (Rp/U.S.$)	Population (Million)	Z1	Z2
Jun. 1995	37,862	31,861	2,246	194.75	2.885	5,541
Dec. 1995	40,098	32,763	2,308	195.77	2.958	5,578
Jun. 1996	43,814	34,155	2,342	196.81	3.168	5,784
Dec. 1996	47,545	35,963	2,383	198.33	3.353	6,044
Jun. 1997 (a)	51,099	36,077	2,450	199.87	3.478	6,016
Nov. 1997 (b)	56,072	37,668	3,648	201.41	2.547	6,241
Dec. 1997	61,749	36,289	4,650	201.15	2.197	6,005
Jun. 1998	82,967	30,785	14,900	202.97	0.914	5,055
Dec. 1998 (c)	91,990	29,968	8,025	204.54	1.868	4,881
Jun. 1999 (d)	—	30,429	—	206.13	—	4,920
(c) / (a)					0.5370	
(d) / (a)					—	0.8178
(d) / (b)					—	0.7883

Source: The figures for GDP and exchange rate are cited from various issues of *Indonesian Financial Statistics* (Bank Indonesia).
Notes: Z1 = nominal GDP per capita per day in U.S. dollar. Z2 = real GDP per capita per day in rupiah.

The usefulness of decomposing Krismon into subperiods was also confirmed by observing the trend of the GDP and per capita GDP. The observation can be made based on different criteria: (1) current vs. real GDP, (2) GDP in rupiah or in U.S. dollar, (3) absolute GDP or per capita GDP. GDP represents the overall activity level, while per capita GDP is more relevant to the real welfare or the standard of living of the general population. The choice of unit between rupiah and U.S. dollar relates to the determination of the extent to which economy became dollarized and to the percentage of commodities priced in U.S. dollar. I adopted two indices: per capita per day nominal GDP in U.S. dollar (Z1) and per capita per day real GDP in rupiah (Z2). Table I shows the basic figures and resulting values of Z1 and Z2.

Z1 = nominal GDP / nominal exchange rate / population / 365 (in U.S. dollar),

Z2 = real GDP (1997 price) / population / 365 (in rupiah).

The Z1 index fell from U.S.$3.478/day in June 1997 to U.S.$1.868/day in December 1998, which is equivalent to only 53.70% of that in June 1997, and near the level at the beginning of the 1990s. The Z2 index dropped from the highest value of Rp 6,241 in November 1997 to Rp 4,920 in June 1999. Therefore, the fall of standard of living was 46% or 22% in terms of Z1 index or Z2 index respectively. The larger decrease of Z1 was ascribed to the fact that the rupiah depreciated markedly and the real exchange rate decreased by only 50% because of the price increase. The degree of dollarization, i.e., the percentage of goods priced according to international price, differed depending on the social groups. The decrease of the pur-

chasing power of the general population thus stood somewhere between these two indices, i.e., 22–46%. The GDP growth rate became positive (0.4%) in the second quarter of 1999, but as the annual population growth rate was around 1.6%, the quarterly growth of 0.4% of real GDP implies zero growth for the standard of living. Therefore, the free fall of the economy stopped after one year, but the economy still stagnated in the former half of 1999 as a whole.

II. MEASUREMENT OF NONECONOMIC DISTURBANCES

Figure 1 suggests that strong noneconomic disturbances affected the exchange rate during the subperiod 2, because such a substantial devaluation of the rupiah and the two large humps in January and June of 1998 in particular cannot be explained by economic factors alone. Therefore, I adopted the following strategy to evaluate noneconomic disturbances: first I estimated the exchange rate equation employing as many economic variables as possible to explain it based on the data until the end of 1997, and then I designated the observation errors as noneconomic disturbances (NED). I selected the explaining variables and postulated the sign conditions as follows:

A. PPP variable (*X1*). The price level (defined as consumer price index) of importing countries positively affects the exchange rate. I denoted this variable by the weighted average of the consumer price index (CPI) of the United States and of Japan based on the share of Indonesian exports to each country.
B. Bandwagon variable (*X2*). The real exchange rates of Thailand and of the Republic of Korea affect positively to exchange rate through various channels. (1) The economic crisis revealed the common weakness of affected countries, such as the weak banking sector, and overborrowing of firms. (2) Since Thailand has a similar export commodity share to that of Indonesia, the devaluation of the currency of such a competing export country exerts a depreciation pressure. Therefore, the devaluation of the currency in Thailand exerts a similar devaluation pressure to that in Indonesia.
C. Demand-supply variable (*X3*). A favorable current balance of payment will increase the supply of foreign currency, and negatively affect the exchange rate.
D. Degree of external debt overhang (*X4*). When the level of total external debt normalized by the dollar import value increases, it positively affects the exchange rate as debt servicing becomes difficult. As a result, the expected default risk increases.
E. Interest-rate arbitrage (*X5*). The investors' expectation implies that the expected devaluation of the exchange rate is equivalent to the interest rate differential between home and foreign countries. I define the interest-rate arbitrage as the difference between the money-market interest rate in Indonesia and in the United States.

The equation which explains the exchange rate (Y, Rp/U.S.$) is specified as follows:

$$Y = F\,[(+)X1,\ (+)X2,\ (-)X3,\ (+)X4,\ (+)X5,\ (+)NED]. \tag{1}$$

After introducing suitable time lags, I obtained the following results based on the data (January 1997–December 1998) estimated by least squares analysis. Since all the explaining variables lagged, the estimated coefficients were expected to be consistent.

$$\begin{aligned} Y/X1 = {} & -22.9873 + 3.985 \cdot X2(-1) - 2.8068 \cdot X3(-1) \\ & \quad (-3.93) \qquad (6.01) \qquad\quad (-1.76) \\ & + 0.2652 \cdot X4(-4) + 0.05057 \cdot X5(-1) + NED, \\ & \quad (2.48) \qquad\quad (2.45) \end{aligned} \tag{2}$$

$R^2 = 0.9159$, $RA^2 = 0.8068$, $R = 0.9570$, $RA = 0.8982$,
$DW = 1.80$, $S = 0.9689$.

(Note: R and RA denote the multiple correlation coefficients before and after correction of the degree of freedom. DW is the Durbin-Watson statistic. S is the estimated standard deviation of the equation error.)

The equation showed a fairly good fit until subperiod 1, but failed to explain the volatile changes after subperiod 2. Figure 1 shows the trends of the actual exchange rate, estimated values, and errors. I define the error term as noneconomic disturbances (NED) which could not be explained by the five economic variables. Figure 1 shows that (1) the absolute value of NED was very small until subperiod 1, and (2) the volatile jumps in January and June 1998 were mostly accrued to NED. Therefore, the precipitous devaluation of June 1998 was mainly due to political and social unrest.[3]

III. CHANGING TRENDS OF PRODUCTION LEVELS

Before discussing the impacts of Krismon on the industrial production index, I first analyzed the impacts of Krismon on five major economic sectors: primary, industry, commerce, monetary, and other sectors. Apart from the impact of the Asian currency crisis (ACC), there were three exogenous (or preceding) shocks: (1) the negative impact on the agricultural sector due to abnormal weather conditions and rainfall shortage, (2) the negative shock to the mining sector due to the fall of the oil price in 1998 (from U.S.$19 to U.S.$12), (3) the negative shock to the real estate and banking sectors due to the bursting of the bubble economy. The free fall of the GDP after July 1997 was caused by all of these three shocks and ACC (quick de-

[3] The definition of NED was given in the previous work (Fukuchi 2000), but NED was introduced into the structural equation of industrial subgroups for the first time here.

TABLE II

TREND OF SECTORAL GDP

Sector	(1) Nov. 1997	(2) Aug. 1998	(3) June 1999	(4) [(2)−(1)]	(5) [(3)−(2)]	(6) [(3)/(1)]
Primary	7,573	8,315	8,333	742	18	1.1003
Industry	10,017	7,680	7,835	–2,337	155	0.7821
Commerce	6,402	4,729	4,958	–1,673	229	0.7744
Monetary	4,151	1,700	1,621	–2,451	–79	0.3905
Others	9,523	7,328	7,679	–2,195	351	0.8063
GDP 1997 price (Rp billion)	37,668	29,755	30,429	–7,913	674	0.8078

Notes: Figures cited from the BPS-Statistics Indonesia.

valuation of rupiah). What was the contribution of factors? As the real GDP reached a maximum value in November 1997, and a minimum value in August 1998, I decomposed the changes between November 1997 and June 1999 into two subperiods: November 1997–July 1998 and August 1998–June 1999 (see Table II).

The monetary sector (banking and others), which provides the important financial services to other sectors, experienced the largest downfall, and the activity level fell to only 39% in nine months. This implies that, during the Krismon period, the weakened monetary sector due to the accumulation of bad performing loans exerted negative impacts on the other sectors (industry, commerce, others). The primary sector recorded a steady increase because some subsectors enjoyed high export earnings based on high dollar prices while receiving negative impacts like those of abnormal weather conditions. The movements of the monetary and primary sectors were rather independent, I assumed that these two sectors applied exogenous shocks to the rest of the economy.

These sectoral trends suggest that (1) the restructuring and revitalization of the monetary sector must proceed first, and (2) attention must be paid to the dualistic development of the primary sector (some stagnating subsectors and other prosperous subsectors). Such a dualistic tendency may be common to every sector: a firm which can sell its products at a suitable dollar price can prosper, while another firm that imports her necessary parts in dollars and sells the assembled products in rupiah to the depressed domestic market is likely to incur large losses. The devaluation of the rupiah thus led to both favorable and unfavorable effects, reflecting the impact on the dollarized economy and rupiah-based economy. The volatile devaluation of the rupiah originally induced by political instability thus resulted in a polarization and dollarization of the economy.[4]

[4] Dollarization, opposite to Gresham's Law, is very common in Latin American countries. See Guidotti and Rodriguez (1992).

TABLE III

TRENDS OF PRODUCTION INDICES OF SUBSECTORS

Subsector	(1) Aug. 1997	(2) Bottom	(3) Dec. 1998	(4) Ratio: (3)/(1)	(5) Type
31. Food & beverage	319.53*	214.04 (May '98)	678.28**	2.1227	Recovery
35. Fertilizer, petroleum refinery	112.66*	92.83 (May '98)	141.40**	1.2551	Recovery
34. Paper	153.85*	131.65 (August '98)	178.31**	1.1589	Recovery
32. Textile	111.25 (131.60* Nov. '95)	—	100.63	0.9745	Decline
37. Iron & steel	129.07 (143.44* August '95)	85.88 (August '98)	111.13	0.8610	Recovery
36. Cement	146.92 (157.80* Nov. '95)	87.53 (May '98)	105.44	0.7176	Recovery
33. Furniture	89.77 (106.52 August '95)	—	61.29	0.6827	Decline
38. Machinery	163.86*	—	44.37	0.2707	Decline
39. Others	158.69 (167.84 May '95)	—	23.00	0.1449	Decline
3. Industry	169.50*	121.13 (May '98)	150.21	0.8861	Recovery

Source: Production index cited from the BPS-Statistics Indonesia (1993 = 100).

When the total industrial sector is divided into nine subsectors according to a two-digit industrial code number, the trend of the production index of each subsector can be represented as follows. Column (1) of Table III shows the value in August 1997 just before the Krismon period. The asterisk symbol (*) indicates the historic high value (otherwise I listed the year and corresponding value of the historic highest value). Column (2) shows the bottom value during Krismon. No value (—) implies that the decline continued during the Krismon period. Column (3) shows the value in December 1998. A double asterisk (**) indicates the historic high value. Column (4) shows the ratio between the values in August 1997 and December 1998. The last column describes the type of trend, whether it showed a recovery or steady decline. The subsector (35) includes fertilizer, petroleum refinery, and others, and

is very sensitive to the natural conditions as well as the dollar price. I refer to this group as the agriculture-related group (in abbreviation), to emphasize the high dependence on natural conditions.

I divided the total industry into three groups, and calculated the weighted ratio of column (4). The results were as follows:

—Agriculture-related group (31. Food and beverages, 35. Fertilizer, petroleum refinery) (weight 37.36%): the ratio was 1.8189, and the weighted average production index increased by 82% during the Krismon period.

—Light-industry group (32. Textile, 33. Furniture, 34. Paper, 39. Miscellaneous) (weight 34.08%): the ratio was 0.8960, and the weighted average index decreased by 10% during the Krismon period.

—Capital-goods group (36. Cement, 37. Iron and steel, 38. Machinery) (weight 28.54%): ratio was 0.4797, and the weighted average production index decreased to less than half.

Based on these data, the following observations can be made.

(a) Production of the agriculture-related group grew steadily and the highest level reached in the past was recorded in August 1997. During the Krismon period, the production declined until May 1998, but showed a rapid recovery, and recorded the historically highest level in December 1998, which was 1.8 times the level before the Krismon period.

(b) Production of the light-industry group showed a volatile growth pattern in the past. Only the paper subsector (34) grew steadily and reached the historic highest in August 1997. During the Krismon period, the paper subsector reached the bottom in August 1998, then recovered and recorded a historic high level in December 1998, while others (textile, furniture, miscellaneous) declined continuously during the Krismon period. The weighted index implies that the level of production after Krismon was 10% lower than that before Krismon.

(c) In the capital-goods sector, the production of the machinery subsector reached a historic high level in August 1997 while the cement and basic metal subsectors showed a rather volatile growth pattern before Krismon. During the Krismon period, the production levels of the cement and basic metal subsectors reached the bottom in July 1998, and recovered slightly until December 1998, while the production level of the machinery subsector declined continuously. The weighted average index (0.4797) implies that the overall production level of this group decreased to one half of the level before Krismon.

Briefly, the production level of the agriculture-related group doubled, that of the light-industry group declined slightly, while that of the capital-goods group declined to one half. We must notice that the changes in the subsectoral patterns markedly differed while the overall production index of the industry declined by 11% during the Krismon period.

IV. ANALYSIS OF IMPACTS OF KRISMON ON PRODUCTION INDEX

Based on the observations included in Section III, I selected the following groups of explaining variables.[5]

(1) Negative impacts of Krismon. Based on the discussion in Section II, the non-economic disturbance (*NED*) parameter was adopted as a good surrogate of political and social instability. Monetary sector GDP (*GDPMO*) and money-lending interest rate (*INT*) describe the shrinkage of the banking sector service and the resulting fund shortage. A dummy [*DKRIS* = 0 (periods 1–32), = 1 (periods 33–48)] shows the structural change between the two subperiods. I introduced one of these variables into each equation except for the food and beverage subsector which did not receive any strong negative impacts based on the observation in Section III.

(2) Negative impacts of rapid devaluation and shrinkage of imports. When an economy experiences a rapid devaluation and faces a skyrocketing import price in local currency, the imports of essential goods such as parts, intermediate and capital goods markedly decrease and the manufacturing output is considerably depressed. Such a stagnation due to foreign-currency-constraint is detrimental to many developing countries including Sub-Saharan African countries (see Fukuchi 1993a, 1993b, 1994b). This harmful effect seemed to have affected practically every subsector except for the food and beverage subsector (31) which has a low import dependency. Therefore, I introduced the real import (*IM*) into each equation except for (31).

(3) Influence of general economic trend. Since some subsectors strongly depend on the intermediate demand from another subsector, I used the lagged value of total production index (*MITOT*). For the fertilizer subsector, I used the agricultural GDP (*GDPAG*) to describe the induced demand from agriculture. For many subsectors, I used per capita GDP (*GDP*/*POP*) to describe the overall trend of purchasing power.

(4) Strong export activity. During the Krismon period, the output of the food and beverage subsector increased largely, partly due to the high export earnings. Therefore, I used the exchange rate (*RATE*) and dollar export price (*X$*/*XR*, dollar value of export divided by real export in rupiah) to describe this effect.

[5] Widianto Bambang (1999) reported the results of the Indonesian competitiveness study conducted by BAPPENAS-BPS at the end of 1998 for about 562 firms in five subsectors: food processing (ISIC 31), garments (ISIC 322), textiles (ISIC 321), chemicals and processed rubber (ISIC 35), and electronics (ISIC 383). These firms reported that the output fall was mainly due to the rupiah devaluation, decrease of the domestic demand, high interest rate, high labor cost, shortage of access to credit, and falling foreign demand.

(5) Persistence of past tendency. Based on the habit hypothesis, consumer attitudes are relatively stable and influenced by past tendency. This suggests that since the outputs of the consumption-goods subsectors strongly depend on past trend, I added the lagged values of these subsectors.

(6) Size of economy. The production level depends on the scale of economy. The demand for the consumption-goods and capital-goods subsectors increases with the population (*POP*) size and the stock of capital (*K*). Therefore, I divided both sides of the equation by such a scale variable, and tried to explain the normalized level.

Based on these considerations, I estimated the equations using monthly data of thirty-six samples. The indices of the three subgroups are defined as weighted averages based on the value-added value in 1993, and that of total industry is also defined as a weighted average of the three subgroups in the same way. As some lagged values are used as explaining variables, the following set of twelve equations constitutes a dynamic multi-equation system. Fukuchi (1993a, 1993b, 1994b) constructed full-fledged multi-equation models of the aggregate manufacturing sector for some African countries based on annual data. The model below is not full-fledged and does not explicitly explain manufacturing imports and exports, but the main purpose is to clarify the different trends of each subsector during the Krismon period. As the index in the agriculture-related group (MI31 and MI35) showed very volatile changes during the Krismon period, presumably due to the abnormal weather conditions and rapid changes in international prices, dummy variables were introduced in certain cases.

Industrial Production Index Model (January 1996–December 1998)

Production index of food and beverage subsector (31): *MI31*

$$\begin{aligned} MI31/POP = {} & -2.7111 + 1.573\text{E-}02 \cdot MITOT(-1) + 0.7378 \cdot D(31A) \\ & \quad (-10.29) \quad (12.27) \qquad\qquad (14.64) \\ & + 3.625 \cdot (GDPAG/GDP)(-4) \\ & \quad (4.09) \\ & + 5.227\text{E-}03 \cdot (RATE \cdot X\$/XR)(-4) + u, \qquad (3) \\ & \quad (29.22) \end{aligned}$$

$R^2 = 0.9809$, $RA^2 = 0.9574$, $R = 0.9904$, $RA = 0.9785$, $DW = 1.45$, $S = 0.0939$.

(Note: $D(31A) = 1$ (44, 48), -1 (41, 46).)

Production index of textile subsector (32): *MI32*

$$\begin{aligned} (MI32)/(POP)(-1) = {} & 0.04760 - 3.677\text{E-}06 \cdot NED + 0.2772 \cdot (GDP/POP)(-2) \\ & \quad (0.92) \quad (-2.86) \qquad\qquad (1.00) \\ & + 0.8337 \cdot (MI32/POP)(\text{-}2) + u, \qquad (4) \\ & \quad (12.38) \end{aligned}$$

$R^2 = 0.9159, RA^2 = 0.8245, R = 0.9570, RA = 0.9080, DW = 0.77, S = 0.01534.$

Production index of furniture subsector (33): *MI33*

$$(MI33)/(POP)(-1) = -1.2016 - 1.666\text{E-}03 \cdot NED + 0.3854\text{E-}03 \cdot YW(-4) \quad (-5.51) \quad (-1.19) \quad (7.07)$$
$$+ 0.01815 \cdot RATE(-4)/RATE(-5) \quad (1.55)$$
$$- 0.01889 \cdot (INT/POP)(-1) \quad (-5.06)$$
$$+ 4.562\text{E-}03 \cdot (GDPAG/POP)(-1) + u, \quad (3.84) \qquad (5)$$

$R^2 = 0.9144, RA^2 = 0.8101, R = 0.9562, RA = 0.9001, DW = 0.97, S = 0.01558.$

Production index of paper subsector (34): *MI34*

$$(MI34)/(POP)(-1) = -0.05336 - 3.712\text{E-}06 \cdot NED + 0.9792 \cdot (MI34/POP)(-1) \quad (-0.94) \quad (-1.93) \quad (11.63)$$
$$+ 0.2507 \cdot IM/GDP(-4) + u, \quad (2.46) \qquad (6)$$

$R^2 = 0.8492, RA^2 = 0.6973, R = 0.9215, RA = 0.8351, DW = 0.66, S = 0.02242.$

Production index of fertilizer subsector (35): *MI35*

$$(MI35)/(K)(-1) = -3.479\text{E-}06 - 5.884 \cdot NED + 8.086\text{E-}03 \cdot (GDPAG/K)(-1) \quad (-0.32) \quad (-4.11) \quad (11.95)$$
$$+ 3.538\text{E-}02 \cdot IM/K(-4) + 1.078 \cdot D(35A) \quad (6.81) \quad (5.34)$$
$$+ 0.7057 \cdot D(35B) + u, \quad (5.34) \qquad (7)$$

$R^2 = 0.9934, RA^2 = 0.9847, R = 0.9967, RA = 0.9923, DW = 0.98, S = 1.958\text{E-}05.$

(Note: Two dummy variables are specified as follows: $D(35A) = 1$ (48), 0 (other), and $D(35B) = 1$ (47), −1 (39, 40).)

Production index of cement subsector (36): *MI36*

$$(MI36)/(K)(-1) = -2.7074\text{E-}04 + 1.7201\text{E-}4 \cdot (GDP/POP)(-1) \quad (-2.74) \quad (3.38)$$
$$+ 6.123\text{E-}03 \cdot (IM/K)(-4) + 1.795\text{E-}02 \cdot (GDPMO/K)(-3) \quad (5.58) \quad (5.48)$$
$$- 6.941\text{E-}03 \cdot DKRIS + 9.514 \cdot D(36A) + u, \quad (-3.96) \quad (6.65) \qquad (8)$$

$R^2 = 0.9908, RA^2 = 0.9786, R = 0.9954, RA = 0.9892, DW = 1.05, S = 3.197\text{E-}03.$

(Note: $D(36A) = 1$ (38–41), $= -1$ (47–48).)

Production index of iron and steel subsector (37): *MI37*

$$(MI37)/(K)(-1) = -1.5971\text{E-}04 + 0.8814 \cdot (MITOT/K)(-1) \quad (-7.99) \quad (9.09)$$
$$+ 1.5420\text{E-}03 \cdot (IM/K)(-1) \quad (1.30)$$
$$+ 7.1555\text{E-}03 \cdot (GDPMO/K)(-1) + u, \quad (1.73) \qquad (9)$$

$R^2 = 0.9895$, $RA^2 = 0.9772$, $R = 0.9947$, $RA = 0.9885$, $DW = 0.30$, $S = 3.246\text{E-}05$.

Production index of machinery subsector (38): *MI38*

$$(MI38)/(K)(-1) = -6.068\text{E-}04 + 4.938\text{E-}6 \cdot (GDP/POP)(-1) \quad (-2.79) \quad (4.41)$$
$$- 1.502\text{E-}04 \cdot DKRIS + 2.948\text{E-}03 \cdot IM/K(-4) \quad (-3.92) \quad (1.81)$$
$$+ 1.342\text{E-}02 \cdot (GDPMO/K)(-3) + u, \quad (1.81) \qquad (10)$$

$R^2 = 0.9309$, $RA^2 = 0.8500$, $R = 0.9648$, $RA = 0.9219$, $DW = 0.37$, $S = 7.414\text{E-}04$.

Production index of agriculture-related industry sector (3AG): *MIAG*

$$MIAG = (12{,}098.73 \cdot MI31 + 6{,}516.78 \cdot MI35)/18{,}615.51. \qquad (11)$$

Production index of light-industry sector (3LI): *MILI*

$$MILI = (9{,}810.57 \cdot MI32 + 4{,}628.66 \cdot MI33 + 2{,}097.79 \cdot MI34)/16{,}537.02. \qquad (12)$$

Production index of heavy-industry sector (3HE): *MIHE*

$$MIHE = (2{,}143.87 \cdot MI36 + 3{,}414.08 \cdot MI37 + 8{,}665.13 \cdot MI38)/14{,}223.08. \qquad (13)$$

Production index of industry sector (3): *MITOT*

$$MITOT = 107.62 + 5.528\text{E-}06 \cdot (18{,}615.51 \cdot MIAG + 16{,}537.02 \cdot MILI \quad (26.48) \quad (9.61)$$
$$+ 14{,}223.08 \cdot MIHE) + 12.80 \cdot DTOTA + 10.26 \cdot DTOTB \quad (6.85) \quad (6.18)$$
$$- 19.30 \cdot DTOTC + u, \quad (-10.56) \qquad (14)$$

$R^2 = 0.9339$, $RA^2 = 0.8564$, $R = 0.9664$, $RA = 0.9254$, $DW = 1.52$, $S = 3.48$.

(Note: Dummies are specified as $D(TOTA) = -1$ (13–17), $D(TOTB) = 1$ (29–36), $D(TOTC) = 1$ (40–48).)

Because the miscellaneous subsector (MI39) consists of mixed activities, and

TABLE IV

RESULTS OF FINAL TEST

Industry Code No.	Subsector	MAPE (%)	Industry Code No.	Subsector	MAPE (%)
31	Food & beverage	3.5446	37	Basic metal	9.2290
32	Textile	1.6897	38	Machinery	9.8946
33	Furniture	4.8063	3A	Agricultural subgroup	3.5281
34	Paper	9.7033	3B	Light-industry subgroup	3.5413
35	Fertilizer	3.6273	3C	Heavy-industry subgroup	7.6842
36	Cement	6.7721	3	Total Industry	1.2842

Source: Calculated by the author.

showed very volatile changes, while its share (0.98%) was very small, I decided to omit it in the total production index equation (14). Next two equations are defined for reference. Equation (16) is a direct estimate of the total production index using some macro-variables.

Production index of miscellaneous subsector (39): *MI39*

$$\begin{aligned} MI39/POP = {} & -0.2522 - 0.1841 \cdot DKRIS + 6.769\text{E-}03 \cdot (IM/POP)(-4) \\ & (-1.31) \quad (-2.90) \qquad\qquad (2.67) \\ & + 0.8632 \cdot (MITOT/POP)(-1) - 0.7303 \cdot (INT/POP)(-1) \\ & (3.93) \qquad\qquad\qquad\qquad (-2.41) \\ & + 0.2197 \cdot DA + 0.1490 \cdot DB + u, \qquad\qquad (15) \\ & (5.42) \qquad (4.07) \end{aligned}$$

$$R^2 = 0.9018,\ RA^2 = 0.7770,\ R = 0.9496,\ RA = 0.8815,\ DW = 0.87,\ S = 0.0675.$$

Production index of industry sector (3): *MITOT*

$$\begin{aligned} (MITOT)/(K)(-1) = {} & 1.4058\text{E-}04 + 2.2551\text{E-}03 \cdot (GDP/K)(-3) \\ & (4.72) \qquad (6.06) \\ & - 5.3030\text{E-}09 \cdot NED - 0.2988 \cdot (INT/K)(-1) \\ & (-1.62) \qquad\qquad (-1.98) \\ & + 3.006\text{E-}03 \cdot (IM/K)(-3) + u, \qquad (16) \\ & (1.90) \end{aligned}$$

$$R^2 = 0.9830,\ RA^2 = 0.9619,\ R = 0.9915,\ RA = 0.9808,\ DW = 0.29,\ S = 3.640\text{E-}5.$$

I determined the final test for the system of nine equations, (3)–(14), for the period January 1996–December 1998. The mean absolute percentage error (MAPE) for the final five months (August–December 1998) was shown in Table IV.

The MAPE for all the subsectors were less than 10%. The MAPE for total industry was only 1.28%, because the errors of the subsectors cancelled out each other. Therefore, I considered that the system as a whole showed a fairly good fit to the actual trend.

V. SIMULATION STUDY OF KRISMON'S IMPACTS

In this section, I applied the system constructed above to some simulation studies to analyze the effects of the Krismon shocks on the industrial sector. As I indicated before, the effects of noneconomic impacts are ambivalent, as the rapid devaluation exerted an adverse effect on the general economy but was beneficial for the primary-goods exporting sector. Therefore, even if the total effects of noneconomic impacts on the industrial sector may not be large, the effects on certain subsectors may be pronounced.

Simulation: Continuation of High Growth without Krismon Shocks. To assess the damage caused by Krismon, I used a simulation case in which the economy grew continuously without Krismon shocks. By comparing the results with the actual trend, we could assess the damage caused by Krismon. First I specified the conditions of sustainable growth without Krismon impacts as follows.

(a) Noneconomic disturbances (*NED*) and Krismon period dummy (*DKRIS* = 1 in Krismon period) are set to zero.

(b) The following variables are assumed to increase by an average rate during the normal period (periods 13–32); GDP of the monetary sector (*GDPMO*), GDP of the agricultural sector (*GDPAG*), real export (*X*), real import (*IM*), dollar value of exports (*X$*), and exchange rate (*RATE*), real GDP, real private consumption (*CP*), and capital stock (*K*).

Based on these specifications, the Indonesian economy was assumed to continuously grow after July 1997 as before without receiving any abnormal shocks. The results of the simulations are shown in Table V. For each subsector, the figures in the first row show the values obtained in the final test (*F*), which approximately follows the actual path during the Krismon period, and those in the second row show the results of the simulation without Krismon shocks (*S*) as specified above. The figures in the third row show the ratio of *F* to *S*, and how the production level increased or decreased by the Krismon shocks. If $R > 1$ ($R < 1$), the activity level of that subsector actually increased (decreased) during the Krismon period.

Thus, based on the comparison with the simple extrapolation case, the effects of the Krismon shocks are as follows.

—The production index of the agricultural group increased by about 60% as of June 1998 and December 1998.

—The production index of the light industry decreased by 6% and 13% on these two dates. Therefore, as a whole, this group incurred a negative impact.

—The production index of the heavy industry decreased to one-half by June 1998, and to one-third in December 1998.

—The total industrial production index increased by 1.5% and 4.77% on the two dates, respectively.

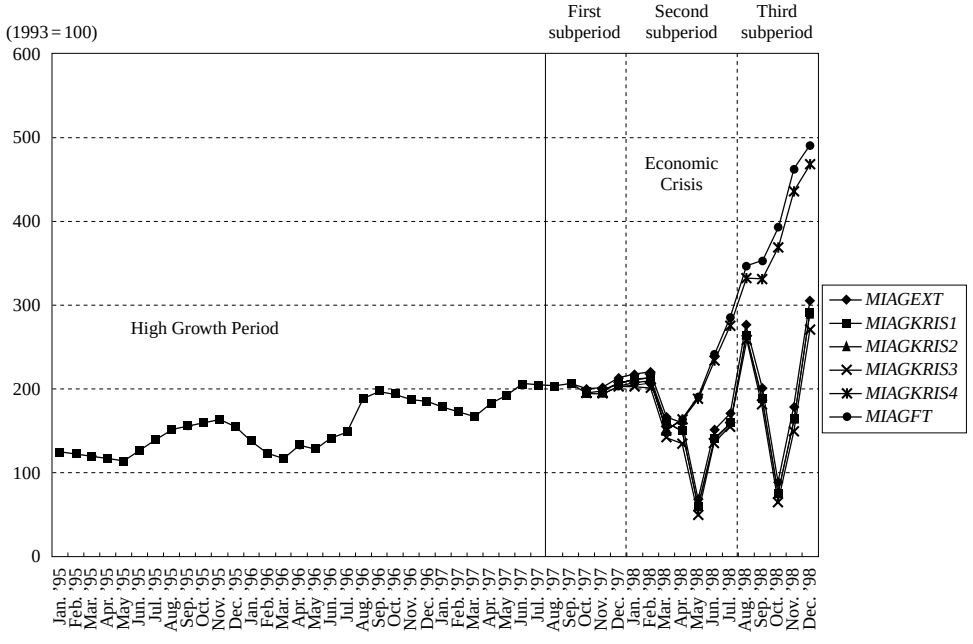
TABLE V

COMPARISON OF TWO CASES (WITH AND WITHOUT KRISMON SHOCKS)

Sector	Number	August 1997	June 1998	December 1998
Food & beverage	31 (F)	251.62	310.48	674.73
	31 (S)	251.62	155.18	357.55
	31 (R)	1	2.0007	1.8870
Textile	32 (F)	118.00	108.88	102.92
	32 (S)	118.00	113.18	117.75
	32 (R)	1	0.9620	0.8740
Furniture	33 (F)	87.51	76.26	60.00
	33 (S)	87.51	71.79	46.14
	33 (R)	1	1.0622	1.3003
Paper	34 (F)	141.79	158.83	176.32
	34 (S)	141.79	140.92	132.85
	34 (R)	1	1.1270	1.3272
Fertilizer	35 (F)	114.45	112.88	146.87
	35 (S)	114.45	114.16	168.64
	35 (R)	1	0.9887	0.8709
Cement	36 (F)	147.99	104.88	107.25
	36 (S)	147.99	126.49	176.92
	36 (R)	1	0.8291	0.6062
Iron & steel	37 (F)	129.72	94.99	94.41
	37 (S)	129.72	79.02	80.37
	37 (R)	1	1.2021	1.1746
Machinery	38 (F)	166.57	79.28	45.38
	38 (S)	166.57	141.11	162.49
	38 (R)	1	0.5618	0.2792
Agricultural group	(3A) (F)	203.60	241.31	489.94
	(3A) (S)	203.60	151.21	305.05
	(3A) (R)	1	1.5985	1.6060
Light-industry group	(3B) (F)	112.48	106.08	100.21
	(3B) (S)	112.48	112.93	114.06
	(3B) (R)	1	0.9393	0.8785
Heavy-industry group	(3C) (F)	154.93	86.91	66.48
	(3C) (S)	154.93	170.16	198.47
	(3C) (R)	1	0.5107	0.3349
Total industry	3 (S)	156.45	131.99	154.22
	3 (F)	156.45	129.99	147.26
	3 (R)	1	1.0153	1.0472

Source: Calculated by the author.

Fig. 4. Production Index of Agriculture-Related Group, January 1995–December 1998

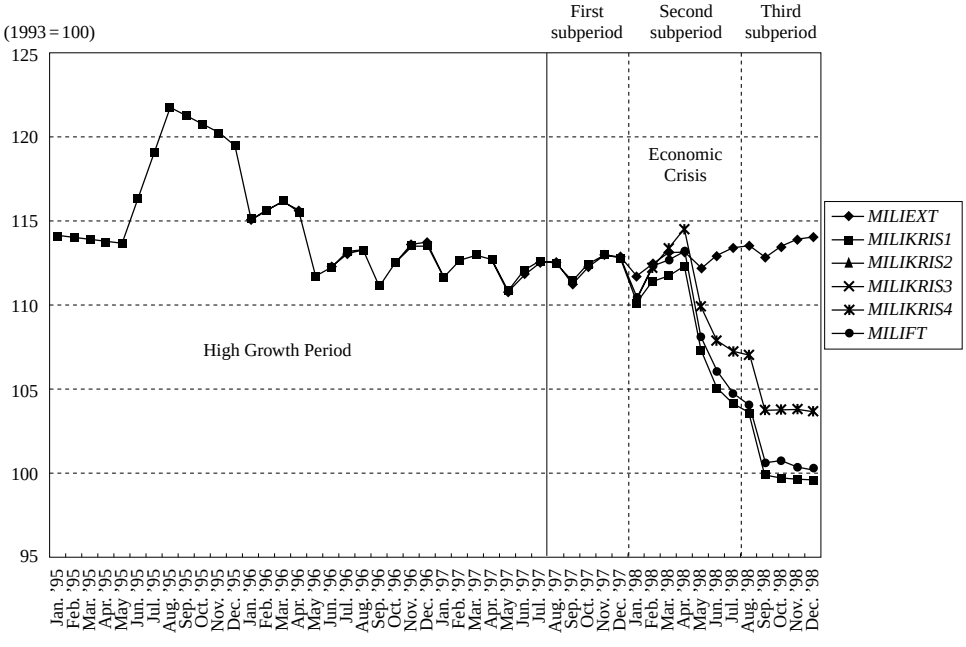


Thus although the total production index increased slightly by the Krismon shocks, this total increase masked the severe negative impact of Krismon for the heavy-industry group. This biased impact must have important implications for the future subsectoral pattern, technological level, and comparative advantage structure.

Figures 4–7 show the trends of production indices and factor decomposition during the Krismon period (periods 33–48). In the figure, six trends were identified during the Krismon period. The suffix (*EXT*) shows the simple extrapolation of the past trend of the high growth period. *KRIS1*, 2, 3, 4 denote the trend when the impacts associated with *NED*, *GDPMO*, the agricultural sector, external sector, general economic conditions are neglected successively (1–5 in Section IV). Finally, the suffix (*FT*) shows the trend based on the final test.

Figure 4 shows the trend of the agriculture-related group. The trend was steadily increasing until August 1997. If this trend had been extrapolated until December 1998, it would have remained steady until July 1998, and then experience volatile changes, and reach a value of about 300 in December 1998 (see *MIAGEXT*), which corresponds the simple extrapolation line of the past trend. However, based on the favorable exogenous impacts on agricultural GDP associated with the improvement of the weather conditions and higher export prices, the actual value of the index suddenly showed a rapid jump in the second half of 1998. Other factors like

Fig. 5. Production Index of Light-Industry Group, January 1995–December 1998



monetary, external, and general economic factors caused volatile changes after August 1998, but did not contribute significantly to the increase in the absolute level until December 1998.

Figure 5 shows the trend of the light-industry group. The index of this group did not show a steadily growing trend, and stagnated even before the Krismon period. If similar conditions had prevailed, a similar level would have been maintained until December 1998. However, noneconomic disturbances (NED) and the subsequent decline of the general economic conditions exerted a strong negative impact, and the actual level decreased to around 100, a level similar to that of 1993.

Figure 6 shows the trend of the heavy-industry group. The index showed an increasing trend in the past, but the group was adversely affected by Krismon impacts. Noneconomic disturbances (NED) and the decline of the general economic conditions exerted strong negative impacts, and the index decreased from around 150 before Krismon to only 66 in December 1998,which is equivalent to only 40% of the pre-Krismon level or only two-thirds of that in the base year of 1993.

Figure 7 shows the trend of total industry. The index showed a volatile but generally increasing trend before Krismon. During the Krismon period, it showed a rapid decline until July 1998, and a slight recovery until December 1998. The agriculture-related group mainly contributed to this turnover.

Fig. 6. Production Index of Heavy-Industry Group, January 1995–December 1998

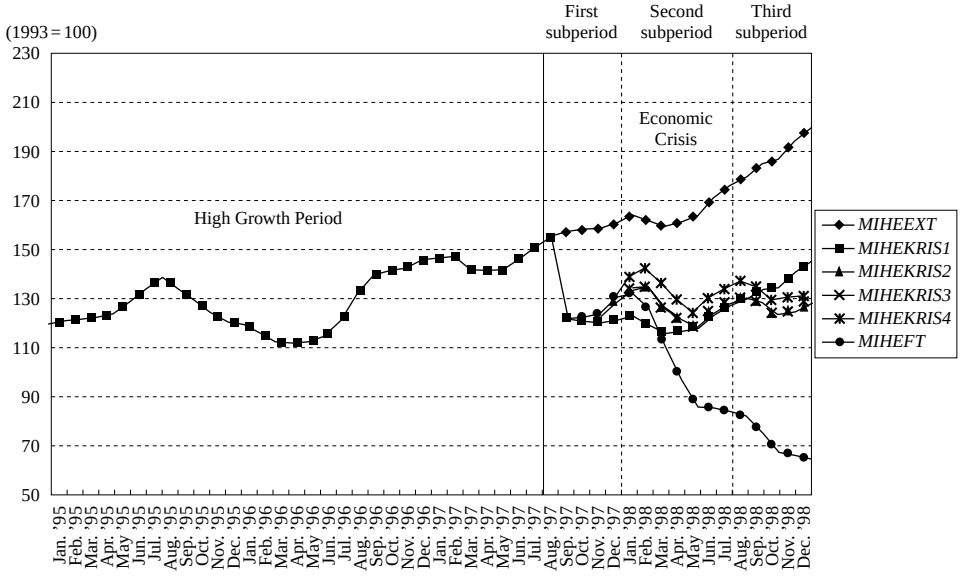


Fig. 7. Production Index of Total Industry, January 1995–December 1998

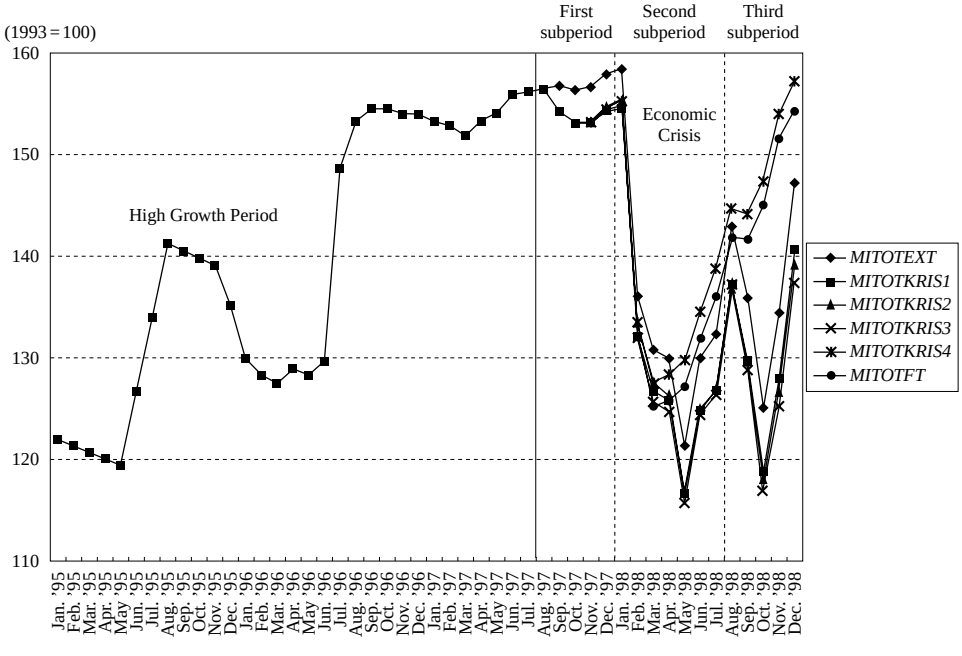


TABLE VI

FACTOR DECOMPOSITION BY SUBGROUPS

	Agriculture Group		Ligiht-Industry Group		Heavy-Industry Group		Total	
	Aug. '98	Dec. '98	Aug. '98	Dec. '98	Aug. '98	Dec. '98	Aug. '98	Dec. '98
1. *XTR*	151.20	305.04	112.92	114.05	170.15	198.47	129.99	147.25
2. *NED*	–10.37	–13.95	–7.8	–14.43	–46.14	–53.51	–5.14	–6.58
3. *MO*	0.32	–2.80	0	0	1.17	–16.15	0.11	–1.48
4. *AG*	–6.04	–18.20	0	0	–0.24	–0.30	–0.61	–1.80
5. *EXT*	98.11	196.84	2.81	4.07	5.39	2.61	10.24	19.80
6. *GEN*	8.09	22.69	–1.83	–3.48	–43.41	–64.62	–2.61	–2.91
7. *SUM*	92.10	184.89	–6.82	–13.84	–83.24	–134.59	1.99	7.01
8. *ACT*	241.34	489.94	106.08	100.21	86.91	66.48	131.99	154.27

Source: Calculated by the author.

The contribution of each variable group is shown in Table VI. The figure in the first row shows the level of simple extrapolation. Values in the second to sixth rows show the change of the index based on the changes of variables in each group. The value in the seventh row shows the sum of these effects. The eighth row shows the actual index calculated by the final test. As the model is not linear, the sum of changes is equivalent to only approximately the difference between the actual and simple-extrapolation values.

- The agriculture-related group was negatively influenced by the shrinkage of agriculture and by noneconomic disturbances, while the positive impacts of external conditions and general economic conditions were far more substantial in absolute value. Total effect of all the Krismon shocks amounted to 60% of the simple extrapolated level.
- The light-industry group received relatively minor negative impacts from the Krismon shocks. Noneconomic disturbances exerted the largest impact. The general economic conditions exerted a negative impact in this group, while external conditions exerted small positive effects.
- The heavy-industry group experienced the worst damage, mainly due to the deterioration of the general economic conditions and noneconomic disturbances. The shrinkage of the monetary sector also exerted a negative effect during the second subperiod. The changes of the external conditions brought about a minor positive effect. As a whole, the total effects of the Krismon shock resulted in a shrinkage of the index to only one-third compared with the level without Krismon shocks.
- The effects on total industrial production correspond to the sum of the effects on these three groups. Only the changes of the external conditions exerted a positive effect, while all the other factors exerted negative effects. The negative effects

resulted from noneconomic disturbances, deterioration of general economic conditions, shrinkage of the agricultural sector and of the monetary sector in decreasing order in absolute value. Since the positive effects due to external conditions outweighed the others, the actual level was slightly higher than the level without Krismon shocks in December 1998.

VI. IMPACTS OF KRISMON SHOCKS ON INDUSTRIAL EMPLOYMENT

I estimated the employment decrease during the Krismon period (August 1997–September 1998) based on the UNIDO's data, in which the activities of large and medium-sized enterprises (number of persons employed 100– and 20–99, respectively) were compiled. In Table VII, the first two columns show the number of persons employed in 1993 and 1996. I assumed that the 1996 labor coefficient (number of persons employed per value added) persisted until now, and estimated the number of persons employed in August 1997 and September 1998 in columns (3) and (4). The figures in (5) and (6) show the ratios of production indices on these two dates, with the average figures of 1996 taken as 1.

(i) The number of persons employed in the manufacturing sector reached 5,102,000 in August 1997, which was historically the highest. That level was higher than the 1996 average by 21%.

(ii) After one year, in September 1998, employment in the manufacturing sector decreased to 4,601,000 persons, which was still higher than the 1996 average by 9.6%. However, it decreased by 429,000 persons after August 1997. If we apply the

TABLE VII

TREND OF EMPLOYMENT BY SUBSECTORS

(1,000)

Subsector	(1) 1993	(2) 1996	(3) Aug. 1997	(4) Sept. 1998	(5) (3)/(2)	(6) (4)/(2)	(7) (4)−(3)
M31	718.1	804.0	1,392.0	1,490.5	1.7314	1.8538	98.5
M32	1,184.7	1,350.2	1,209.4	1,146.9	0.8957	0.8494	–62.6
M33	501.5	560.2	544.2	545.8	0.9713	0.9743	1.7
M34	122.9	164.9	195.5	170.0	1.1857	1.0306	–25.6
M35	402.2	484.6	502.5	494.6	1.0368	1.0206	–7.9
M36	148.4	188.1	201.5	156.8	1.0710	0.8322	–44.9
M37	43.5	50.3	49.1	26.8	0.9757	0.5333	–22.3
M38	367.6	522.1	717.9	388.4	1.3751	0.7439	–329.5
M39	70.5	72.1	94.9	58.1	1.3156	0.8059	–36.7
Total manuf.	3,559.4	4,196.5	5,102.2	4,601.6	1.2158	1.0965	–429.3

Source: UNIDO (1999), pp. 350–54.

average employment coefficient, the decrease of employment should reach 500,500 persons.

I also analyzed the relative intensity of resources use by each subsector. Table VIII summarizes the characteristics of the subsectors. Column (1) shows the incremental capital-output ratio (ICOR), which is the ratio between the sum of investments in 1994 and 1995, and the increment of value added from 1994 to 1996. Column (2) and (3) show the labor coefficient, the number of persons employed over the added value in 1993 and 1996. Column (4) shows the ratio of the 1996 labor coefficient over ICOR. Columns (5) and (6) show the average wage levels in 1993 and 1996.

(i) Based on the figures in column (4), three subsectors [Food and beverage (31), Textile (32), Furniture (33)] were clearly the most relatively labor-intensive (or less capital-intensive) subsectors.

(ii) Subsector 38 (electrical machinery, transport equipment, parts) was the next relatively labor-intensive subsector.

(iii) The remaining subsectors [Paper (34), Fertilizer (35), Cement (36), Iron and steel (37), Others (39)] can be classified as relatively less labor-intensive subsectors.

Hill and Phillips (1997) observed the same characteristics, and classified wearing apparel (except footwear, ISIC 322) as unambiguously labor-intensive; textiles (321), fabricated metal products (381), professional scientific equipment (385), and other manufactures (390) as generally labor-intensive; and electric machinery (383) as average labor-intensive. In fact, as shown in Tables III and VII, the level of production of textiles (MI32) and machinery (MI38) declined, and contributed significantly to the decrease of employment during the Krismon period. The food and beverage subsector, whose labor coefficient is about average, was the largest

TABLE VIII

CAPITAL AND LABOR COEFFICIENTS BY SUBSECTORS

Subsector	(1) ICOR: '94–'95	(2) Labor ('93)	(3) Labor ('96)	(4) (3)/(1)	(5) Wage ('93)	(6) Wage ('96)
M31	0.5412	0.0646	0.0457	0.08444	1.6056	2.7260
M32	1.3748	0.1231	0.0849	0.06175	1.6115	2.8574
M33	0.7704	0.1097	0.0816	0.10591	1.6397	2.8215
M34	0.8825	0.0603	0.0342	0.03875	2.5207	5.1680
M35	0.9947	0.0648	0.0398	0.04001	2.8083	4.6393
M36	1.6007	0.0712	0.0502	0.03136	2.2675	4.3402
M37	0.1431	0.0136	0.0051	0.03563	3.5034	6.8946
M38	0.4401	0.0439	0.0241	0.05476	2.7029	5.1927
M39	3.0573	0.1611	0.1057	0.03457	1.3589	2.3936
Total manuf.	0.6775	0.0747	0.0450	0.06642	1.9391	3.5214

Source: UNIDO (1999), pp. 350–54.

Note: (2) and (3) denote persons per million rupiah. (5) and (6) in million rupiahs.

and practically sole contributor to the increase in employment (98,500) during the Krismon period. But this increase could hardly cover the total employment loss of 4,293,000 persons, which mainly occurred in the labor-intensive subsectors (MI32 and MI38).[6]

Considering the existence of major unemployment and underemployment, the increase of employment opportunities will be one of the top priorities in the future recovery period. The stagnation of the labor-intensive subsectors and the shift of the subsectoral employment pattern create a structural problem in the labor market in addition to other issues like labor repression (Manning 1997, p. 113) by regulation, and the relatively highly effective protection rate of food and beverage products (World Bank 1993, p. 299). Another remarkable fact is that the Indonesian economy is just experiencing a major demographic transition. In 1997, the five-year cohort corresponding to the 10–14 age group reached 22.32 million. Therefore, more than 4 million persons will be annually entering the working age population in the near future. In normal years, productive capacity would have improved, but during a period of economic crisis, additional employment opportunities should be provided. The impact of such a demographic transition will be another important factor when suitable employment generation policy is discussed.

VII. TENTATIVE FORECAST UNTIL DECEMBER 1999

To determine the recent development, I attempted to forecast industrial indices until December 1999. The basic premises were as follows.

(a) I adopted the actual data of the production-side components of GDP until the third quarter of 1999, and extrapolated the growth rate by the same growth rate of the third quarter until December.
(b) I adopted the actual data of investment, exports, and imports until the second quarter of 1999, and extrapolated the growth rate of the second quarter until December 1999.
(c) Population was extrapolated using the recent annual growth rate of 1.54%.
(d) I used the actual data of dollar export value until November 1999.
(e) I used the actual data of exchange rate until November 1999.
(f) The value of noneconomic disturbances (*NED*) was extrapolated based on the trend between June 1999 and December 1998. As a result, *NED* decreased monthly by 79.8.

[6] Yamashita and Prijadi (1999) reported the results of a BAPPENAS-JICA survey on the impacts of Krismon for 343 firms at the end of 1998. During the crisis, in the large and medium-sized firms the employment of skilled and unskilled labor decreased by 6.3% and 8.3%, respectively. In the small firms the employment of skilled workers decreased only by 4%. Food, beverage, and tobacco (ISIC 31) was the only subsector where the employment of skilled workers increased by 1.6% and management by 2.6% although the employment of unskilled workers decreased by 1.0%.

TABLE IX

PROJECTION OF PRODUCTION INDICES BY SUBSECTORS

Subsector	(1) Dec. 1998	(2) Jun. 1999	(3) Dec. 1999	(4) Ratio: (2)/(1)	(5) Ratio: (3)/(2)
MI31	670.64	583.36	763.48	0.8698	1.3087
MI32	102.23	99.67	100.87	0.9749	1.0120
MI33	67.30	108.26	109.14	1.6086	1.0081
MI34	176.59	149.47	116.40	0.8464	0.7787
MI35	141.40	143.06	143.98	1.0117	1.0064
MI36	107.25	71.24	71.85	0.6642	1.0085
MI37	92.51	79.85	81.40	0.8631	1.0194
MI38	44.13	29.26	34.08	0.6630	1.1647
MI39	26.63	7.68	12.71	0.2883	1.6549
MIAG	485.37	429.23	546.61	0.8843	1.2734
MILI	101.89	108.39	105.15	1.0637	0.9701
MIHE	65.25	47.73	51.14	0.7314	1.0714
MITOT	152.72	146.16	158.22	0.9570	1.0825

Source: Calculated by the author.

Table IX summarizes the results of the projection for June and December 1999. The figures in columns (4) and (5) show the rates of change in each of the six-month periods preceding these dates. Figure 8 shows the trends of production indices of all the subsectors, while in Figure 9 the indices of MI31 and MIAG, which show very drastic changes were omitted and the trends of other subsectors are depicted for clarity.

The observations were as follows:

- Since subsector 31 (food and beverage) showed a continuous and steady increase, the agriculture-related subgroup (MIAG), which represents the sum of the two subsectors (31 and 35), also showed a rapid growth.
- In the light-industry group, the index of subsector 33 (wooden product and furniture) showed a rapid recovery, while the index of subsectors 32 (textile) and 34 (paper) decreased. The index of light-industry (MILI) increased slightly.
- Since the indices of all the subsectors in heavy industry decreased including 36 (cement), 37 (iron and steel), and 38 (machinery), the index of heavy industry (MIHE) decreased steadily.
- The index of total manufacturing decreased slightly until July, but recovered in the latter six-month period, and increased slightly in 1999. The level of December 1999 was equivalent to the level of July 1997. Therefore, as a whole, the industrial production index recovered to the level before the Krismon shocks.

Fig. 8. Trend of Production Indices in Manufacturing Sector: All Subsectors, January 1996–December 1999

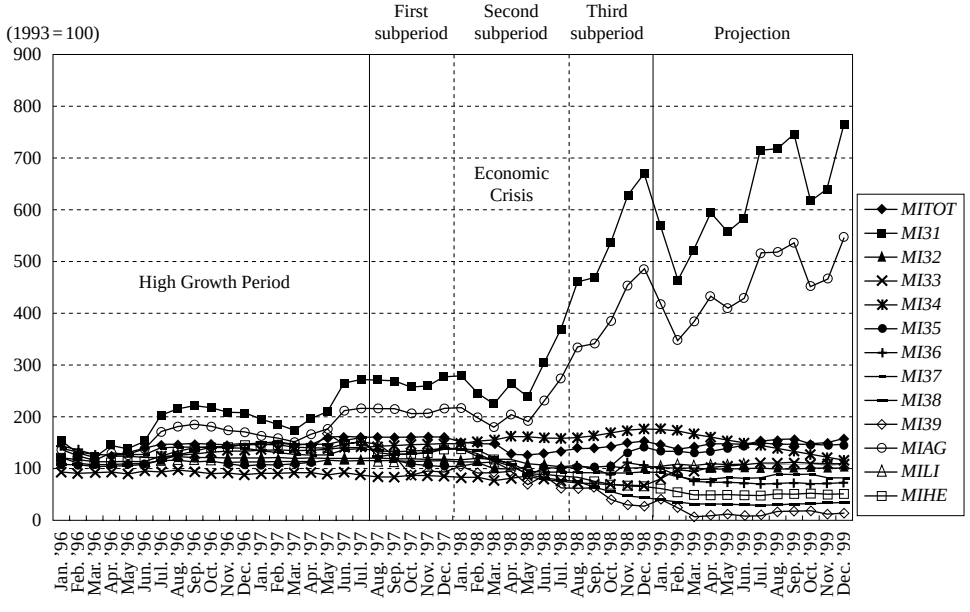
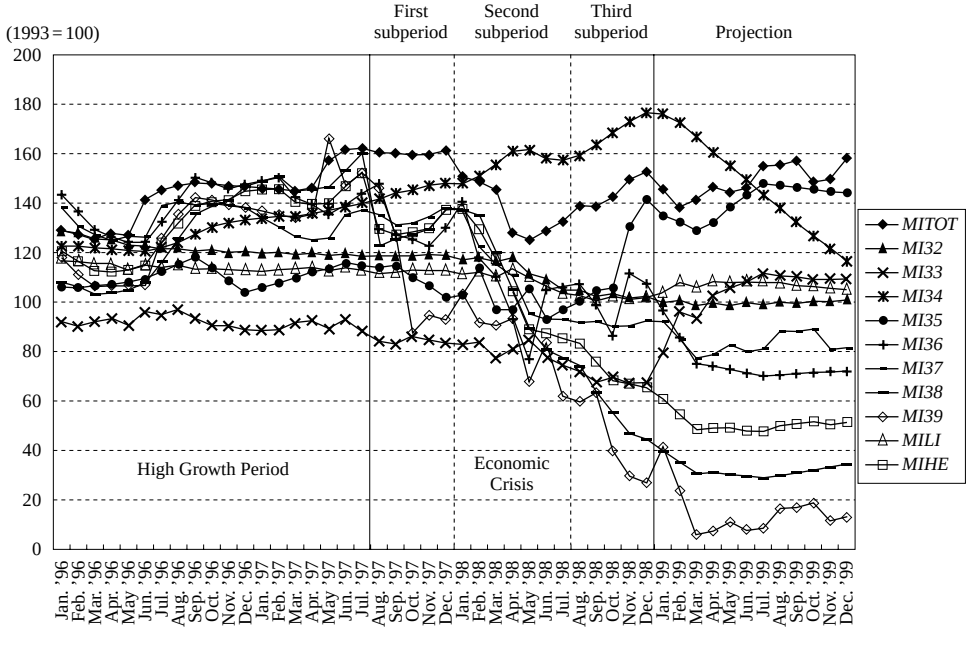


Fig. 9. Trend of Production Indices in Manufacturing Sector (Except MI31 and MIAG), January 1996–December 1999



VIII. CONCLUDING REMARKS

In this paper I analyzed the impacts of the Krismon shocks on the Indonesia's industrial sector and also made a preliminary forecast until December 1999. Some observations are as follows.

Trend of production indices of the total manufacturing sector during the Krismon period. The industrial production index recorded a value of 169.50 in August 1997, fell to 121.13 in May 1998, and rapidly recovered to 152.72 in December 1998, which corresponds to 90.10% of the pre-Krismon level, and was projected to reach a value of 158.22 in December 1999 (equivalent to 93.34%). Therefore, as a whole, the industrial production index almost recovered to the pre-Krismon level.

Trend of production indices of subsectors. The rapid recovery of the total index was somewhat misleading. During the Krismon period, production increased only in the agriculture-related group due to favorable external market conditions, while the level of production of the heavy-industry group decreased to only one-third compared with the simple extrapolated level without Krismon shocks, and the level of production at the end of 1998 was far below that of 1993. While the total or average picture is showing a rapid recovery, it conceals the important depression of core industrial activities.

Dualistic development of industrial subsectoral pattern. These findings reflect the positive and negative effects of a rapid devaluation or the polarization of the economy into two extremes: prosperous sector which sells products at favorable dollar prices, and declining sector which must import parts and intermediate goods at high prices and sell the products based on rupiah prices to the domestic market. Due to such a polarized development pattern, the economic inequalities expanded in various aspects. The political tension between Java and outer islands increased since many prosperous resource-oriented exporting activities are located in the outer islands, and the people in these islands have complained about their relatively minor share from economic gains derived from these resources.

Necessary policy action for future recovery. Sound recovery to sustainable growth will take time, and the creation of a better social environment is necessary for the reactivation of industry. First, stabilization of the political situation and resulting elimination of noneconomic disturbances (NED) is required, since this variable exerted a large negative impact especially on the heavy-industry group. Secondly, the recovery of the overall economic condition is necessary, including the recovery of the domestic demand like GDP, private consumption, and supply capacity. Thirdly, the restructuring and recovery of the monetary sector are important for the recovery of the heavy industrial group.

Positive and negative effects of external conditions. The devaluation of the rupiah was beneficial for some subsectors, while it adversely affected other groups.

The debt service problem was omitted in the discussion of this paper. However, even if we set the debt issue aside, there was no optimum level of exchange rate in the industry sector as a whole. Some of the policies to alleviate the polarization tendency of industry may require a delicate combination of policies for harmonized recovery, including tax incentives, subsidies, and other deregulation measures.

Short-term crisis management versus long-term development. The strategic importance of industry for long-term sustainable growth of the economy is well recognized. The manufacturing sector plays an important role in employment generation, export promotion, human resources development through the "learning by doing" effect and technological progress. In the past, Indonesia had gradually developed new subsectors like chemical, metal, and machinery, and had achieved a more balanced and diversified industrial structure. The current changes in the subsectoral patterns, especially the stagnation of the heavy-industry group implies that the overall subsectoral pattern reverted to the dependence on the light industry structure as in the past. In the short term, policies should place emphasis on employment generation and poverty alleviation. However, in the medium or long term, Indonesia should again identify a comparative advantage structure and determine how the subsectoral pattern should be reorganized toward that direction.[7] The important task of reconstruction and restructuring of the industrial sector must be carefully handled in taking account of the trade-off between short-term urgent priorities and long-term development target.

[7] Therefore, there is an important trade-off between growth and employment. Shepherd (1998) pointed out that the Indonesian labor productivity relatively reached that of Australia during the period 1975–90 (from 12% to 17%). Is such a high productivity growth compatible with high unemployment rate? Timmer (1999) analyzed the growth in 1975–95, and pointed out that Indonesia's TFP levels did not show any evidence reaching the world frontier. Will the same tendency continue in the future?

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