7-1-1992

Regional Development in Indonesia, 1994-2019 - Preliminary Exercises for a Long Term Scenario Analysis

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National Regional Development Study (LTA-97)

Progress Report II.A

REGIONAL DEVELOPMENT IN INDONESIA, 1994-2019

PRELIMINARY EXERCISES FOR A LONG TERM SCENARIO ANALYSIS

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Badan Perencanaan Pembangunan Nasional (BAPPENAS)
Jakarta, July, 1992

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Preface

This paper contains part IIA of a larger study project carried out by Netherlands Economic Institute (NEI) consultants of the Bappenas National Regional Development Study (LTA-97) working under a contract with the Development Studies Project (DSP) II (contract 497-0340-C-00-7104-00 Indonesia DSP). A first version of a Base Line Scenario (BLS) is worked out for the Second 25 Year Plan for Indonesia (1994-2019). Recent national, international and regional developments are reviewed, the basic assumptions of the BLS are discussed and the resulting projection of regional and national economic development is presented and evaluated. For the BLS a Multiregional Input-Output Forecasting model (MRIOF) for Indonesia has been used. The broad outline of this model is presented and written out in more detail in Appendix A. The policy implications and some possible alternative 25-year scenarios for the BLS are discussed in a separate paper which is part IIB of the underlying study. The preparation of the paper has greatly benefited from information and ideas available within the regional department (Deputy V) in Bappenas, and especially from the meeting organised by this department on July 13, 1992, where the main ideas of both papers were discussed.

1. INTRODUCTION

1.1. Strategic visions and scenarios

Indonesia enters a new development era which will be formulated in a new 25-year strategy. In this context it is important for the staff of BAPPENAS in general and Deputy V and his staff in particular, to develop and reconsider strategic visions on the future economic development of Indonesia and its regions. Economic development in a broad sense includes not only all aspects of welfare, i.e. income and income distribution, physical and socio-economic infra-structure, housing, health, education, transport and energy, but also the developments in the fields of the environment and provision of raw materials.

In preparing a 25-year outlook, one has to cope with many fundamental uncertainties and it is not possible to make a blueprint of the future. It is possible, however, to formulate alternative scenarios which should be tested on their consistency and plausibility. The main purpose of these scenarios is to encourage and organise the discussions about future economic developments and policy alternatives.

1.2. National growth versus regional equity

There is a strong indication that further industrialization in combination with export promotion policies will result in increasing regional disparities. LTA-97 Discussion Paper XXIV shows a growing inequality for the coming 10 years in terms of production per capita between Jawa and some other regions, especially provinces in the Eastern part of Indonesia. These results suggest a conflict between the objectives of growth and equity in a regional context. It also makes clear that there exists a challenge for regional

policy, particularly in a 25 years perspective. The possibilities of compensating negative trends without jeopardizing national growth can be studied through national-regional policy scenarios.

1.3. Set up and contents of the paper

As a preparation for the discussions within BAPPENAS about "the next 25-years", this paper gives a preliminary outcome of a first scenario in which the effects are projected of a continuation of the economic policy of the Indonesian government and of the present economic trends (a so-called Base Line Scenario or BLS). For this scenario a Multi Regional Input Output Forecasting model (MRIOF)[1] has been developed by the LTA-team which can be used to technically support the formulation of a number of policy scenarios.

The main attention in this paper is devoted to the regional deviations from national trends. Since to date no official data have been published about the expected national economic development in the long run, data from other sources (in particular the World Bank) are used in the BLS.

It has to be emphasized that the assumptions and results from the BLS presented below are of a provisional and preliminary nature. Nevertheless, the projected regional trends with respect to convergence to or divergence from the average national trends give a picture which can serve as a starting point for further discussions.

In section 2 and 3 of this paper some basic starting points of the analysis are discussed: the expected trends in the

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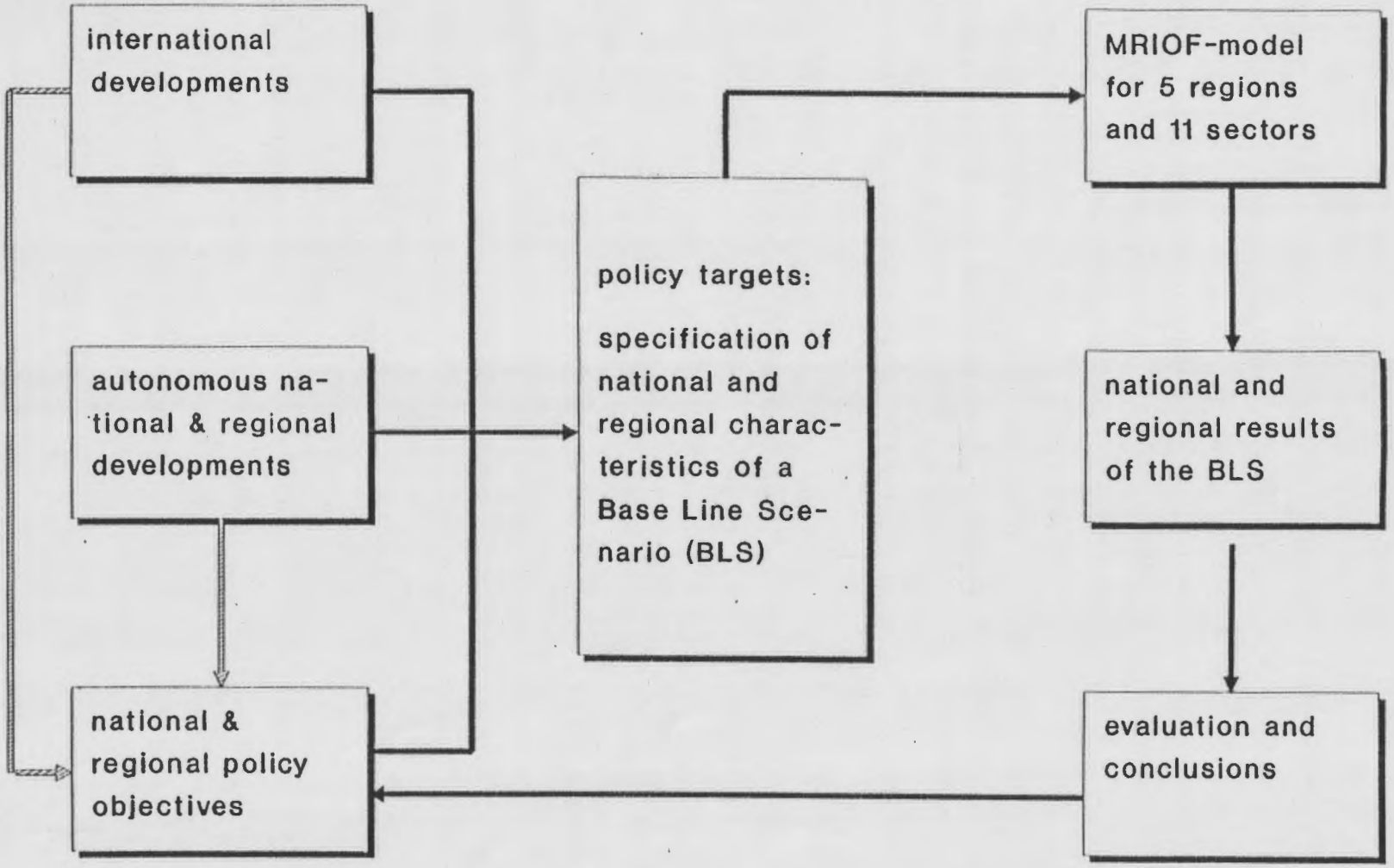
[1] For the present projection the MRIO-model is specified in terms of:
- 5 regions: Sumatera, Jawa, Kalimantan, Sulawesi, and Eastern Islands, and
- 11 sectors: food crops, other agriculture, non-migas mining, non-migas manufacturing, public utilities, construction, trade, transport, other services, public services, and migas.

international economic environment, recent economic developments in the country as a whole and in the five regions, and the expected government policy (see figure 1). In section 4 the structure of the MRIOF model is presented and the necessary exogenous assumptions for the BLS are discussed. In section 5 the results of the BLS are presented and evaluated.

Of course the assumptions made in this paper should be thoroughly discussed within BAPPENAS and especially within Biro SETR and Deputy V. The assumptions represent only one possible set of starting points. Simulations with alternative sets can start a sensitivity analysis and initiate a continued planning process. The policy implications of the BLS and some possible alternative scenarios are discussed in part IIB of this study.

Figure 1.1 Outline of a 25 years scenario analysis



2. WORLD-WIDE DEVELOPMENTS

2.1. General

The driving forces behind economic progress can be monitored by a number of different indicators. Key elements for a successful economic development are a high saving rate leading to productive investments and capital accumulation, and technological progress, brought about by investment in education, implying more efficient production. The level of prosperity depends on the availability of production factors (natural resources, quantity/quality of labour, and infrastructure). Factor allocation will be more efficient as the economy is characterised by a more smoothly functioning price mechanism and international free trade.

Furthermore, many economists believe that the government should to a certain extent intervene in the economic interactions between individual actors in order to bring about stability in the economy. This can be done by stimulating cooperation and promoting the collective adaptability of the community to new developments. According to this view the quality of the government is important, as is a consistent government policy with respect to the social and physical infrastructure, international trade and the price mechanism.

Other important indicators for economic progress are individual adaptability and in innovative forces of entrepreneurs.

The relative importance of each indicator depends on the theoretical perspective of the observer. Different weights will for instance be given by adherents of a neo-classical, a Keynesian or a free market approach.

The indicators mentioned above are summarized in table 1 for the main economic regions in the world. It is assumed that neglecting any one of these aspects completely could be unfavourable for the development potential of an economy.

Table 1. Summary regional comparative strength analysis of the world economy

DRIVING FORCES	NAM	WEU	JAP	DAEs	LAT AFR	CIS CE	INDO NESIA
Natural resources	+	0	--	0/+	+	++	++
Saving rate	--	+	++	++	-	--	+
Price mechanism	++	0	+	+	-	--	0/-
Property rights/incentives	++	-	+	+	+	--	0
Autonomy of economic sphere	+	0	0	0/-	--	--	-
Invention/innovation	++	-	+	0	-	--	-
Individual adaptability	++	--	+	+	+	--	+
Collective adaptability	--	+	++	++	-	--	+
Cooperation	--	+	++	++	--	--	+
Quality of government	+	+	++	+	--	--	+
Infrastructure	-	+	0	0	--	--	--
Education	-/+	+	++	0/+	--	+	-

Source: CPB, WB

NAM: North America
WEU: Western Europe
JAP: Japan
DAEs: Dynamic Asean Economies, Taiwan, South Korea, Singapore, Hong Kong ,Indonesia, Thailand, Malaysia and the Philippines
LAT: Latin America
AFR: Sub-Saharan Africa
CIS: Commonwealth of Independent States
CE : Central Europe

Under this assumption the table gives an impression of the relative strength of the different parts of the world economy. The Developing Asean Economies (DAEs) seem to be the most capable of tackling development bottlenecks, compared to other economies. This means that, whatever global scenario for the next 25 years is chosen, the DAE's will take a relatively strong position. In this analysis an annual GDP growth of at least 7% and an export growth rate of some 9% is assumed for the average member of this group

of countries. Labour productivity will grow with 5%, and income per capita with 6%.

2.2. The relative position of Indonesia

The DAEs can be broken down into first-tier DAEs (Taiwan, South Korea, Singapore and Hong Kong) and second-tier DAEs, also known as the ASEAN four (Thailand, Indonesia, Malaysia and the Philippines). The first-tier have achieved impressive growth during the last three decades. In many respects they followed the Japanese development strategy and their approach has virtually become an example for other developing countries since they have proved that it is possible for a developing country to combine a rapid rise in living standards with an equitable distribution of income. Especially South Korea and Taiwan have shown that it is possible for strong agrarian economies to transforme into industrial societies with a reasonable distributed prosperity within a time span of 20 to 40 years. They combined high expenditures on education, a high saving rate and an outward orientation supported by government policies.

Indonesia and the other second-tier DAEs, Malaysia, Thailand and the Philippines have copied a number of these policies during the last decade from the first-tiers DAEs. The two-tiers DEAs countries are well positioned to benefit from the expected strong development of their East Asian neighbours in terms of technology transfer, direct investment and marketing. However, in general these countries are much larger and within these countries there are large differences in regional economic structure and performance. They are also rather resource rich. For these reasons they require a different path to development and industrialisation. The challenge for these countries is to

learn from the lessons from the first-tier DEAs, and to develop their own country specific development strategy.

Based on a first impression, it is assumed that comparative strength of the Indonesian economy can be characterized by the last column of table 1. The column shows positive scores for natural resources, savings, adaptability (individual and collective), cooperation and government quality. On other characteristics Indonesia seems to have lower scores, especially on the infrastructure. In this paper it is nevertheless assumed that the annual growth of non-migas GDP and exports for indonesia will be according to the DAE's average.

3. RECENT NATIONAL AND REGIONAL DEVELOPMENTS

3.1. General

In the 1980s Indonesia has shown a very heterogeneous pattern of regional economic development, not only with respect to the growth of population and labour force, but also with respect to other production factors such as natural resources and capital which are unevenly distributed over the five regions. Other economic variables such as investment and exports also show large regional differences in level and growth rate.

Based on a number of characteristics, table 2 gives an impression of the relative position of the five regions against the national average. The level of per capita GDP on Jawa is nearby equal to the national average, largely due to the relative weight of the island. Migas activities are mainly concentrated on Sumatera and Kalimantan, and non-migas on Jawa. As non-migas exports are increasing and migas exports are getting relatively less important, the GDP growth rate on Jawa is increasing, while the rate on Sumatera and Kalimantan decreases. Economic development in Sulawesi and Eastern Islands is lagging and this trend has not been improved in the 1980s.

Table 2. Summary of characteristics Indonesian regions

	SUMA TERA	JAWA	KALI-MANTAN	SULA-WESI	EAST. ISL.
1. Economic development					
GDP per capita (1989)	++	-	++	--	--
non-migas GDP per capita	0	0	++	--	--
annual growth GDP (1983-1989)	-	+	--	-	0
annual growth non-migas GDP (1983-1989)	0	0	++	-	0
growth non-migas GDP/p.cap. (1983-1989)	-	0	++	-	0
2. Population & labour force					
annual population growth (1985-1989)	++	-	+	-	+
population density per sq. km. (1990)	-	+++	---	--	---
green pressure (1990)	++	-	+	+	+
grey pressure (1990)	0	0	---	++	0
annual labour force growth (1985-1990)	+++	--	++	++	0
participation rate (1990)	0	0	0	-	+
3. Human capital					
poverty incidence (1990)	-	0	+++	--	+++
share of pop. with tertiary education (1989)	-	+	--	+	-
share with more than primary educ.(1989)	+	0	-	+	--
4. Investment					
ratio investment-GDP (1983-1988)	-	+	-	-	-
ratio private investment-GDP (1983-1989)	0	+	-	---	---
ratio govt. investment-GDP (1983-1989)	-	-	-	+++	+++
5. Export					
ratio non-migas export/non-migas GDP (1983-89)	+++	--	+++	0	+

+++ = > 150 % of national average
++ = 120 - 150 % of national average
+ = 105 - 120 % of national average
0 = 95 - 105 % of national average
- = 80 - 95 % of national average
-- = 50 - 80 % of national average
--- = < 50 % of national average

3.2. Population and labour force

The population on Sumatera has shown a relative high growth, while on Jawa and Sulawesi the population growth was below the national average. This below average population growth on Jawa - due to a further phase of demographic transition - is expected to continue during the

next decades[2]. The share of the population younger than 20 years (green pressure) on Jawa is also lower than in the other regions, while the share of the population older than 65 (grey pressure) is the lowest in Kalimantan.

Labour force growth shows a regional distribution similar to population growth. Mainly in consequence of lower growth in population, also the labour force in Jawa has been growing at a lower rate than in the other regions. High growth in labour supply means that in general also a high growth rate in regional GDP or migration flows are needed to absorb all new workers[3]. The participation rate (i.e. share of the labour force in the population from ten years and older) is quite similar in all regions.

3.3. Human capital

High poverty incidence (i.e. share of the population below the poverty line) is found in Kalimantan and the Eastern Islands, while in Sulawesi the poverty incidence is the lowest. Large differences can be noticed, if the regional results of this indicator are compared with the regional non-migas GDP per capita. This different regional view, in particular on Kalimantan and Sulawesi, can probably be explained by a different income distribution in these regions. With respect to tertiary education Jawa and Sulawesi score above average, while the Eastern Islands are lagging behind. The share of the population with more than primary education is higher in Sulawesi and Sumatera.

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[2]See for projections "Population Projection of Indonesian Provinces: 1990-2020", Faculty of Economics, University Indonesia (Nov. 1991, LTA-97).

[3]In DPS XXIV preliminary analysis indicates also regional variations in employment-GDP elasticities.

3.4. Investment

In the 1980s private investment were mainly concentrated in 7 provinces on Jawa and Sumatera: the migas provinces Sumatera Utara, Riau, Sumatera Selatan, and all the provinces on Jawa, except Yogakarta. The only province outside Jawa and Sumatera which has attracted large private investment projects is the migas province Kalimantan Timur. These 8 provinces account for 90 percent of the private investment in Indonesia.

By contrast, from the government investments in the 1980s a larger share has been allocated towards Kalimantan, Sulawesi and Eastern Islands. In 1989 only 12 percent of the private investment in Indonesia was spent in these three regions, while almost 26 percent of the total government investment was located there. To be more specific, from government investment 8 percent was allocated to Kalimantan, also 8 percent to Sulawesi and 9 percent to the Eastern Islands, while 25 percent was spent in Sumatera and 49 percent to Jawa.

3.5. Foreign exports and sector structure

The decline of the oil prices on the world market in the mid 1980s had a large impact on the availability of foreign exchange and on the Government revenues. Up to then, non-migas exports were less than 30% of total export, and only 10% of total non-migas GDP. This non-migas quote varied over the regions, from about 25% for Kalimantan to less than 5% for Jawa.

To avoid such a situation in the future, the expansion of non-migas exports has become a main policy issue during REPELITA V, which have resulted in a fast expansion of production and exports in manufacturing in particular. In

1990 the share of non-Migas exports in total exports has increased to 58%, while the national non-Migas export/GDP rate has risen to 17%. Jawa is still the least export oriented region (about 13% of its non-Migas GDP), allthough the increase of the national non-Migas exports was mainly concentrated in manufacturing on Jawa.

In the period 1983-1989 the manufacturing sector was the fastest growing sector in Indonesia with a growth rate of 12% per year. Manufacturing activities are concentrated in Jawa (textiles, paper and pulp, metal products). Outside Jawa only on Sumatera manufacturing is substantial (food processing, chemicals and basic metals). In Kalimantan with its dominant wood production sector, the non-Migas exports were above 35% of its non-Migas GDP. The trend of a relative fast growth of export and GDP for the manufacturing sector is expected to continue in the future. This will result in a broader export commodity mix which is less affected by price fluctuations.

4. MODEL STRUCTURE AND BASIC ASSUMPTIONS

4.1. Introduction

One of the central activities of the National Regional Development Study LTA-97 has been the development of a multiregional input-output model (MRIO) of the Indonesian economy which allows the evaluation of the potential impact of national and regional policies for regional development. For this purpose an interregional input-output table has been constructed for the year 1980 and 1985 at the level of 25 industries and 27 regions[4]. Recently a long term forecasting model for Indonesia has been developed at the level of 5 regions and 11 industries which is based on the input-output table. This Multi Regional Input-Output Forecasting model (MRIOF) has been used for the underlying 25 year scenario.

A detailed description of all equations in the MRIOF model can be found in Appendix A. Here only the broad outline of the model is given in section 4.2. For the 25 year scenario some specific extensions of the basic model have been made for household consumption and government expenditures. These extensions will be discussed in section 4.3 and 4.4. The remaining exogenous assumptions are given in section 4.5.

4.2. Basic outline of the MRIOF model.

In earlier LTA-97 projections the standard MRIO model has been used in a one step procedure to project the expected economic development for a medium term period at once. However, for long term projections as the BLS it is useful to monitor the economic performance of the regions during

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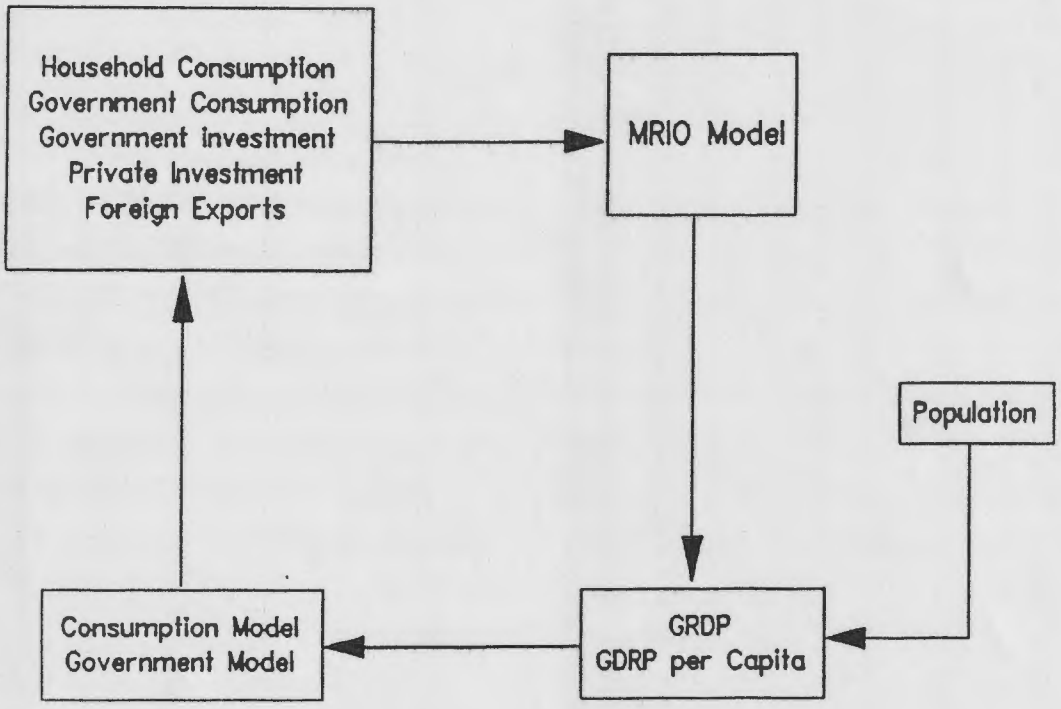
[4] See LTA Discussion Paper Series nr XVII

the projection period. For this purpose a fine-tuning of the model has been carried out which makes it possible to calculate the year-to-year growth of the relevant variables throughout the period. Furthermore, the model is reformulated in growth rate terms which substantially reduces input-output forecasting errors in long term forecasting applications. Hence, a Multi Regional Input-Output Forecasting model (MRIOF) has been constructed which calculates endogenous regional GDP growth rates from exogenous final demand growth rates for each year of the projection period. The MRIOF model is used at the level of 11 industries and 5 regions.

Figure 2. Basic outline of the MRIOF model for Indonesia



The growth rates for the exogenous final demand categories can be fully specified by region and sector which means a 100% bottom-up approach. The other extreme case is a projection in which the same national growth rates for all sectors and regions are used leading to a "shift-and-share"

division of national trends (100% top-down). As will become clear below, for the BLS a mixture of both methods has been used.

The structure of the MRIOF model is given in figure 3. Like all input-output models it is basically demand driven by the final demand expenditures mentioned in the upper left block. However, there are two important endogenous feedback mechanisms, one for household consumption and one for government expenditures. In general the balance equation for the resulting GDP forecasts can be written as follows:

$$y = c_h^{end} + c_g^{end} + i_g^{end} + i_p^{exo} + x^{exo} - m^{end} \qquad (1)$$

where

y=GDP
c_h=household consumption
c_g=government consumption
i_g=government investment
i_p=private investment
e=foreign exports
m=foreign imports

Within the MRIOF model foreign imports are determined endogenously by region and by industry according to the import coefficients in the input-output table. Only private investment and foreign exports need to be feeded into the model exogenously.

The yearly GDP growth which is projected by the MRIOF model is combined with the yearly growth of the population by region in order to obtain a forecast of the development of regional GDP per capita. Both the resulting GDP and GDP per capita are feeded back into a consumption model and a

government model to calculate the development of household consumption and government expenditures in the next period. Both submodels are discussed in more detail below.

It should be stressed here that the MRIOF model is not primarily designed to produce forecasts of the national economy. For such a purpose other and better types of models exist (see Appendix A and report IIB). The national results of the MRIOF should only be read as a benchmark from which the regional deviations from the national growth path can be calculated.

4.3. The consumption submodel

In standard input-output analysis household consumption is either treated exogenously as a component of final demand, or made endogenous by closing the input-output model for household income and expenditure by region and industry. The latter solution can be straightforward with proportional consumption coefficients or with income elasticities[5].

In the MRIOF model, however, a different approach is chosen which is more suitable for long term projections such as the 25 year scenario. For each year of the forecasting period the MRIOF model predicts growth of GDP $\dot{y}$ and of GDP per capita $\dot{y}/\dot{p}$. The growth of household consumption $\dot{c}_h$ is then determined by

$$\dot{c}_{h_t} = \dot{p}_t \cdot q \cdot \dot{y}_{t-1} / \dot{p}_{t-1} \qquad (2)$$

In this equation the variables should be read as vectors with different entries for each region and industry. The

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[5] See LTA Working Paper XVI

vector q denotes the income elasticities for the consumption of specified products by industry. In general, these elasticities are less then one for agricultural and other nutrition products, and greater than one for the products of the manufacturing industries.

The time lag in (2) enables a recursive solution of the model: total consumption growth is determined by population growth and the growth of GDP per capita in the previous period. The advantage of this method is that over a longer period of time population growth can be taken into account, whereas in the standard input output model it is only final demand expenditures that determine consumption growth.

4.4. The government submodel

4.4.1. Introduction

While in standard input-output applications the government expenditures are usually treated exogenously, the LTA-MRIOF model for Indonesia has a separate submodel for the government revenues (grev) and government expenditures (gexp). Because the Indonesian government in 1966 adopted the balanced budget principle, which has been strictly adhered to ever since, it is assumed that throughout the forecasting period government revenues and expenditures are in balance i.e. grev=gexp. Both are discussed in more detail below. A full description of all government equations is given in appendix A.

4.4.2. Government revenues

The government revenues consist of the following parts:

$$grev = fa^{exo} + mr^{end} + tr^{end} \qquad (3)$$

where

grev=government revenues
fa=foreign aid
mr=MIGAS revenues
tr=tax revenues

Tax revenues are endogenously determined by the growth of GDP and household consumption ($\dot{y}$ and $\dot{c}_h$). For the direct and indirect tax rates some additional assumptions are made. From the mid 1980s onwards the government of Indonesia has been in a process of reforming the tax raising system in order to improve the unbalanced structure of the government revenues. Tax reforms were started in response to a sustained weakening of international oil prices. The Indonesian government has successfully expanded its domestic revenue base by changing the tax structure. As a result, from 1986 onwards the domestic non-migas revenues have been larger than the migas revenues while they were only half the migas revenues in the beginning of the 1980s. During the last three year the domestic non-migas government revenues have even increased by more than the GDP growth and have been able to offset the reduction in migas revenues caused by price declines of migas on the world market.

It might be expected that the effects of this tax reforming policy will at least continue up to the year 2000. As a result of the tax reforms it is expected that the indirect tax revenues will grow 1.5 times faster than household consumption and the direct tax revenues will grow 1.5 times faster than GDP during the first half of the projection period. In the second half of the period this elasticity is assumed to decline gradually to 1.0.

The MIGAS revenues have been a major share of government revenues during the last 20 years. In oil and oil products 34% of total production was supplied to domestic consumers in 1990. In the future a fast growth of domestic demand for oil products, resulting from a high economic growth (in particular in the manufacturing sectors) on the one hand, and a restricted production capacity of 1.5 million barrels a day or 548 million barrels a year on the other, will lead to a reduction of the exportable surplus of oil and oil products. Because the oil reserves of Indonesia are not excessive this trend will bring Indonesia nearer to the day to become an net importer of oil.

Although no official estimates of reserves are published, unofficial industry estimates of recoverable oil reserves range from 8.5 (proven) to 50 billion barrels. Based on these estimates Indonesia can continue the present level of production for a period ranging from 15 to 90 years.

In the BLS it is assumed that Indonesia will continue the present level of oil production in the next 25 years. Under the assumption of a constant price of oil of US$ 20 per barrel, i.e. the average world market price in 1991, the government revenues from oil will be constant. If the present level of oil production is combined with a five percent annual growth in domestic consumption up to the year 2020, Indonesia will become a net importer of oil around the year 2010.

Unlike oil, gas is a promising source of government revenue in the future. In 1990 the production of gas was 290 million barrels in oil equivalent and only 18 percent of total supply was domestically consumed. Up till now, a number of significant gas fields remain undeveloped due to inadequate infrastructure for substantial domestic consumption and limited exports markets for LNG.

Nevertheless, the foreign demand for Indonesian LNG, which is located in the Pacific Basin, is expected to grow by more than 5% annually during the next 25 years. To meet these demands large investments in gas exploitation have been made in Kalimantan Timur. Indonesia has estimated potential gas reserves of about 70 years production at the present volume.

In the BLS it is assumed that Indonesia will be able to increase the present migas government revenues proportionally to the projected MIGAS GDP growth. However, this growth is below the national average of total GDP growth because it is assumed that the foreign export of MIGAS products will remain at the present level. In other words, it is only the growth of domestic demand for MIGAS products that has a positive effect on MIGAS production and consequently government MIGAS government revenues.

The foreign aid revenues have no endogenous relation with other variables in the model but are determined exogenously. The amount of foreign aid has increased since the decline of the oil prices in the mid 1980s in order to support the economic adjustment and to finance the development expenditures needed to sustain long-term development programs. It is expected that no large changes in the amount of foreign aid will take place in the next 25 years, implying no strong impulse for the size of the government budget. In the BLS the value of foreign aid is fixed at US$ 5 billion per annum, i.e. the growth rate of foreign aid in the period 1990-2020 is set at zero.

4.4.3. Government expenditures

The government expenditures are classified into two categories: recurrent or routine expenditures and capital or development expenditures. The routine expenditures are

largely determined endogenously. Hence, given the total government revenues in (3) the development expenditures are endogenously calculated as a residual:

$$gexp = re^{end} + de^{end} - grev \qquad (4)$$

$$re^{end} = ds^{exo} + w^{end} + o^{end} \qquad (5)$$

where

re=routine expenditures
de=development expenditures
ds=debt service payments
w=personnel expenditures (wages and salaries)
o=other routine expenditures

In the 1980s the share of debt service payments (interest and amortization of public debt) in the government expenditures has increased drastically from 6.4% in 1980/81 to 32.9% in 1988/89. In the last three years, this share has gradually been reduced to 27.9% in 1991/1992. In the BLS projections are made for government debt, amortization, interest payments and the loan disbursements by using a auxiliary model in which the debt service payments are explained by the debt in previous years (see appendix A for more details on all equations). The government debt is equal to the debt in the previous year plus loan disbursements minus amortization, and it is further assumed that the disbursements of loans are linked to foreign aid receipts which are held constant during the projection period. Up to 2020 the debt service payments growth will fluctuate around 0.2% per year.

In the BLS it is assumed that the growth of personnel expenditures of the government will grow at the same rate as GDP. Personnel expenditures include wages and salaries, rice allowances, food allowances and other costs.

Other routine expenditures include material expenditures, regional subsidies and subsidies related to domestic consumption of fuel. Fuel subsidies are direct payments to Pertamina to cover the difference between the prices set by the government and the costs (including crude, refining, storage, transportation and marketing). In the Budget speech of 1991/92 a "gradual and conscientious" reduction of the subsidies on petroleum products was announced, in order to ease price signals and improve resource allocation. In the BLS other routine expenditures will also grow proportionally to the GDP and total routine expenditures will grow by 4% to 5% each year at the end of the period.

The development expenditures are concentrated in supporting investment in utilities, other infrastructure and human resources. In the 1980s by far the largest part of the development expenditures in Indonesia was spent through the departments (75%). The value of Inpres and other transfers to lower level governments (IPEDA/PBB) was 14% in Repelita III and has increased to 17% in 1990/91. The remaining part includes capital participation in public enterprises and subsidies on fertiliser.

The development expenditures are calculated in (4) as the difference between the projected total government revenues on the one hand and the projected routine expenditures on the other hand. As a result development expenditures will grow by 8% to 9% during the first half and 5% to 6% during the second half of the projection period.

4.5. Other exogenous assumptions

The remaining final demand categories that need to be projected exogenously are private investment and foreign exports. In addition, a separate forecast of regional population growth is nesseccary to run the model. These projections are made at the lowest possible level of sectoral and regional aggregation in order to make the model as "bottom up" as possible.

In accordance with the fast growth of private investment in the most recent years, the BLS assumes a national private investment growth rate of 10 percent in the first year 1995. Of course such an investment growth rate which is higher than the GDP growth rate cannot continue for a long time because it is rather the investment level than its growth which determines the capital stock and thus the GDP growth potential. Because the Indonesian economy is in a transition phase comparable with developments that have taken place in other DAEs, it is assumed that Indonesia will see its investment rate (private investment as a percentage of GDP) grow temporarily to the level of 35%, which is about the maximum level that was achieved in the ASEAN countries during the 1980s.

In the BLS this level is reached for Indonesia in 1998. From this year onwards this high investment rate is reduced gradually to the average ASEAN level of 26% in the second half on the projection period.

The private investment growth rates are regionally distributed in accordance with the growth pattern in recent years. In Jawa the private investment growth rate is set at 1.2 times the national growth, in Sumatera and Kalimantan at 0.8, in Sulawesi at 0.7 and in the Eastern Islands at 0.75.

For foreign exports in the BLS specific growth rates are used for each region and each sector. Based on recent experience it seems quite unrealistic to assume an equal export growth rate in all regions and sectors in the next 25 years. At the aggregate level total non-Migas exports are assumed to grow on average with 9.5% per year. This is in accordance with the recent double digit growth during the last five years, but of course in the longer run it should be seen as a target to be reached, or merely as an assumed scenario of which the regional implications are examined. Since a sustained export growth will probably be a main target in the long run, in the BLS non-Migas exports are set at a macro growth rate of 10% in the first half and 9% in the second half of the period. For the Migas exports a zero growth is assumed as a result of a reduction of oil exports and an increase of LNG exports.

For non-Migas sectors the export growth is diversified over the regions on the basis of the regional distribution of the growth in export volume and value in the period 1985-1990. At the sectoral level the non-migas manufacturing sector is expected to grow, while the share of the migas sector in total export will diminish from more than 40% in 1990 to 34% in 1995 and only 7% in 2020.

The population growth by region is taken from the study "Population Projection of Indonesian Provinces, 1990-2020" by A. Ananta and E. N. Anwar, University of Indonesia, 1991. On average throughout the projection period the total population of Indonesia will grow at a rate of 1.35% each year. The population on Jawa is expected to grow below this level at a rate of 0.85% while in Sumatera and Kalimantan this rate is estimated at a considerable higher level of 2.35% in both regions. Sulawesi and the Eastern Islands are slightly below the national average and are expected to see their population grow with 1.15% and 1.20% respectively.

5. RESULTS AND EVALUATION

As is always the case in long term scenarios for 10 years or more, the results of any forecasting model should be interpreted as a possible outcome of an assumed scenario rather than as an actual forecast of what is likely to happen. Furthermore, it should be stressed again that it is only the regional deviations from the national trend that are the most important results from the MRIOF model and the underlying scenario. The national trend itself is of less concern in this paper, but the national outcome of an average GDP growth of 6% to 7% each year does not seem to be too unrealistic for the first coming years. However, the projected sustained growth of GDP at this level throughout the period all the way up till 2019 is of course very uncertain and should be seen as a possible policy target or an assumed development strategy.

The resulting average annual growth rates by region of the expenditure categories mentioned above and of total GDP are presented in table 3 below.

Table 3. Aggregated results of the BLS 1995-2019

non-Migas exports and non-Migas GDP between brackets

	Household Consumption	Government Investment	Private Investment	Exports	GDP
Average annual growth (%)					
Sumatera	6.1	6.2	5.6	4.6 (7.3)	5.5 (6.1)
Jawa	7.0	6.2	8.4	10.9 (11.4)	7.1 (7.1)
Kalimantan	6.8	6.2	5.6	5.6 (7.7)	6.3 (6.7)
Sulawesi	5.1	6.2	4.9	4.4 (4.4)	5.1 (5.1)
Eastern Islands	5.1	6.2	5.3	4.0 (4.5)	5.0 (5.0)
Indonesia	6.7	6.2	7.5	7.7 (9.5)	6.5 (6.6)

For all expenditure categories Jawa shows the highest growth rates of all regions. The growth of household consumption more or less follows the GDP pattern but is migitated through the regional differences in population growth. The effects of the consumption growth in the long run flows mainly to Jawa because rising income leads to a shift away from the consumption of agricultural goods to manufactured goods of which the production is concentrated on Jawa.

According to the regional distribution of the government investments in 1989, 25% was spent in Sumatera, 49% on Jawa, 8% each in Kalimantan and in Sulawesi, and 9% in the Eastern Islands. In the BLS this distribution will not change in the next 25 years which implies that the projected growth rate of an average of 6.2% is the same for all regions.

The high growth rate for private investment which was set exogenously (see section 4) speeds up GDP growth in Jawa considerably because it takes account of 20% of the total final demand in Jawa while in other regions this rate is below 10%.

The opposite is true for foreign exports because the export rate is more than 40% of final demand in Sumatera and Kalimantan and 15% to 20% in the other regions. Since a zero growth for Migas export is assumed table 3 also shows the non-Migas results for exports and GDP. The non-Migas export growth of 7.3% in Sumatera and 7.7% in Kalimantan has a positive effect on GDP in these regions. However, for Jawa still the highest export growth rate is projected because the export of manufacturing goods will grow faster than for the non-Migas mining sector which is relatively important in Sumatera and Kalimantan. In Sulawesi and the Eastern Islands export growth is much lower because their

exports are more concentrated in agricultural products and food processing for which the projected export growth is below the average.

In figure 3 the regional development of non-Migas GDP and GDP per capita is shown over the whole projection period. For each Repelita period the average annual growth of non-Migas GDP and non-Migas GDP per capita is given in table 4.

Table 4. GDP and GDP per capita by Repelita period

	REP VI 1995-1999	REP VII 2000-2004	REP VIII 2005-2009	REP IX 2010-2014	REP X 2015-2019	total period
Annual % growth non Migas GDP						
Sumatera	6.5	6.2	6.0	5.8	5.8	6.1
Jawa	6.9	6.7	7.1	7.2	7.4	7.1
Kalimantan	7.3	6.9	6.7	6.4	6.4	6.7
Sulawesi	5.2	5.0	4.9	5.0	5.2	5.1
Eastern Islands	5.2	5.0	4.9	5.0	5.1	5.0
Indonesia	6.7	6.4	6.7	6.7	6.8	6.6
Annual % growth non-Migas GDP per capita						
Sumatera	4.1	3.8	3.6	3.4	3.4	3.6
Jawa	6.0	5.8	6.2	6.3	6.5	6.2
Kalimantan	4.8	4.5	4.2	4.0	3.9	4.3
Sulawesi	4.0	3.8	3.7	3.8	4.0	3.9
Eastern Islands	4.0	3.7	3.7	3.7	3.9	3.8
Indonesia	5.2	5.0	5.2	5.2	5.4	5.2

The resulting non-Migas GDP growth is clearly the highest for Jawa. Kalimantan can keep up with the national average but the other three regions show a performance below the national trend, especially Sulawesi and the Eastern Islands. With respect to the growth of GDP per capita, the

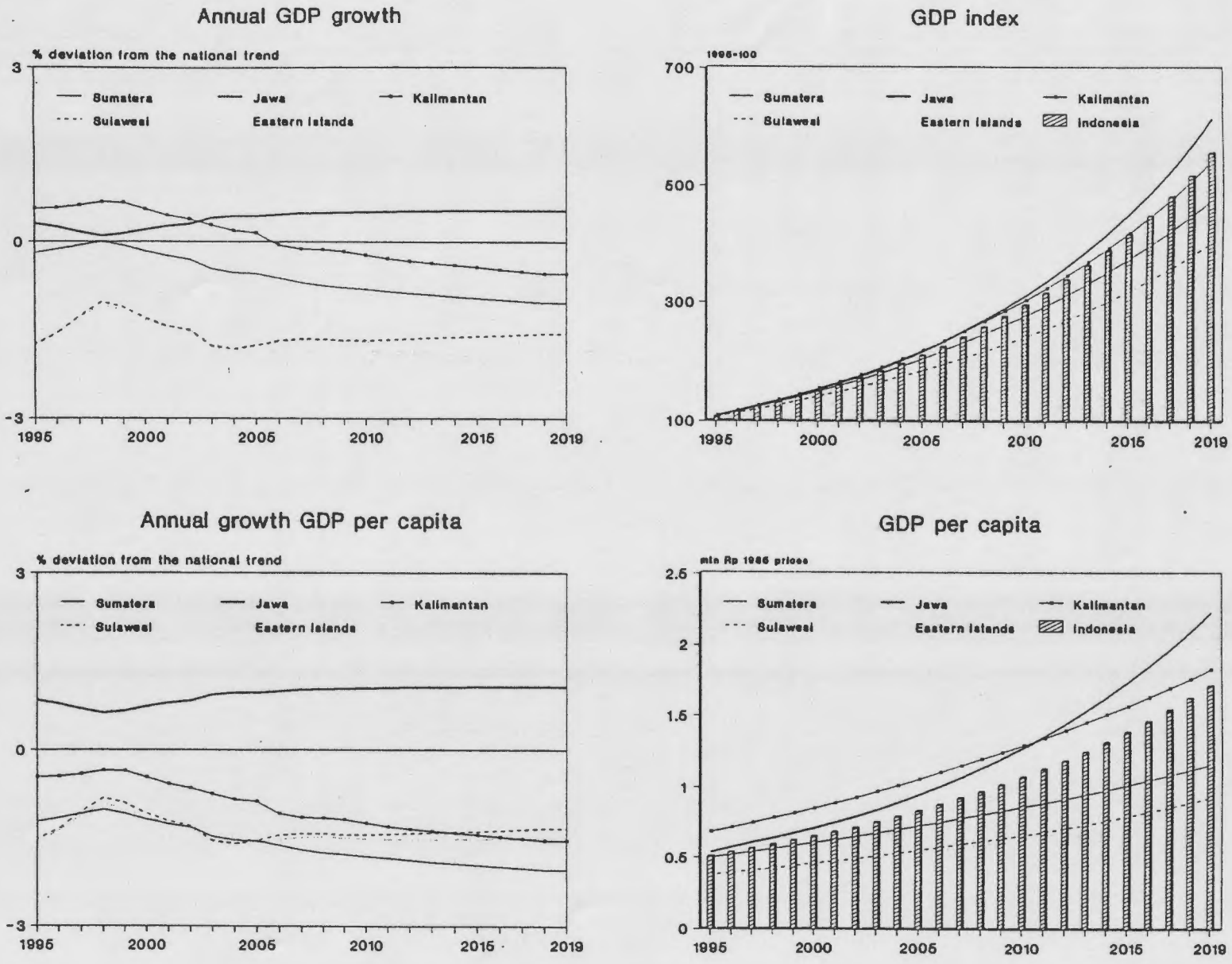

Figure 3. GDP and GDP per capita by region (non-Migas)

off-Jawa regions are more close to each other because population growth is higher for Sumatera and Kalimantan than in Sulawesi and the Eastern Islands. The difference in GDP per capita between Jawa and the off-Jawa regions is more pronounced than in GDP because Jawa is projected to have the lowest population growth of all regions (see section 4).

As is shown in figure 3, the absolute level of GDP per capita according to the BLS will rise above 1.5 million Rp for Indonesia in 2019 (in constant prices 1985). As a result of the projected regional differences in growth rates GDP per capita will rise above the level of 2 million RP in Jawa while Sumatera, Sulawesi and the Eastern Islands are expected to remain below the level of 1 million Rp per capita. Kalimantan remains above the national average due to its relative high GDP in the non-Migas mining sector and wood products.

The further widening of the gap in GDP per capita between Jawa and the off-Jawa regions which results from this BLS is clearly a challenge to regional policy in the next 25 years. Furthermore, growing regional income differences might lead to increased interregional labour migration movements from the outer regions to Jawa. These topics will be discussed in part IIB of this report.

Appendix A. The Multiregional Input Output model for Indonesia

1. Introduction

One of the central activities of the National Regional Development Study LTA-97 has been the development of a multiregional input output model (MRIO) of the Indonesian economy which allows the evaluation of the potential impact of national and regional policies for regional development. For this purpose an interregional input output table has been constructed for the year 1985 at the level of 25 industries and 27 regions[1].

Because of its constant coefficients the basic MRIO model is less suitable for forecasting applications when final demand developments of the total economy need to be estimated over longer periods of time. From 1960 onwards these kinds of input output applications were experimented with at the national level by Gosh (1964), Theil (1966), Polenske (1970), Ehret (1970) and others, but they have been gradually replaced by econometric time-series techniques.

At the regional level the possibilities of building econometric models based on time series remain most of the time very limited because of the unavailability of the necessary data. When the time-series data are scarce it can still be better to use input-output models that give a detailed picture of the regional economy at one moment of time rather than to rely on poorly estimated econometric models that do not use the input-output information. This might be one of the reasons why input-output analysis continues to be a standard tools of regional analysis (Hewings & Jensen, 1988). Furthermore, especially in regional analysis a substantial amount of research has recently emerged that is aimed at an integration of input-output, econometrics and general equilibrium techniques in order to achieve a satisfying modelling of both demand and supply variables and changing technology (see Madden & Anselin, 1990 for a recent overview).

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[1] See DPS nr XVII

One option of integrating econometrics and input-output in a interregional model is aimed at a consistent combination of national econometric forecasts and an interregional input-output model in order to forecast the *regional deviations from the national trend* rather than the regional trend itself. Based on an error reduction analysis by Theil (1966) a MRIOF model for Indonesia has been developed by LTA-97 which has allready been succesful for the Netherlands (Stelder, 1991). Its basic features will be described in section 2. In section 3 some modifications of the basic MRIOF model are discussed which were used for the 25-year projection for Indonesia.

2. Basic outline of the MRIOF growth rate model

Because input-output forecasts of absolute productions levels made with absolute levels of exogenous final demand become unreliable when the forecasting is done over 5 years or more, it can be useful to look only at the *change* of production resulting from a *change* of final demand without worrying about the errors of the absolue levels themselves. Theil (1966) found the interesting result that under certain conditions input output forecasting errors can be subtracted from one another. If for instance:

$$\mathbf{x}_t = (\mathbf{I}-\mathbf{A}_{t_0})^{-1}\,\mathbf{f}_t \qquad (1)$$

where

$\mathbf{x}_t$ = endogenous output in year t

$\mathbf{f}_t$ = exogenous final demand in year t

$\mathbf{A}_{t_0}$ = matrix of input coefficients in year $t_0<t$

the forecasting errors $\mathbf{e}(\mathbf{x}_t)$ can be approximated by the sum of all year-to-year forecasts over the period $t_0 \longrightarrow t$. This means that the errors of two forecasts $\mathbf{e}(\mathbf{x}_{t_1})$ and $\mathbf{e}(\mathbf{x}_{t_2})$ can be subtracted from each other so that the errors over the period $t_0 \longrightarrow t_1$ are eliminated. A forecast of production growth over for example the period 1994-1995 then only has an errorlevel of a one-year-ahead input-output forecast, even when an input-output table of 1985 is used[2].

[2] See Stelder (1991) for more details

If t_0 is the table construction year and the forecasting period is $t \rightarrow t+\sigma$, the MRIOF model is formulated as:[3]

$$f_t = i\, F_t \tag{2}$$

$$F_t = F_{t-1} \,.\, \hat{F}_t \tag{3}$$

$$x_t = (I - A_{t_0})^{-1} f_t \tag{4}$$

$$\mathring{x}_t = (x_t - x_{t-1})/x_t \tag{5}$$

$$\mathring{y}_t = \mathring{x}_t \tag{6}$$

$$\mathring{l}_t = \mathring{y}_t/\mathring{a}_t \tag{7}$$

with

F_t = matrix of final demand (one column for each category)

$\hat{F}_t$ = final demand growth rates

$\mathring{x}_t$ = output growth rates

$\mathring{y}_t$ = GDP growth rates

$\mathring{l}_t$ = employment growth rates

$\mathring{a}_t$ = labour productivity growth rates

i = unity columnvector of the appropriate size

The assumption in (6) that the GDP growth rates $\mathring{y}_{it}$ are equal to the output growth rates $\mathring{x}_{it}$ can of course be modified with possible changes of GDP/output rates.

Because model (2)-(7) is based on the full interregional input-output table for Indonesia 1985 each vector is of the size (ixr) where i is the number of industries and r is the number of regions. The operational model for the 25 year scenario at the moment is 5 regions and 11 industries which means that all vectors have 55 entries and A is of dimension 55 x 55. The final demand matrix F has five categories (household consumption, government consumption, government investment, private investment and foreign exports) for each region of destination. Because there is in fact only one foreign exports column the total number of categorie columns in F is 21 (4x5 + 1). Population growth is calculated for the aggregate regions which implies that $\mathring{p}_t$ hase 5 entries. In figure 1 the general structure of the model is given.

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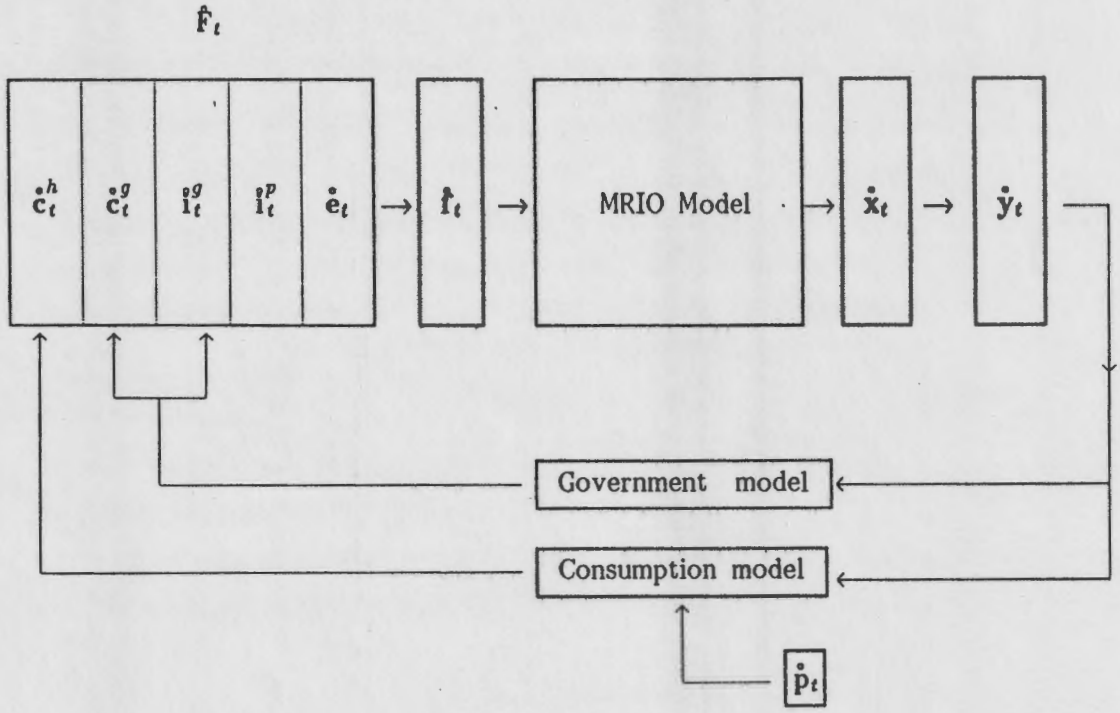
[3] The cell-to-cell multiplication and division is marked by "." en "/"

Figure 1. General outline of the MRIOF model



c^h = household consumption
c^g = government consumption
i^g = government investment
i^p = private investment
e = foreign exports
p = population

In (2)–(7) the matrix $\hat{F}_t$ is exogenous but in the implementation of the MRIOF for Indonesia some parts of $\hat{F}_t$ are endogenous. As is shown in figure 1 the MRIOF model produces endogenous results for household consumption and government expenditures which are linked to $\dot{y}_t$ and $\dot{p}_t$. These links will be discussed in section 3 and 4.

3. Endogenous consumption

In standard input–output analysis consumption is either considered exogenous as a component of final demand or made endogenous by closing the $(I-A)^{-1}$ matrix for household income and expenditure. The latter solution can be straighforward with proportional consumption coefficients or with income elasticities (see LTA Working Paper XVI). In the MRIOF model, however, a different approach is chosen which is more suitable for long term projections such as the 25 year scenario. The following extension of (2)–(7) is made:

$$\overset{\circ}{c}{}^{h}_{t} = \overset{\circ}{p}_{t} \cdot \mathbf{q} \cdot \overset{\circ}{y}_{t-1}/\overset{\circ}{p}_{t-1} \qquad (8)$$

where

$\overset{\circ}{c}{}^{h}_{t}$ = household consumption growth rates

$\overset{\circ}{p}_{t}$ = population growth rates

$\mathbf{q}$ = consumption elasticities

The time lag in (8) enables a dynamic solution of the model: total consumption growth is determined by population growth and the growth of GDP per capita in the previous period multiplied by the elasticities $\mathbf{q}$. The vector $\mathbf{q}$ contains industry specific elasticities but these are assumed to be the same across the regions[4]. The advantage of this method is that over a longer period of time population growth can be taken into account whereas in the standard closed input–output model it is only final expenditures that determine consumption growth.

4. Endogenous government expenditures

While in standard input–output applications the government expenditures are usually treated exogenously, the LTA–MRIOF model for Indonesia has a seperate submodel for the government budget and government expenditures. The *government revenues* are modelled in the following way:

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[4] The 55-vector $\mathbf{q}$ thus consist of 5 x the same 11 elasticities.

$$gr_t = fa_t + mr_t + dt_t + it_t \tag{9}$$

$$fa_t = fa_{t-1} \cdot \overset{\circ}{fa}_t \tag{10}$$

$$\overset{\circ}{fa}_t = \overset{\circ}{fa}_t^{(ex)} \tag{11}$$

$$mr_t = mr_{t-1} \cdot \overset{\circ}{y}_t^{migas} \tag{12}$$

$$dt_t = dt_{t-1} \cdot \overset{\circ}{y}_t^{n} \cdot \overset{\circ}{\tau}_t^{d} \tag{13}$$

$$it_t = it_{t-1} \cdot \overset{\circ}{c}_t^{n} \cdot \overset{\circ}{\tau}_t^{i} \tag{14}$$

$$\overset{\circ}{\tau}_t^{d} = \overset{\circ}{\tau}_t^{d(ex)} \tag{15}$$

$$\overset{\circ}{\tau}_t^{i} = \overset{\circ}{\tau}_t^{i(ex)} \tag{16}$$

where

gr = government revenues

fa = foreign aid (^{ex} = exogenous)

mr = MIGAS revenues

dt = direct taxes revenues

it = indirect taxes revenues

y^{migas} = total national MIGAS GDP

y^{n} = total national GDP

c^{n} = total national household consumption

τ^{d} = direct tax rate

τ^{i} = indirect tax rate

$^{(ex)}$ = exogenous

The expected growth of the two tax rates $\overset{\circ}{\tau}_t^{d}$ and $\overset{\circ}{\tau}_t^{i}$ and the growth of foreign aid $\overset{\circ}{fa}_t$ are the exogenous variables for (9)–(16). As is clear from (12)–(14) the non–foreign aid revenues are endogenously determined by the growth of (MIGAS)–GDP and household consumption.

The *government expenditures* are modelled as follows:

$$ge_t = gr_t \tag{17}$$

$$ge_t = re_t + de_t \tag{18}$$

$$re_t = dp_t + w_t + o_t \tag{19}$$

$$dp_t = (\alpha + \beta)\ d_{t-1} \tag{20}$$

$$d_t = d_{t-1} - \beta\ d_{t-1} + \gamma\ fa_t \tag{21}$$

$$w_t = w_{t-1} \cdot \overset{\circ}{y}_t^{n} \tag{22}$$

$$o_t = o_{t-1} \cdot \overset{\circ}{y}_t^{n} \tag{23}$$

where

ge = total government expenditures
re = routine expenditures
de = development expenditures
dp = debt payments
d = total government debt
α = interest rate on government debt
β = amortization rate of government debt
γ = debt rate of foreign aid
w = wages and salaries
o = other routine expenditures

Equation (17) assumes a balanced budget constraint for total government expenditures, i.e. the budget deficit is equal to γ fa_t. The routine expenditures are determined by (19)–(23) which implies that the development expenditures can be calculated as a residual in (18). The rates α, β and γ are exogenous and determine the debt payments in (20) and (21). For government wages (w) and other routine expenditures (o) the simple assumption is chosen that they grow proportionally with $\dot{y}_t^n$.

5. Exogenous corrections and supply constraints

In principal the MRIOF model described above is only demand driven and there are no supply constraints. However, the model is not primarily aimed at an adequate forecast of the *national* economy but at the *regional deviations from the national growth path.* This enables us to add two types of exogenous corrections to the model.

First, if there are national forecasts available from other sources, the matrix $\hat{F}_t$ can be adjusted to an exogenous forecast of national final demand growth $\hat{F}_t^n$, and/or the forecasted $\dot{y}_t$ can be rescaled at the national level to some exogenous $\dot{y}_t^n$. This type of correction should be carried out if the exogenously available national forecast is expected to be better because it is for instance econometriccally derived with time series and stochastic estimation of both demand and supply factors .

Second, a rescaling of national results because of some specific supply constraint can be carried out under the assumption that *a supposed supply constraint is the same across all regions*. In the BLS for example such a supply correction is used for agriculture for which supply constraints were assumed to reduce the maximum GDP growth to 3% at the national level. As is discussed in report IIB this type of national adjustment cannot be carried out for investment and labor supply because for these variables regional specific supply constraints should be projected.

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