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THE NONLINEAR GENERAL EQUILIBRIUM IMPACT OF THE FINANCIAL CRISIS AND THE DOWNFALL OF MANUFACTURING

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I. THE SETTING

LIKE most East Asian countries, Indonesia experienced a booming economy in the early 1990s. When signs of overheating appeared, the government was forced to tighten the monetary policy. Massive capital inflows resulted in the appreciation of the exchange rate (low international interest rates contributed to the supply of "easy money" from abroad), hence reducing the country's export competitiveness.

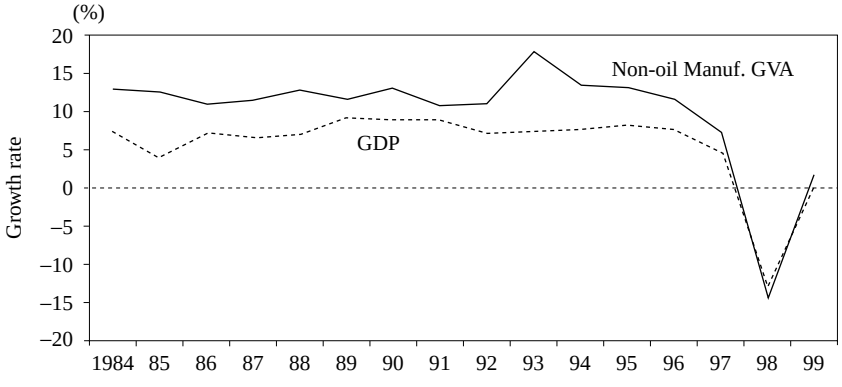
Increased deposits and reserves due to capital flows inevitably resulted in a high growth of credit, a considerable portion of which was diverted to manufacturing investment. Indeed, one of the most dynamic growth sectors in the country has been the manufacturing sector which expanded persistently at a rate higher than that of the GDP until 1997 (Figure 1). However, credits, including those from abroad, also were increasingly allocated to the property and real estate sector, creating a bubble in the economy. Was this the cause of the 1997 crisis?

Sachs, Tornell, and Velasco (1996) suggested that a combination of credit boom, real exchange rate appreciation, low foreign reserves, and massive capital flows is among the "fundamentals" that could contribute to a crisis. But this did not seem to be the case in Indonesia. The growth of credit and the size of capital flows were not excessively high (lowest among Southeast Asian countries), and even the real exchange rate was in fact depreciating.[1] As I argued elsewhere, it was the weakness of the country's institutions, not the economic fundamentals, that played a major role in determining the country's vulnerability that led to the crisis.[2]

[1] The bank's credit growth from 1992 to 1996 was 17.8 per cent, compared to 25.9 per cent, 36.7 per cent, and 212.0 per cent in Malaysia, Thailand, and the Philippines, respectively. Using the consumer price index (CPI) as the deflator, between 1989–93 and 1994–96 the rupiah real exchange rate "depreciated" by 2.5 per cent, whereas the Philippines peso "appreciated" by 6.9 per cent during the same period. However, real appreciation could be detected (roughly by 6.8 per cent) when the wholesale price index (WPI) is used as the deflator. But, clearly, the combination referred to by Sachs, Tornell, and Velasco (1996) did not occur prior to the crisis.

[2] See Azis (1999).

Fig. 1. Growth of GDP and Non-oil Manufacturing GVA, 1984–99



Leaving aside the issue of what really caused the crisis, the main purpose of this manuscript is to analyze the impact of the crisis and the resulting downturn of the manufacturing sector on social indicators such as unemployment, labor income, and household income. In doing so, I use multisectoral general equilibrium models. At first, using the social accounting matrix (SAM), I apply a multiplier model by adopting the global influence (GI) concept based on structural path analysis (SPA). Subsequently, I construct a more complex general equilibrium model that allows nonlinearity in the system. With the two models, the impact analysis can be performed in a more comprehensive way.

Why this topic and why the use of models? While the economic repercussions of the crisis and the collapse of the real sector are serious, the social impacts have been even more devastating. To the extent that no recovery program could be sustainable without alleviating the negative social impacts, it is important to understand the precise mechanism through which the financial crisis affected the social conditions, before necessary policies could be implemented. The model is designed to serve such a purpose. But the model is also useful for conducting counter-factual scenarios in order to analyze and test some hypotheses on the subject. Only through the use of a model can the analysis go beyond before-and-after type, and potentially provide a with-and-without form of analysis. While the impacts of the financial catastrophe are felt across all the sectors, the counter-factual scenario I run in this manuscript consisted of imposing further shocks on manufacturing industries. This way, one can also analyze the linkages between the manufacturing sector and the rest of the economy.

Before describing the models and presenting the results of simulations in Section III, I will first discuss the trends of some social indicators.

TABLE I

PERCENTAGE OF RESPONDENTS EVER EXPERIENCING LAYOFF AND BANKRUPTCY BY EMPLOYMENT CHARACTERISTICS, 1997–98

(%)

Employment Characteristics, 1997–98	Ever Laid-Off	Ever Bankrupt
Employed	40.2	62.1
Formal sector	21.7	22.4
Informal sector	18.5	39.7
Unemployed	59.8	37.9
Changes in jobs		
1–2 times	59.8	82.8
Above 2 times	40.2	17.2

Source: BPS (1998), quoted in Irawan et al. (1999).

II. TRENDS OF SOCIAL INDICATORS FOLLOWING THE CRISIS

During 1996–98, the poverty incidence in Indonesia increased significantly, i.e., from 7.2 to 17.6 million and from 15.3 to 31.9 million people were affected in the urban and rural areas, respectively. Hence, the increase of the urban poverty incidence was twice as high as, and faster than the increase in the rural areas.

The number of poor people increased for various reasons. The most direct mechanism was through a decline in nominal income or wages, which was related to the fact that the number of laid-off workers increased during the crisis. Based on *SAKERNAS* (labor force survey) data, from August 1997 to August 1998, open unemployment in urban areas increased by 21 per cent, i.e., from 2.5 to 3.1 million (or, from 8 to 9.3 per cent) (BPS, *SAKERNAS*, various years).

Some argued that the collapse of many formal sectors in urban areas forced most workers either to go back to rural areas or to accept informal jobs. As a result, at least during 1997–98, a majority (about 60 per cent) of the laid-off workers remained jobless, even after they attempted to change jobs one to two times (see Table I).[3] Furthermore, *SAKERNAS* data also point to 9.4 and 14.4 per cent increases of urban self-employed and unpaid family workers, respectively, whereas the number of employees in the total labor category, according to the survey, decreased from 55 to 52 per cent. These data, however, do not imply that there is no urban-rural migration.[4]

[3] Based on BPS (1998).

[4] It should be emphasized that the selection of the post-crisis year (timing) is important. For example, according to BPS data, during 1995–98 rural and urban populations increased by 4.6 and 3.3 per cent, respectively. But during 1998–99, urban population decreases by 10 per cent and the

TABLE II

DISTRIBUTION AND PERCENTAGE CHANGE OF EMPLOYMENT BY REGION AND WORKING HOURS

Region / Working Hours	1997		1998		Percentage Change
	Number (1,000)	% Distribution	Number (1,000)	% Distribution	
Urban:					
15 hrs	1,673.2	5.70	1 933.1	6.38	15.53
35 hrs	6,120.5	20.85	7,314.3	24.14	19.50
Above 35 hrs	23,233.3	79.15	22,990.2	75.86	–1.05
Total	29,353.8	100.00	30,304.5	100.00	3.24
Rural:					
15 hrs	6,497.6	11.59	7,260.2	12.66	11.74
35 hrs	24,444.2	43.61	26,987.5	47.04	10.40
Above 35 hrs	31 607.5	56.39	30,380.4	52.96	–3.88
Total	56,051.7	100.00	57,367.9	100.00	2.35

Source: BPS, *SAKERNAS*, 1997 and 1998 edtions.

As also argued by Azis (2000), urban recession eventually affected the rural non-farm sector. Those who are still lucky enough to remain employed have to face the possibility of working fewer hours. Indeed, the number of urban workers who worked less than fifteen and thirty-five hours increased by, respectively, 15.5 per cent and 19.5 per cent (Table II). Obviously, their income per week also decreased.

A BPS-Statistics Indonesia (BPS) survey in 1998 (BPS 1998) revealed that the average monthly income from main jobs in all income brackets, with the exception of those whose income was higher than Rp 400,000, had decreased. The largest percentage of decrease, i.e., 22.1 per cent, affected the low-income earners (less than Rp 200,000), followed by the informal sector (20.5 per cent). Combined with the sharp increase in inflation (over 90 per cent during 1996–98), the drop in nominal wages could be translated into a collapse of real wages. Indeed, across all the sectors real wages declined (Table III).

One estimate reveals that the decrease of urban per capita real income was larger than that in the rural areas (30 per cent versus 6.5 per cent), and the sharpest decline in the two areas occurred within the low-income group, i.e., 37.1 per cent and 22.7 per cent, respectively (Irawan et al. 1999).

Another element of welfare is related to the health status. One of the important health indicators is the morbidity rate MR (feeling of illness), especially the so-called disruptive morbidity rate, DMR, defined as the morbidity that disrupts daily

rural population increases by 8 per cent. Hence, there is an indication that during 1998–99 there might have been a considerable urban-rural migration.

TABLE III

INDEX OF REAL WAGES BY TYPE OF INDUSTRY (1994 Quarter I = 100)

	1996-II	1997-II	1997-III	1997-IV	1998-I	1998-II	1997-II–1998-II (% Change)
Hotel	91.4	86.4	86.8	88.9	84.4	72.5	–16.1
Mining	117.8	104.5	100.6	82.1	79.0	85.2	–18.5
Manufacturing industry	112.9	125.7	121.5	121.5	96.7	92.2	–26.7
Foods	103.3	117.0	113.2	106.2	88.4	84.6	–27.7
Textile	113.5	124.5	118.2	124.6	97.8	89.6	–28.0
Wood/products	120.4	138.7	140.5	136.7	109.2	107.0	–22.9
Paper/printing	128.7	153.9	137.7	129.4	109.7	83.2	–45.9
Chemical	118.2	123.4	118.9	116.8	95.8	95.5	–22.7
Ceramic	111.8	118.2	116.2	117.7	88.8	83.7	–29.2
Basic metals	95.5	104.7	102.3	98.3	79.5	80.3	–23.3
Metal products	110.6	131.4	128.4	125.6	97.1	98.8	–24.8
Others	102.5	120.4	115.9	108.8	84.3	75.0	–37.7

Source: BPS, Bureau for Demographic and Population Statistics, quoted in Irawan et al. (1999).

activities. A series of *SUSENAS* (national socioeconomic survey) data shows that prior to the crisis, the DMR dropped from 9.6 per cent in 1995 to 9.1 per cent in 1997. But as the crisis hit the country, the rate went up to 10.6 per cent, and continued to increase to 10.8 per cent in 1999 (BPS, *SUSENAS*, various years). Most of the deterioration occurred in the rural areas. Such a trend coincides with the substantial drop in the budget share of the health care sector.

In some regions, i.e., Sulawesi and Kalimantan, however, the DMR decreased during 1998–99 (Table IV). An improvement of MR from 1998 to 1999 is also detected in all the regions except in the "other islands." But one should not be overly optimistic to relate the effectiveness of the social safety net (SSN) programs with such a performance in the health sector. Also, the national averages of both MR and DMR in 1999 still remain higher than the 1997 levels (in fact, the DMR is still rising). During 1997–99, the average urban MR is always higher than the rural MR, but it varies across the regions, i.e., in some regions outside Java the opposite is observed.

The outcome of the education-related sector is less damaging than originally thought. The fear of a sharp drop in school enrollment during the crisis appears to be unfounded. At the primary education level, the enrollment rates did not change significantly both in the urban and rural areas. At the junior secondary level, the urban rates are generally higher than the rural rates, and in both areas the enrollment rates are higher in 1999 than in 1998 (see Figure 2).

A similar pattern is observed for the senior secondary enrollment rates. *SUSENAS* indicates that expenditures per student increased, mainly in the urban areas. The

TABLE IV

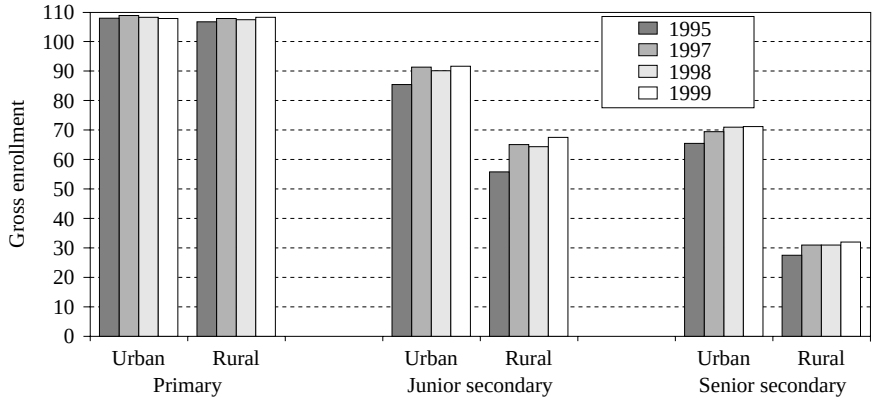
MORBIDITY BY REGION, URBAN AND RURAL AREAS

(%)

		MR			DMR		
		1997	1998	1999	1997	1998	1999
Java Bali	Urban	25.8	27.2	26.1	8.6	10.3	10.5
	Rural	24.3	26.3	25.4	9.5	11.2	11.5
	Total	25.0	26.7	25.8	9.1	10.8	11.1
Sumatra	Urban	20.8	21.8	21.0	6.1	7.8	8.0
	Rural	21.9	21.0	21.0	7.9	8.7	9.1
	Total	21.6	21.2	21.0	7.4	8.4	8.8
Sulawesi	Urban	23.1	26.6	21.8	8.8	11.2	9.5
	Rural	25.3	24.9	23.1	11.4	12.3	10.9
	Total	24.7	25.3	22.7	10.7	12.0	10.5
Kalimantan	Urban	27.5	29.1	26.6	8.3	10.1	8.8
	Rural	22.7	24.2	22.7	8.2	9.6	9.4
	Total	24.2	25.7	23.9	8.2	9.8	9.2
Other islands	Urban	26.5	25.3	24.9	11.4	12.2	12.5
	Rural	29.1	28.5	29.6	14.3	15.5	17.2
	Total	28.6	27.8	28.7	13.7	14.8	16.3
Indonesia total	Urban	24.9	26.3	25.0	8.2	10.0	10.0
	Rural	24.1	25.0	24.4	9.6	10.9	11.2
	Total	24.4	25.5	24.6	9.1	10.6	10.8
No. of observations		887,266	880,040	864,580	887,266	880,040	864,580

Source: Pradhan and Sparrow (2000a).

Fig. 2. Gross Enrollment: Urban/Rural and Level



Source: Pradhan and Sparrow (2000a).

SSN programs implemented during the crisis may have contributed directly and indirectly to the above situation. But one needs to be more careful in identifying the real reasons behind the results.[5]

To the extent that the deterioration of social conditions is not entirely caused by the financial crisis, and not all the sectors experience the same social repercussions, an impact analysis is conducted by using a general equilibrium economywide model. After presenting the multiplier analysis, I will discuss some of the model specifications first before using it for the impact analysis.

III. IMPACT ANALYSIS BASED ON MULTIPLIER AND NONLINEAR PRICE ENDOGENOUS MODELS

Conducting a consistent multisectoral analysis that incorporates social conditions requires the use of the social accounting matrix (SAM). This comprehensive system of data needs to be decomposed into several components, the choice of which depends on the purpose of the analysis. Since the aim of the current study is to analyze the social impacts of the crisis and the downfall of manufacturing industries, the SAM has to be decomposed in such a manner that the transmission of any perturbation, including that applied on the manufacturing sector, to household income distribution, can be traced and scrutinized.

A. *Multiplier Analysis of Manufacturing Downfall*

Structural path analysis (SPA) provides a detailed procedure for decomposing SAM. Developed by Defourny and Thorbecke (1984), SPA allows the identification of the complete set of accounts through which the impact travels from the point of origin to any given destination in the system. SPA distinguishes three different influences: direct influence (DI) that connects directly the origin and the destination poles; total influence (TI) that captures a multitude of interactions by incorporating all the impulses involved in the transmission from the origin to the destination poles; and global influence (GI) that sums up all the TIs. A summarized version of SPA applied in Indonesia using the 1993 SAM can be found in Azis (1998, 2000).

After taking into account all the relevant DIs and TIs, GIs can be derived by summing up all TIs. Table V displays the GIs, which are identical with the SAM multipliers, of the manufacturing sector on household income. It is not difficult to see from the table that the urban households are most affected by the shocks in the manufacturing sector.

When we select the two categories of households most affected by GI, in all the

[5] The trend in the health and the education sectors described above also indicates that the movements of social variables during the crisis are not monotonic. The worsening trend from 1997 to 1998 does not necessarily continue toward 1999.

TABLE V

LARGEST GLOBAL INFLUENCE (MULTIPLIERS) OF MANUFACTURING ON HOUSEHOLD INCOME

Year	Food Processing		Textile and Clothing		Wood and Products		Paper and Transport		Chemical and Fertilizers	
1995	Rural high	0.127	Urban low	0.117	Urban high	0.111	Urban low	0.098	Urban high	0.124
	Urban high	0.124	Urban high	0.091	Rural low	0.110	Urban high	0.091	Urban low	0.099
1998	Urban low	0.147	Urban high	0.054	Urban low	0.120	Urban high	0.035	Urban high	0.162
	Rural high	0.147	Urban low	0.048	Rural high	0.087	Urban low	0.022	Urban low	0.118
1999	Urban low	0.096	Urban low	0.090	Urban low	0.140	Urban high	0.079	Urban high	0.143
	Rural high	0.081	Urban high	0.064	Rural low	0.107	Urban low	0.077	Urban low	0.095

Source: Author's calculation based on SPA of SAM 1995, 1998, and 1999.

cases urban households always appear in the list. When we select only the top largest, we have a similar picture, except for the case of the food processing industry in 1995, where the rural high-income type was the most affected. Based on the fact that during 1995–98 the largest decrease of value added occurs in the textile, wood, and chemical industries, it is obvious that the households of urban high-income and urban low-income types are potentially the hardest hit.

While useful and important, SPA and multiplier analysis fail to distinguish impacts caused by the crisis from those caused by some other events unrelated to the crisis. The collapse of the manufacturing sector is taken exogenously without disentangling the part caused by the financial shock and that due to other factors, e.g., weather conditions. Agriculture-related industries such as food processing, for example, clearly depended on the supply of agricultural products, which in turn was affected by the weather conditions in 1997–98, i.e., El-Niño-related phenomenon. But more importantly, the dynamics of price changes and the presence of substitutions (nonlinear system) are neglected in the SPA. Yet, they are extremely important for the analysis of household income determination.

To overcome these shortcomings, a price-endogenous model of a computable general equilibrium (CGE) type with detailed specifications of the financial sector should be used. The model should be able to capture and define the linkages between the financial sector, the production sector, and the household income. I will begin with the description of some main components of the model.

B. *Price Endogenous and Nonlinear CGE Model*

The CGE model used in the analysis is specifically designed to include a fairly detailed financial block. It is a direct extension of a model previously developed by the author (Azis 2000). There are several components in the model: financial/monetary block, capital flow block, real sector block, price block, trade block, labor market block, and investment-saving block. The financial block plays a pivotal role

since the model is designed specifically to capture the financial crisis episode. Given the financial balance sheets of six institutions in the economy, i.e., central bank, commercial banks, foreign sector, government sector, households, and production sector, the behavior of each is specified separately.

For space-saving purposes, the following discussions are centered only on selected relevant blocks and the mechanism of the model.[6]

The saving-investment closure deviates from a neoclassical specification, in which private domestic investment in sector *p*, $DOMPINV_p$ and capital inflows *FCAP* that set the size of foreign investment, *FORINVNET*, are determined through independent functions as in equation (3):

$$FORINVNET = FCAP - \Sigma_{inl} BORROW_{inl}, \quad (1)$$

$$FCAP = PFCAP + BORROW_{govt}, \quad (2)$$

$$DOMPINV_p = \lambda_p \cdot VA_p^{\lambda 1p} \cdot (1 + RLOAN)^{\lambda 2p} \cdot EXR^{\lambda 3}, \quad (3)$$

where $BORROW_{inl}$ is the total foreign borrowing by *inl* institutions (government, private companies including banks and state-owned enterprises), *PFCAP* is the net capital flows, VA_p is the value added of sector *p*, and *RLOAN* and *EXR* are the interest rate and exchange rate, respectively.

The specification of domestic investment reflects the financing behavior (i.e., bank-dependent) and the emerging constraints on the corporate balance sheet following the exchange rate collapse (Bernanke and Gertler 1989; Krugman, 1999). Hence, the influence of the interest rate and production capacity is combined with the effect of (depreciating) exchange rate on domestic investment. As the exchange rate collapsed, the corporate balance sheet deteriorated, hindering investment and contributing to further recession.

Foreign capital inflow is modeled as a function of interest rate differentials and the country's risk (labeled *RISK*), the latter being measured in terms of debt exposure. This is primarily determined by the service-debt ratio (equations 4 and 5):

$$PFCAPIN = \sigma_0 + degree \cdot \sigma_1 \cdot (RLOAN - RFLOAN - RISK/scal), \quad (4)$$

$$RISK = \sigma_0 + \sigma_1 \cdot (FOREXDEB / \Sigma_p E_p \cdot pwe_p), \quad (5)$$

where *PFCAPIN* and *FOREXDEB* are the gross capital flows and the size of foreign debt, respectively, *degree* indicates the intensity of capital openness, the size of which is calibrated from the SAM, and *pwe* is the world price of exports. Theoretically, the interest rate acts as an equilibrating factor in securing the saving-investment balance. However, during the crisis, the interest rate is treated as a policy variable, hence exogenously determined. On the other hand, the rupiah/dollar rate was allowed to float in August 1997. Therefore, along with other endogenous variables, the exchange rate plays an important role in the saving-investment balance.

[6] The complete list of equations is available upon request.

The phenomenon of capital outflows by foreign investors is widespread during the early part of the crisis. In the model, this aspect is captured by a shrinking equity asset, *EQROW*, in the foreign sector's balance sheet. This shrinking portion contributes to the rising capital outflows, *PFCAPOUT*:

$$PFCAPOUT = \mu_0 \cdot (PEQ \cdot EQROW / EXR)^{\mu_1}. \quad (6)$$

If there is one distinct difference between the crisis episode in Indonesia and the crisis in other Asian countries, it would be the political factor. Indeed, political variables played a very prominent role in the whole episode of the crisis (Azis 1998, 2000). On this subject, the interest-parity condition is proxied through equation (7), in which the risk premium is replaced by a variable reflecting the political condition of the country. The more unstable the political condition, the lower the value of *POL*:[7]

$$RLOAN = RFLOAN + (EXPEXR / EXR - 1) + POL. \quad (7)$$

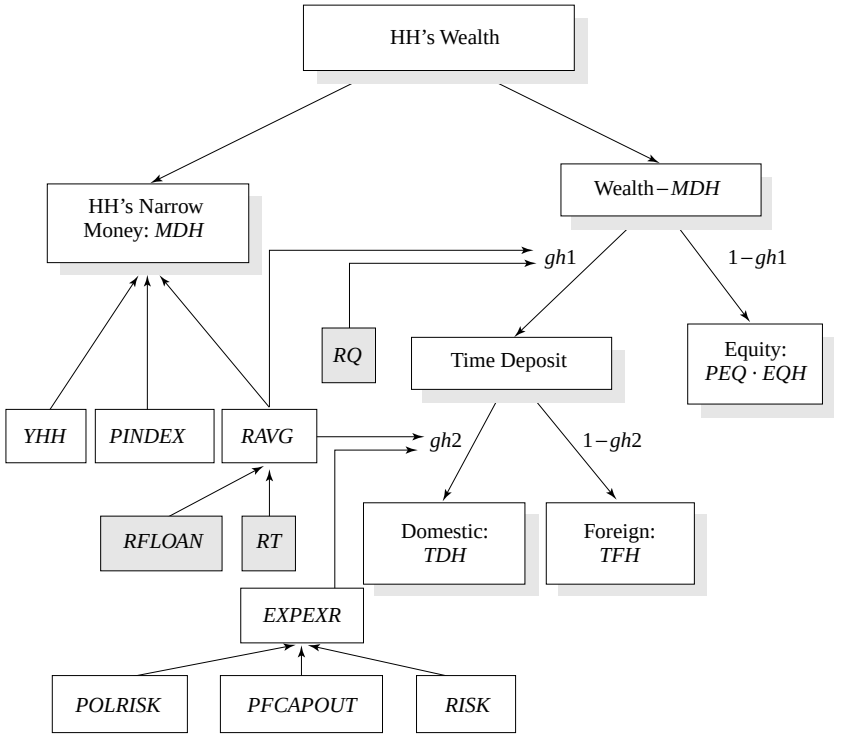
The portfolio allocation of assets is specified according to Tobin's approach. Following Tobin (1969), Brunner and Meltzer (1972), and Bernanke and Blinder (1988), I decided to abandon the perfect substitutability assumption in the portfolio allocation. More specifically, households' wealth is allocated between liquid assets (narrow money) and other assets. Other assets are further allocated between time deposits and equity holdings. Hence, there are four assets in the model: narrow money, domestic time deposit, foreign time deposit, and equity. The specific allocation is determined by household's preferences/tastes reflected through parameter *gh*1, which is influenced by the expected returns to equity and to time deposits (Figure 3).

The decision of holding domestic or foreign time deposits is also determined by household preferences, the parameter of which (*gh*2) is influenced by returns to time deposits and the expected depreciation (risk premium). Political risks, capital outflows, and the country's debt risk will jointly determine the precise size of the expected exchange rate.

The selection of foreign or domestic time deposits by the non-household (production) sector is determined by (as a fraction of) the size of foreign loans and bank loans, respectively. The production sector's demand deposits, on the other hand, are influenced by the value of total output. Once the portfolio allocation is known, money demand is derived (narrow money and time deposits), and so is the amount of loanable funds (bank loans), after taking into account the commercial bank's borrowing and reserve requirements.

[7] Ideally, variable *POL* should be determined by a set of formal indicators reflecting the degree of the country's political instability. However, at this stage of the research I simply set arbitrary values on *POL*. The selection of the values is determined subjectively by what I consider as important political events (e.g., riots, presidential resignation, etc.).

Fig. 3. Household Portfolio Allocation Decision



The money supply is modeled through a money multiplier and high-powered money (reserve money), the size of which is determined by the difference between the central bank's loans plus reserves (NDA plus NFA) and the central bank's wealth plus noninterest bearing government deposits and the central bank's certificate (Sertifikat Bank Indonesia or SBI). The money multiplier fluctuates rather sharply during the crisis episode, because the household behavior changes considerably. Therefore, we specifically allow the money multiplier to freely change, influenced among others by the government policy, such as reserve requirements (Harberger 2000).

The real sector resembles the class of common CGE models, in which the production structure is modeled as a set of nested constant elasticity of substitution (CES) functions. At the first stage, the production function of value-added is specified, with primary inputs in the right-hand side. Like in most emerging markets, Indonesia's structure of production and trade is such that many intermediate inputs, including those of export-oriented sectors, are still imported. Therefore, the composite intermediate inputs are necessarily modeled as a CES function of domestic and imported inputs.

At the second stage, domestic output is specified as a CES function of value-added and composite intermediate inputs. The demand side is modeled at the subsequent stage, in which sectoral exports are assumed to be different from domestically sold output (domestic sales). By using a constant elasticity of transformation (CET), domestic output is formed through exports and domestic sales.

This fact suggests that substitution of exports with domestic goods is costly; lower elasticity implies greater cost (more obstacles). Furthermore, the domestic market price will be different from the export price (which is determined by the world price and the exchange rate). Thus, in the revenue maximization program, the producers' behavior is captured through equations that express the ratio of exports to domestic sales as a function of the price ratio.

Finally, the total supply is modeled by using an Armington function (Armington 1969), in which composite demand is a CES function of imports and domestic sales. Importers minimize the cost of acquiring composite goods such that the ratio of imports and domestic sales is determined by their price ratio. The supply of imports is assumed to be infinitely elastic with fixed world prices (small country assumption). Along with the exchange rate, import tax and trade and transport margin, the fixed world prices determine the domestic price of imports.

The labor market is specified by using an independent function for wages, in which the changes in the value-added prices PV_p, labor productivity $X_p / \Sigma_{fl} FACDEM_{p,fl} / PDL0_p$, and the price level *PINDEX*, are the right-hand-side variables (equation 9). Wage factor income WF_{fl} is proportional to wages (equation 10). Since in reality wage rates differ across sectors, despite the intersectoral mobility of labor, some stickiness and market distortions are allowed in the model, and they are captured by a sector-specific parameter (*wfdist* in equation 8).

Labor demand in sector *p*, classified according to the types of labor *f*, that is, $FACDEM_{p,f}$, could be subsequently derived. Given the labor supply *LABORSUP*, the size of unemployment *UNEM* can be estimated (equation 11).

$$FACDEM_{p,f} = VA_p \cdot [\beta_{p,f} \cdot PV_p / (av^{\mu p} \cdot WF_f \cdot wfdist_{p,f})]^{1/(1+\mu p)}, \tag{8}$$

$$WAGES_p = PINDEX^{vp/1.5} \cdot (PV_p / PV0_p)^{(1-vp)} \cdot (X_p / \Sigma_{fl} FACDEM_{p,fl} / PDL0_p)^{\pi p}, \tag{9}$$

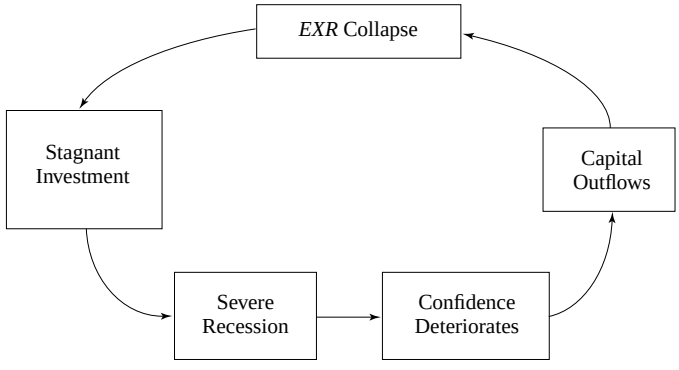
$$WF_{fl} = WF0_{fl} \cdot \Sigma_p WAGES_p \cdot wshare_{p,fl}, \tag{10}$$

$$UNEM = LABORSUP - \Sigma_{fl} \Sigma_p FACDEM_{p,fl}. \tag{11}$$

C. *Model Mechanism in the Crisis Evolution*

In this section, the evolution and precise sequence of the shocks that had occurred during the crisis are analyzed, along with the mechanism whereby macroeconomic indicators such as exchange rate, investment, capital flows, sectoral GDP growth, and interest rate, as well as social indicators such as unemployment, labor income, and household income are affected.

Fig. 4. Circular Causality, Multiple Equilibria, and Policy Choices



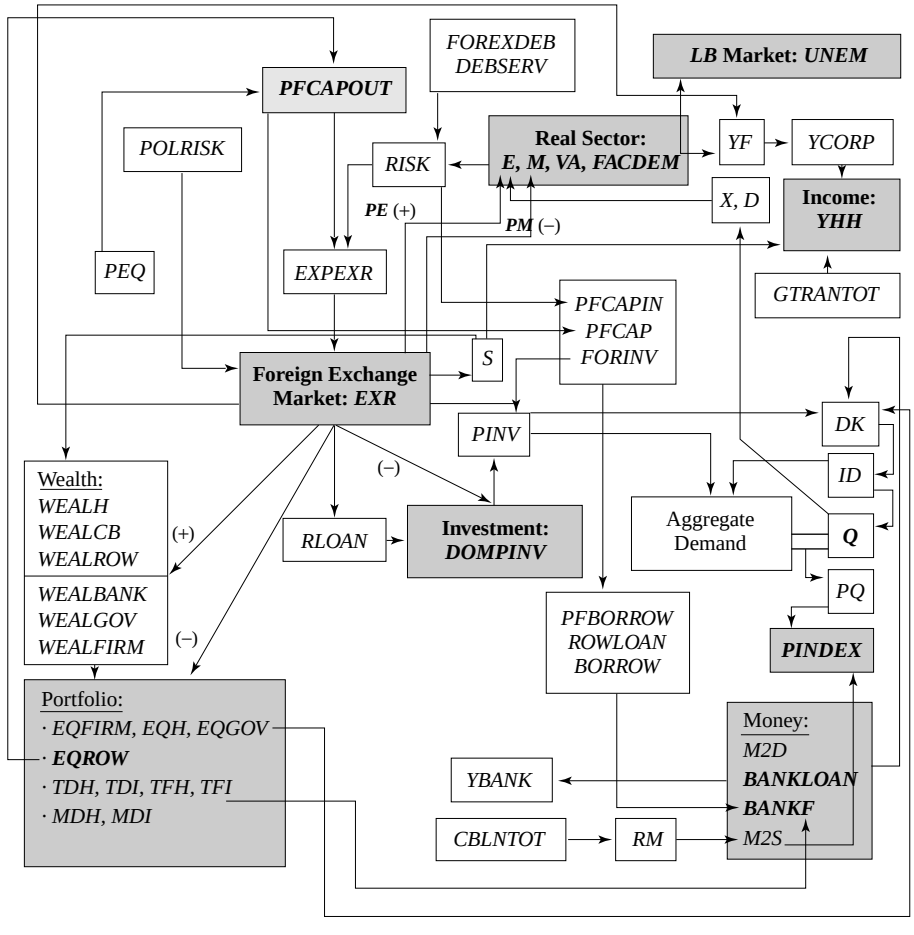
Beginning with the loss of confidence induced by the Thai baht collapse in June 1997, capital began to leave the country. With sizeable corporate sector debts, private domestic investment could not be made, since the corporate balance sheet had markedly deteriorated. This was exacerbated by the inability of the banking sector to lend, due to the fast growth of the nonperforming loans and attenuation of investment activity. Consequently, the economy plunged into recession. This caused a further loss of confidence. Hence, the cycle continued, and the circular causality in Figure 4 is intensified.

Figure 5 displays the detailed mechanism of the CGE model related to the above circular causality (the shaded areas contain the relevant variables in the illustration). With the collapse of confidence, capital began to leave the country. As a result, foreign equity *EQROW* decreased, leading to rising capital outflows (*PFCAPOUT*). The most direct impact is on the shift in devaluation expectation reflected through the change in *EXPEXR*. With additional pressure from the *RISK* factor, the actual (nominal) exchange rate *EXR* collapses.

Four subsequent repercussions are to be expected: (1) standard push on net exports, *E–M*, via more competitive export prices, *PE*; (2) increased value of foreign savings that will affect household income *YHH*, (3) increased domestic value of foreign investment (*FORINV*), and (4) declining domestic investment, *DOMPINV* via both, increased interest rate (*RLOAN*) and direct impact of deteriorated firm balance sheets due to rising values of foreign liabilities. As a result, the total supply (*Q*) decreases as well as the aggregate demand.

The resulting inflation (*PINDEX*) is determined by the interaction between the aggregate demand and total supply. In the Indonesian case, however, we need to add several cost-push sources of inflation, one through a drop in food production due to unfavorable weather conditions (El-Niño phenomenon), another through interruptions in the distribution systems of some basic commodities such as rice, especially after May 1998, due to a major riot, many Chinese business people left

Fig. 5. Impacts of Capital Outflows on Financial and Real Sectors



the country. This cause of disruption of the effective supply of several commodities is captured in the model by adjusting selected parameters in the production function. Finally, import prices also soar due to the depreciation of the exchange rate. With this specification, prices remain endogenously determined, and for some goods (e.g., rice), prices soared because of the additional constraints described above.

Theoretically, pressures on prices can be countered by a tight monetary policy (*MS*2). But the brakes were not effective, since the central bank began to extend special loans known as Bantuan Likuiditas Bank Indonesia (BLBI) to several commercial banks (increased *CBLNTOT* in Figure 5). This measure was adopted in response to the fear of a collapse in the financial system following a major rush related to the closure of sixteen banks in November 1997. As a result, prices increased significantly throughout 1998.

There are five components of household income (*YHH*): the first bracket on the right-hand side of equation (12) contains the factor income, the second bracket contains transfers from "rest of the world," inter-household transfers and government transfers, the third bracket contains household income from the after-tax corporate dividend, the fourth, the interest income from time deposits (*OTDH* is the time deposit in the initial period). The last bracket captures the interest income from foreign currency-denominated time deposits. The disposable income (*YCONS*) is given by equation (13).

If the interest rate *rt* is raised, *YHH* of household categories *ihh* who hold savings will also increase:

$$\begin{aligned} YHH_{ihh} = {} & [\Sigma_f factoin_{ihh,f} \cdot YF_f] + [EXR \cdot ROWTRAN_{ihh} \\ & + \Sigma_{ihh} transihh_{ihh,\,ihhh} \cdot YHH_{ihhh} \cdot (1 - th_{ihhh}) \\ & + gtran_{ihh} \cdot GTRANTOT] + [compdist_{ihh} \cdot (1 - ctax) \cdot YCORP] \\ & + [rt \cdot OTDH_{ihh}] + [rfloan \cdot EXR \cdot OTFH_{ihh}], \end{aligned} \tag{12}$$

$$YCONS_{ihh} = YHH_{ihh} \cdot (1 - th_{ihh}) \cdot (1 - mps_{ihh} - \Sigma_{ihh} transihh_{ihh,\,ihhh}). \tag{13}$$

The household time deposits *TDH* will be affected by the size of household wealth (*WEALH* in equation 14), the latter being determined by household savings, *HHSAV*, defined as the *mps* proportion (marginal propensity to consume) of *YHH* after tax (equations 15 and 16). Hence, with a certain time lag, *YHH* and *HHSAV* are actually interdependent:

$$TDH_{ihh} = gh2_{ihh} \cdot gh1_{ihh} \cdot (WEALH_{ihh} - MDH_{ihh} - EXR \cdot HHFR_{ihh}), \tag{14}$$

$$HHSAV = \Sigma_{ihh} mps_{ihh} \cdot YHH_{ihh} \cdot (1 - th_{ihh}), \tag{15}$$

$$\begin{aligned} WEALH_{ihh} = {} & mps_{ihh} \cdot YHH_{ihh} \cdot (1 - th_{ihh}) + OWEALH_{ihh} \\ & + (EXR - EXR0) \cdot OTFH_{ihh} + (PEQ - PEQ0) \cdot OEQH. \end{aligned} \tag{16}$$

With this specification, the relative income distribution could actually be adversely affected if the interest rate is raised, as is often the case when an IMF-type policy is adopted.

Using the model described above, I intend to analyze the detailed movements of major indicators during and after the crisis. This will be shown in a sequential fashion (event by event), so that one can examine the direct and indirect impacts of each policy response, including the IMF-initiated policies, on those indicators. The sequential dynamics of the model is expressed through the following motion equations for the aggregate capital stock *K*:

$$K_{t,\,p} = K_{t-1,\,p}\,(1 - \Delta_p) + \psi DK_{t,\,p}, \tag{17}$$

where Δ is the depreciation rate and ψ is the absorption rate.

Two sets of simulations are conducted. The first (Subsection D) follows closely

the sequence of events during and after the crisis. For such a purpose, we first need to determine how these events evolved. The second set of simulations (Subsection E) analyzes more closely the impact of the manufacturing sector downfall.

D. *Results of Sequential Simulations of the Crisis*

Following the Thai baht depreciation in July 1998, the government responded to the early pressure on the exchange rate by widening the exchange rate band to 12 per cent. At the same time, due to the jitteriness among foreign investors, some capital began to leave the country. This outflow, reflected in the model through *EQROW* and *PFCAPOUT*, continued in the following month (August 14), despite the fact that the interest rate (on the central bank certificate Sertifikat Bank Indonesia) was raised. Unable to defend the exchange rate further, at the subsequent stage the government floated the rupiah that month. In the model simulation, these two events (in July and August) are captured sequentially.

The third and fourth stages of simulation are basically a continuation of the previous two, except that at these stages the central bank tried to intervene in the foreign exchange market by releasing some of its foreign reserves, and the SBI rate was reduced. But the outflow *EQROW* continued, prompting the government to finally ask the IMF to intervene. With no deep understanding of what caused the crisis, the IMF formulated its standard prescription, i.e., raising interest rate and closing some banks, despite the fact that the country had virtually no deposit insurance system. The resulting outcome was obvious: a bank run.

When the interest rate kept increasing but the capital outflows and rupiah depreciation also continued to occur (partly because of the IMF's neglect at the time to deal with mounting corporate foreign debts), the situation deteriorated. The country's financial sector went haywire. Practically, the entire economy fell into a deep recession. The stock market plunged and the rupiah hit an "insane" level of over 11,000 per U.S. dollar. Pandemonium set in when on January 8 and 9, 1998 people went on a buying spree to hoard foodstuffs.[8] Meanwhile, perceptions were widespread that Soeharto had lost his touch. A popular revolt gained strength and public attacks on the government and Soeharto's leadership were on the rise.

By mid-May, the Indonesian politics began to reach a turning point. Following a bloody incident in May 12 (while Soeharto was attending the G-15 summit in Cairo), mob violence broke out in Jakarta, in which more than 500 people were killed,

[8] I observed the IMF's lack of touch with these chronological events, when in a private conversation with the IMF economists in Jakarta in March 2000 he was told that food hoarding and rioting in January 1998 that caused prices of some basic goods, including rice, to soar did not occur. The fact is that hoarding and occasional riots occurred, and the inflation rate rose by 13 per cent from December 1997 to January 1998. The IMF remained convinced that the inflation was an aggregate-demand phenomenon, hence to be solved by aggregate demand management, i.e., continued rise of the interest rate.

many of them, looters, burned to death. A chaotic situation was clearly developing. The stock market plunged and the rupiah weakened. On May 18, the wave of student protest escalated, thousands of them managed to enter the parliament compound, demanding an immediate special session of the People's Consultative Assembly (MPR) and Soeharto's resignation. Then came the historical day, May 21, when Soeharto announced his resignation and Vice President B. J. Habibie took charge. The exit of capital, especially owned by Indonesian Chinese, increased. The exodus of expatriates and foreigners bruised the country's image. Meanwhile, the exchange rate and the stock market continued to decline: the former reached 17,000 per U.S. dollar and the latter came close to a low of 400.

In the model specification, the collapse of the exchange rate led to a deterioration of the corporate balance sheet with large negative net-worth (related to unpaid foreign debt). Consequently, no investment could be made, prolonging the recession (see equation 3). As suggested in Figure 4, the deep recession damaged investors' confidence further, causing a continuous flight of capital from the country (increased *EQROW*). Furthermore, for the first time the political factors (*POL* in equation 7) began to play a significant role in the system. This is applied in simulations (5) and (6).

Under the Habibie government, various uncertainties could not be removed. Consequently, the loss in market confidence persisted. This is detected by, and captured through, the continued outflows of capital and increased political risks. Such a trend is applied in simulations (7) and (8).

By adjusting the size of exogenous changes, the attention then shifted toward the repercussions of the changes on macroeconomic indicators and on social variables such as unemployment and income distribution. The results of sequential simulations from stage 1 to stage 8 are as follows.

Figure 6 displays the collapse of value added in various sectors. Clearly, the construction, real estate, and banking and financial sectors are among the hardest hit during the crisis. Within industries, the largest drop occurred in the food processing and paper-manufacturing sectors, the least affected being the textile manufacturing sector. All the categories of manufacturing industries, represented by solid lines, experienced a significant downfall.[9] Note that the x-axis represents the eight stages of events described earlier.

The most immediate impact of the economic downfall is reflected in the real

[9] This is consistent with the recently released national account data showing that all the industries decline, and that the food processing and paper industries experience the largest drop of value added in nominal terms. Note that for a comparison with the SAM data used in the model, one needs to use nominal, not constant, prices. A different situation can be observed when constant prices are used, e.g., the value added of the two industries may increase, not decrease. Also, in making the comparison, one needs to take into account the fact that there are some discrepancies in the classification and coverage of the manufacturing sectors between those in the national account and in the SAM.

Fig. 6. Sectoral Value Added: Results of Model Simulation

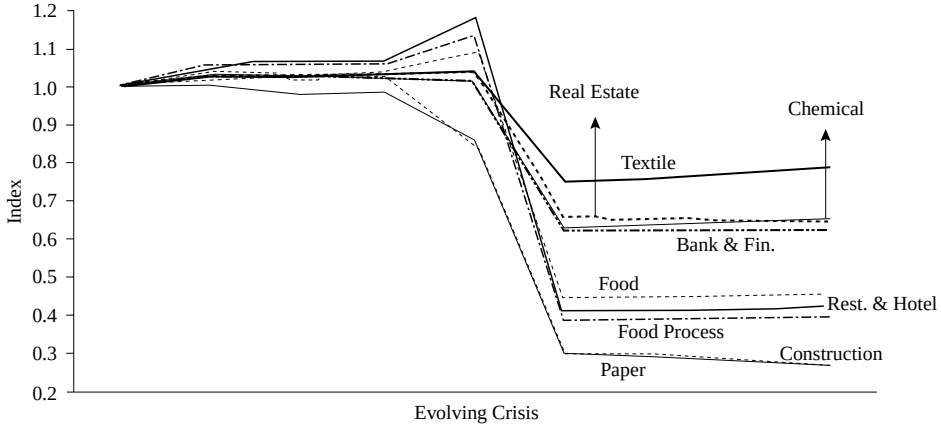
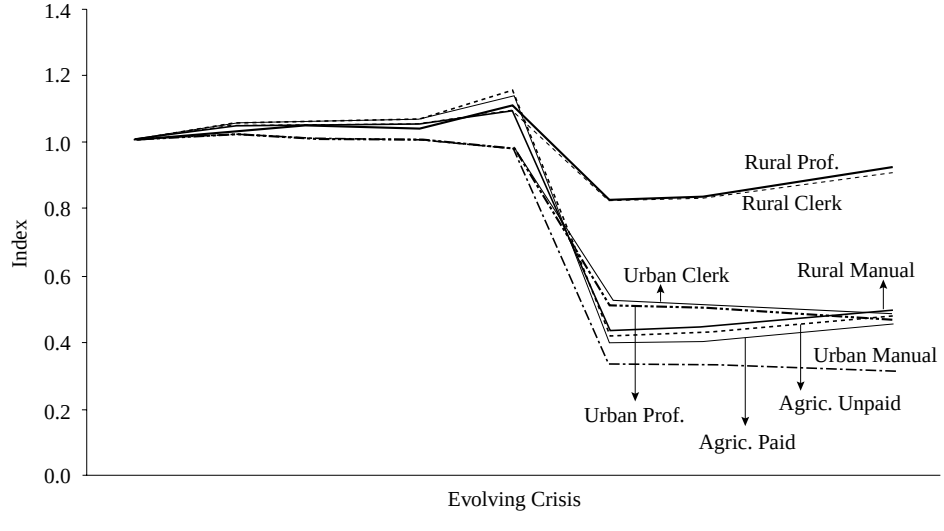
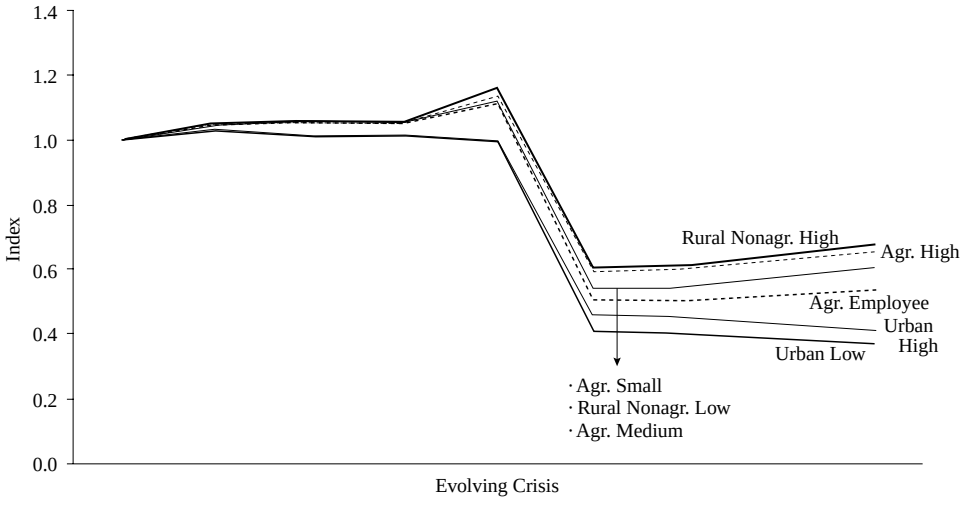


Fig. 7. Crisis Impact on Labor's Real Income: Results of Model Simulation



income of workers. Figure 7 indicates that the steepest fall of real wages affected urban workers among all categories, i.e., manual, professional, and clerical types. At the end of the simulation period, real wages of the latest two types are close to those of agricultural paid and unpaid workers. The difference is that while real wages of agricultural workers show a slightly upward trend from simulations (6) to (8), real wages of all urban workers decline persistently.

Fig. 8. Crisis Impact on Household Real Income: Results of Model Simulation



In the subsequent analysis, the impact on household real income is evaluated. The trend of this variable is more important since in reality the income is not completely derived from wage earnings. Furthermore, various forms of transfer were extended to the low-income groups during the crisis, either through the government social safety net and anti-poverty programs, or prompted by a mutual-help process, which is an important traditional institution among rural communities (*gotong royong*).

As displayed in Figure 8, based on the household income, once again the urban areas are the hardest hit. Both urban low and urban high categories experienced the largest decrease in real income. As in the case of the wages, the household income moves persistently downward, while for other categories there is an increasing trend. Obviously, rising inflation related to a sharp increase in the food prices during 1998 contributes significantly to such a decline.

The unemployment results of the simulation clearly indicate that unemployment increases considerably at the annual rate of roughly 10 per cent. This estimate is close to what the BPS data indicate. According to *SAKERNAS*, based on the official definition of "employment" (i.e., those who worked at least one hour per week), the open unemployment rate increased (from 4.3 to 5.1 million people were affected from 1996 to 1998). Of the 5.1 million unemployed, 3.1 million are in urban areas (accounting for 9.3 per cent of the urban unemployment rate), and 2.0 million are in rural areas (3.3 per cent). Using a different definition of unemployment, the Minis-

try of Labor predicted that unemployment would continue to increase each year, reaching 36 million people in 2000.[10]

The combined effect of declining real wages (and income) and increase of unemployment could potentially raise poverty dramatically. The process is activated through a downfall in consumption levels. If real consumption dropped as much as the rate of price increases, the impact on poverty would be most devastating. Rather fortunately, there was a process of consumption smoothing. Many households either changed their food menu (e.g., eating rice once a day, using other less desirable foods the rest of the time), switched to lower-price food (e.g., from imported to domestic produce), or used their accumulated savings to purchase food (dis-saving).[11]

There is widespread evidence that a smoothing process also takes place in non-food consumption. However, the impact on poverty, more particularly on diets, is less serious compared to the case when the smoothing affects food consumption (especially among the poor).[12]

Since income can be derived from the model, one could estimate the relative income distribution resulting from the sequential shocks. Figure 9 shows the trend of estimated Gini index. It is clear from the figure that the relative income distribution tends to fluctuate, i.e., worsening at the early stage and slightly improving towards the end of the simulation period.

Why was there a period of worsened distribution? First of all, as the model suggests, the depreciating exchange rate contributes to rising exports (see again Figure 5), which occurred at the early stage mainly in the export-oriented primary sector. However, as prices of basic necessities and inputs, including imported inputs, began to rise, farmers' relative position tends to deteriorate.[13] Secondly, at the early stage, the urban households were the hardest hit group including the high-income group. But as specified in equations (12) to (16), when the interest rate remains

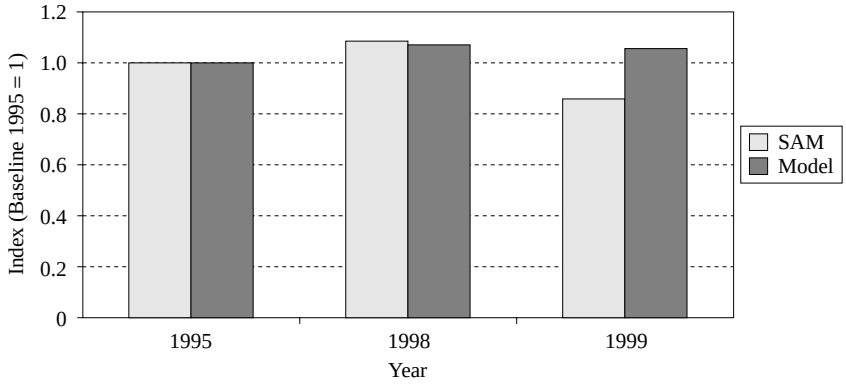
[10] At this stage of the modeling, the unemployment rate is not broken down either by sector or by labor category. Yet, such a breakdown is important (I am currently working on disaggregating labor categories in the model). For example, while the downturn in the construction sector is likely to hurt male workers more than female workers, within the manufacturing sectors different activities affect female and male workers differently. In the machinery sector, for instance, most of the affected workers are male, while downsizing in textile and electronic industries may affect disproportionately female workers.

[11] Also, as the price of rice and CPI decreased from the 1998 levels, the poverty line in 1999 went down, resulting in a decline of the head-count poverty index. However, within the poor group the conditions may have been more severe, as indicated by the Foster-Greer-Thorbecke index of poverty.

[12] The economic crisis, however, was not the only culprit. During 1997–98, Indonesia also suffered from crop failures due to the unstable global weather (El-Niño phenomenon). Subsistence farming areas were the worst affected. The economic and political crisis only aggravated the situation.

[13] Data on farmer's terms of trade also indicate an improvement in certain major areas during the mid-1997 to mid-1998, followed by a deterioration during the mid-1998 to mid-1999 (BPS-Statistics Indonesia, *Buletin ringkas, BPS* [Short bulletin of the BPS], various issues).

Fig. 9. Gini Index: SAM Data and Model Simulation



high, the middle- and higher-income groups who hold savings in the bank will eventually benefit from their increased interest incomes.[14]

However, the precise condition of relative income distribution at a certain point in time is highly sensitive to the date of data collection. Results of a survey conducted during the pre-harvest period tend to differ from data collected during or after the harvest season. The model simulation, on the other hand, does not take into account such seasonal adjustments. This fact explains why the income distribution index generated by the model is rather different from what the SAM data suggest, although the two show the same direction of change (see again Figure 9).

E. *Simulating the Impacts of Manufacturing Downfall*

The decline of the manufacturing sector during the crisis is simulated by the addition of pressures on the already declining industries. This counter-factual scenario is performed by altering the technical coefficients of selected industries, and, in one case, also by applying downward pressures on the exports of the respective industries. Output data from SAM 1995, 1998, and 1999, and the price deflator of each industry from the national account indicate that during 1995–98, of the five manufacturing categories, two recorded a negative annual growth rate, i.e., textile and clothing, and paper and transport equipment. Furthermore, during 1995–99, only the food processing industry did not experience a negative growth.[15] Based on

[14] Using the income data from SAM 1995, 1998 and 1999, the Gini index also shows fluctuations, with the following trend: 0.31 (1995), 0.34 (1998), and 0.29 (1999).

[15] There is a discrepancy between the manufacturing coverage in the national account and in the SAM. In the national account data, paper and transport industries are not combined. The latter recorded a steep fall during 1995–98 (more than 20 per cent annually), while the former increased by 3.3 per cent. During 1995–99, the national account data indicate that only two industries, i.e., textile and wood, experienced a negative growth. Again, this shows that the data from the two sources cannot really be compared in a precise manner.

TABLE VI

SIMULATION RESULTS OF MANUFACTURING DOWNFALL

	Evolving Crisis without Added Pressure for Mfg. Downfall	Evolving Crisis with Added Pressure on Textile and Paper Industries	Evolving Crisis with Added Pressure on Industries across the Board
Price index	1.0000	1.0859	1.1134
Current account	1.0000	0.9314	0.9699
Unemployment	1.0000	1.1157	1.1032
Real GDP	1.0000	0.9367	0.9412
Exchange rate	1.0000	1.0411	1.0628
Gini index	1.0000	1.0009	1.0018
Household income:			
A. Rural	1.0000	1.0100	0.9832
Farms			
1. Agric. workers	1.0000	1.0120	0.9845
2. Small farmers (< 0.5 hectare)	1.0000	1.0097	0.9822
3. Medium farmers (0.5–1 hectare)	1.0000	1.0099	0.9840
4. Large farmers (> 1 hectare)	1.0000	1.0137	0.9896
Non-farms:			
5. Rural low	1.0000	1.0044	0.9765
6. Rural high	1.0000	1.0142	0.9869
B. Urban	1.0000	1.0093	0.9792
7. Urban low	1.0000	1.0063	0.9746
8. Urban high	1.0000	1.0112	0.9823
C. Rural/urban	1.0000	1.0008	1.0041

Source: Simulation results of the author's model.

such information, two sets of simulations are conducted: (1) in column 2 of Table VI, I apply the adjustments on production and exports of the two sectors above and (2) similar adjustments are made in all the manufacturing industries except for food processing (column 3).[16] The two simulations are then compared with the "actual" scenario in the absence of additional downward pressures (column 1).

The selection of the initial condition is crucial. In the current study, I use simulation 4 (described in the previous section) as the initial condition, primarily because the rescue program with IMF involvement officially began at this stage. The relevant question to ask is therefore: if one applies further pressures on the manufacturing sector, in addition to what had been caused by the crisis (continued capital outflows) and the IMF-type policy response (rising interest rate), what would be the impacts of such additional pressures on the economy? By running simulations in this way, one can discriminate the impacts of changes in manufacturing-specific shocks from the overall impact of the crisis.

[16] Since in the 1995 SAM classification the wood industry is combined with the construction sector, I do not include this industry in the model simulation.

As expected, when added pressures are applied to the production and exports of textile and clothing, and paper and transport, the overall macroeconomic indicators are not too favorable: the GDP decreases, and inflation and unemployment increase. However, with the depreciating exchange rate, the current account deficit could be reduced. While all the household categories enjoy rising incomes, the largest increase of income occurs among the high-income groups, i.e., large farmers (by 1.37 per cent), rural high group (1.42 per cent), and urban high group (1.12 per cent). Agricultural workers are the only group among the poor who are able to raise their income by more than 1 per cent. With such a trend, the overall income distribution slightly worsen (see the Gini index in Figure 9).

Rather surprisingly, when downward pressures are applied to all the manufacturing industries except for food processing, the overall macroeconomic performance is not necessarily less favorable than in the preceding case. The drop in GDP is not as large as before (5.9 per cent versus 6.3 per cent), and the increase in the unemployment rate is also smaller.[17] However, inflation is higher and, although it is likely that the exchange rate will depreciate more, its impact on the reduction of the current account deficit is limited.

There are two possible explanations for this phenomenon: (1) With greater rupiah depreciation, it appears that overall exports grow faster, although exports of the manufacturing sector are lower (intentionally made so in the simulation). Consequently, the decline of output or real GDP is less severe. Given the degree of substitution (between imported and domestically produced goods), the fall of imports is less severe than before, such that the net effect on the current account is still favorable but less than in the previous scenario; (2) Shrinking output of other industries in column 3 of Table VI, particularly the chemical industry, presumably caused by the decrease in the demand from users' industries, tends to reduce significantly the required imported inputs. Indeed, chemical industries are among the most import-dependent activities. This itself is sufficient to prevent the GDP from falling faster than in the previous scenario (see again Table VI). Of the two alternative explanations, the latter seems to be more suitable for the Indonesian case.

Obviously, nonlinearity and price effects also play an important role in the process. If the prices of domestic goods increase less proportionally than those of imports, the fall of imports will be larger than the decrease in domestic production (the model clearly specifies that the ratio of imports to domestic goods is inversely related to its relative prices). Again, this could limit the fall of GDP, and in turn would prevent further unemployment.

While the simulation in column 3 shows that the macroeconomic conditions are

[17] Note that the simultaneous collapse of imports may have "neutralized" the decrease in GDP. However, the relative comparison of GDP changes in the two scenarios does not change. Even when using the total absorption (removing imports from the GDP calculation), the decrease in the second scenario remains less substantial than that in the first scenario.

not necessarily less favorable than those in column 2, the welfare effect expressed in terms of household income is more devastating. All the categories of households experience a declining income, potentially raising the poverty incidence. Since the largest drop is recorded in the rural low and urban low groups, the resulting income distribution also worsens, as indicated by a larger Gini index. The prevailing high interest rate enables the urban middle- and high-income groups, i.e., the savers, to gain windfall revenues from interest income.

To summarize, while the social impact of the crisis is already serious, the results from the addition of further downward pressures on the manufacturing sector are mixed. Inflation and unemployment rates are higher, the exchange rate collapses further, and GDP growth becomes negative. But the household income could have been improved if the additional shocks had been applied to only selected industries. It is the high-income group who tends to gain more, primarily because it has more options and potential asset returns (e.g., interest income). On the other hand, the income of all the households may fall when additional shocks are applied across all manufacturing sectors. With rising inflation, real income would have been falling more significantly.

From the modeling perspective, the analysis has shown that the presence of substitutions and nonlinearity in the system enables us to generate some non-monotonic trends, e.g., a negative shock imposed on all the industries does not always result in less favorable macroeconomic conditions than when the shock is applied to only a few number of industries. Using models equipped with such features could enhance policy debates, including those about industrial policy. Such debates are considered to be more necessary when the system is under a severe stress (crisis).

IV. CLOSING REMARKS

Indonesia is at a policy crossroads. The economic achievements of the last generation have been in many ways remarkable. But the 1997 crisis that led to a significant downfall in many sectors, including manufacturing industries, reminds us that the policy framework underlying the achievements was not robust enough to sustain the economy into the next generation. Without criticizing the standard economic analysis on the determinants of a crisis based on "fundamentals" (Sachs, Tornell, and Velasco 1996), I do not think that it was the country's macroeconomic fundamentals that triggered the crisis.[18] Instead, the role played by institutions is significant, and in the Indonesian case, it is very important (Azis 1999). From this perspective, the concept of asymmetric information (e.g., Mishkin 1999), the balance-sheet constrained investment models (Aghion, Bachetta, and Banerjee 1999) and the so-called third generation models (Krugman 1999) may have a great relevance.

[18] See also Klein (1998).

Leaving aside the discussions about which models could well explain the determinants of the crisis, in this manuscript, I develop a model of general equilibrium type by allowing some substitutions—hence nonlinearity—in the system. One of the key features of the model is that, prices are determined endogenously. The model is then used to analyze the sequential impact of the crisis and counter-factual scenarios of the downfall of the manufacturing sector in Indonesia.

While the results of model simulations indicate that the urban households are the hardest hit, the dynamics of the nonlinear model enables us to identify a more detailed mechanism through which the financial shock is transmitted to the real sector (e.g., manufacturing downfall), and subsequently to the household income. The validity of the model is tested through sequential simulations indicating how different events evolved during and after the crisis. From those simulations, it is shown that the model is capable of generating outcomes close to the actual data.

Another advantage of using the model is the possibility of running counterfactual scenarios. I have conducted simulations of such scenarios by imposing further shocks on different manufacturing sectors and the results are far from monotonic. The macroeconomic impact of a shock on all the manufacturing sectors is not necessarily worse than if the shock is applied to only a few industries. Furthermore, the latter could have resulted in a higher income of all the households than in the scenario without additional shocks. But the social impact of the shocks on all the manufacturing industries are certainly more devastating.

Obviously, other important counter-factual simulations can be conducted. I have done some, but due to the space constraint I do not report the results here. Also, in the current study we endogenized only selected social indicators; yet, there are other social variables of interest, one of them is the incidence of poverty. Since prices are endogenously determined, given a certain basket of basic needs that are made up of food and nonfood commodities, a monetary poverty line could also be derived "endogenously." In this way, the usual problems of choosing a correct set of price deflators can be resolved.

However, in order to obtain estimates of poverty incidence, information about the overall income distribution is necessary. Since in the SAM-based CGE models the number of household categories is usually limited (there are eight in the current model), it is necessary to generate an intra-group distribution for each of the household categories. My work along this line is still underway.

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APPENDIX

LIST OF VARIABLES, PARAMETERS, AND SUBSCRIPTS

A. *Variables*

BANKLOAN: Sectoral-com-bank-loan demand.
BANKF: Available-com-bank-financial fund.
BORROW: Foreign borrowing.
CBLNTOT: Special loans to commercial banks.
D: Sales of domestic output.
DEBSERV: Debt service (interest and amortization) to the rest of the world.
DK: Volume of investment.
DOMPINV: Private domestic investment.
E: Exports.
EQFIRM: Private company equity holding.
EQGOV: Government equity holding.
EQH: Household equity holding.
EQROW: Row equity holding.
EXPEXR: Expected exchange rate.
EXR: Exchange rate (rupiah per U.S. dollar).
FACDEM: Factor demand.
FCAP: Capital inflows.
FOREXDEB: Size of foreign debt.
FORINV: Domestic value of foreign investment.
FORINVNET: Size of foreign investment.
GTRANTOT: Total government transfers to households.
HHFR: Hard foreign currency demand.
HHSAV: Household savings.
ID: Final demand for productive investment.
K: Aggregate capital stock.
LABORSUP: Labor supply.
M: Imports.
M2D: Broad money demand.
M2S: Broad money supply.
MDH: Household money demand.
MDI: Sectoral company demand deposit.
NDA: Net dometic assets.
NFA: Net foreign assets.
OTFH: Household foreign time deposit in the initial period.
OTDH: Household domestic time deposit in the initial period.
OWEALH: Household wealth in the initial period.

PDL: Average labor productivity.
PE: Export price.
PEQ: Price of equity.
PFBORROW: Gross foreign borrowing.
PFCAP: Gross capital flows.
PFCAPIN: Gross private capital inflows.
PFCAPOUT: Gross private capital outflows.
PINDEX: Composite price index.
PINV: Private investment by sector of destination.
PM: Domestic price of imports.
POL: Political condition.
POLRISK: Political risk.
PQ: Price of composite goods.
PV: Value-added prices.
Q: Total supply.
RFLOAN: Foreign loan interest rate.
RISK: Country risk.
RLOAN: Domestic loan interest rate.
RM: Central bank reserve money.
ROWLOAN: Rest of the world loan.
ROWTRAN: Foreign transfers to households.
S: Total saving.
TDH: Household domestic time deposit.
TDI: Sectoral domestic time deposit.
TFH: Household foreign time deposit.
TFI: Sectoral foreign time deposit.
UNEM: Size of unemployment.
VA: Value added.
WAGES: Wages.
WEALBANK: Private bank wealth.
WEALCB: Central bank wealth.
WEALFIRM: Commercial bank wealth.
WEALGOV: Government wealth.
WEALH: Size of wealth.
WEALROW: Row wealth.
WF: Average factor price.
YBANK: Private bank income.
YCONS: Disposal income.
YCORP: Corporate income.
YF: Factor income.
YHH: Household income.
X: Domestic output.

B. *Parameters*

av:	Value added function shift parameter.
compdist:	After tax transfer from corporation to other institutions.
ctax:	Tax rate for corporate income.
degree:	Degree of openness of capital account.
*gh*1:	Share of portfolio in time deposit.
*gh*2:	Share of time deposit in domestic time deposit.
faction:	Coefficient for mapping factor income to households.
govt:	Government.
gtran:	Proportion of government transfer to institutions.
mps:	Marginal propensity to consume.
pwe:	World price of exports.
rfloan:	Foreign loan interest rate.
rt:	Interest rate.
scal:	Scalar.
th:	Household tax rate.
transihh:	Inter-household transfer rate.
wfdist:	Factor price proportionality factor.
wshare:	Sectoral weight of labor wages.
β:	Coefficient of input distribution.
Δ:	Depreciation rate.
λ:	Accelerator coefficient for domestic private investment.
$\lambda 1$:	Value-added elasticities for private investment.
$\lambda 2$:	Domestic interest rate elasticities for private investment.
$\lambda 3$:	Exchange rate elasticities for private investment.
μ:	Foreign equity parameter for capital outflows.
ν:	Price elasticity of wages.
π:	Labor productivity elasticity of wages.
σ_1:	Coefficient for foreign capital related to *degree*.
σ_0:	Intercept for foreign capital.
ψ:	Absorption rate.

C. *Subscripts*

f:	Factors of production.
fl:	Labor factors.
ihh, ihhh:	Household categories.
inl:	Non-labor institution (government, company, commercial bank).
p:	Sector.
t:	Time.