THE ROLE OF FDI AND RURAL-URBAN MIGRATION IN THE FUTURE OF INDONESIAN ECONOMIC GROWTH[1]

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A. Introduction

Studies on total productivity in developing countries are scarce, primarily due to the absence of capital stock data, forcing them to use some assumptions to proxy capital stock. These studies are basically static in nature, using the residual to measure productivity, ignoring feedback interactions likely to occur when there is an increase in productivity, i.e., capital formation augments when productivity increases, or "inspiration gives rise to more perspiration" (Hulten and Srinivasan, 1999).[2] But more seriously, studies on TFP tend to be distant from actual policy environments because they fail to embrace the economy-wide impacts of the changes in productivity. Many policy trade-offs are excluded and hence overlooked.

In this paper, we wish to extend the standard TFP growth exercise by incorporating the feedback interactions and economy-wide repercussions of productivity changes. Using Indonesia as a case study, our primary motive is to explore an alternative approach such that when we incorporate different productivity changes we can fully engage in a broader policy analysis. For that purpose, we build a dynamic economy-wide model, based upon which we examine various policies and target variables under a set of TFP growth scenarios.

Prior to the description and the use of an alternative model, we first present the standard TFP analysis for Indonesia in Section II. The results are to be compared with those obtained from the work of other authors. It is in Section III that we discuss the alternative model and its use for the analysis of alternative TFP growth scenarios. The application of the model is forward-looking, covering some 20-year period from 2000 to 2020. The assumptions in the scenario are carefully selected so that they are relevant to the new reality of the Indonesia's situation after the fall of

[1] Prepared for the Seminar on the commemoration of the 50the Anniversary of Faculty of Economics, University of Indonesia, Jakarta, October 4-5, 2000
[2] In Abramovitz term, this residual is the "measure of our ignorance" about productivity

Suharto in 1998. The variables of interest are not only macroeconomic but also to include other development variables highly relevant for developing countries, e.g., urbanization, education (human resources) and income distribution.

B. Standard TFP Analysis for Indonesia

a. Existing Studies

Few studies on TFP growth in Indonesia are worth to cite. Dowling (1997) found that Indonesia's TFP growth during 1961-95 is –0.1 percent, which seemingly supports the notion of "growth through perspiration" implied by Krugman (1994). Dowling selection of time is awkward since they include the early period of highly unstable economy (1960s). A similar but slightly more optimistic number, i.e., .8 percent, was found by Collins and Bosworth (1996) when they included the post-reform period (1960-1994). Updating to 1960-1996, Bosworth and Collins (2000) adjusted the TFP growth for Indonesia slightly upward to .9 percent.

Restricting the time frame to 1970-1985, Young (1994 and 1995) came up with 1.2 percent TFP growth for Indonesia. Interestingly, by including the post-reform period, i.e., 1978-1996, Sarel (1997) found a very similar figure. Realizing the importance of policy and institutional changes, Benhabib and Spiegel (1994) assessed the net implications for catching up in TFP by weighting schooling relative to the productivity gap. Having obtained the weight from the cross-sectional econometric analysis, their "projected" TFP growth for Indonesia in 1984-1994 and the year before the financial crisis (1996) is surprisingly high, i.e., 4 and 3.4 percent, respectively (see Crafts, 1999).

But the selection of time period is not the only factor that matters. Even by including the 1960s, World Bank (1993), Nehru and Dhareswar (1994), Bosworth et. al (1995) and Drysdale and Huang (1995) all came up with positive TFP growth, ranging from 1.25 to 2.10 percent. Obviously, the assumptions used to generate capital stocks and the particular TFP models being employed could affect the resulting outcomes.

Some argued that TFP models would be better applied to only a particular sector. Using manufacturing data, Aswicahyono and Hill (1999) strongly disputed the "growth through perspiration" hypothesis for Indonesia. They found that economic reforms of the mid 1980s appeared to have resulted in a significant acceleration of TFP growth, i.e. from 2.7 percent (1976-1983) to 5.5 percent (1984-88) and 6.0 percent (1989-93).

Clearly, a consensus on Indonesia's TFP growth is hardly to come by. While the "growth through perspiration" may not be openly accepted by most analysts (see for example Hill, 1996), privately some of them acknowledged the real essence of the hypothesis. Nonetheless, the overall perception points to a growth potential that is probably a good deal stronger than what Krugman's pessimism towards East Asia would allow.

As indicated earlier, in this manuscript we intend to go beyond just a simple TFP growth accounting. In order to enhance the policy analysis, we wish to incorporate various trade-offs involved in the changes of TFP growth into the analysis. But prior to such an analysis, we will first present the results of our standard TFP growth calculation for Indonesia.

b. Aggregate and Sectoral TFP Growth

In this section, a standard growth accounting is applied.[3] The capital stock is estimated by using sectoral investment data from the national account for 1970-1998 and we applied the usual perpetual inventory method. In order to analyze the impacts of different policy regimes, we selected the following classification: (1) oil boom period, 1970-1982; (2) post oil boom or transition, 1982-1986; (3) active reform, 1986-1991; and (4) reform fatigue period, 1991-1996. Tables I.1 to I.4 show the TFP growth for the entire economy during those periods (the value-added and labor shares are given in Tables A.1 and A.2 in Appendix 1).

Indonesia's TFP growth during the oil boom was relatively high, i.e., 3.7 percent. Government policies to use the proceeds from oil revenues to build basic infrastructure seems to have positive impact on TFP, as indicated notably by the high growth of TFP for utilities and construction sector (Table I.1). Import-substitution supported by capital-intensive industries was predominant during this period. The positive impact of investment in the demand-driven infrastructure outweighed the negative impact of protectionist industrial policy (see also the positive figures of the reallocation index in the last row of Table I.1).

The fall of oil price in 1982-1986 caused the TFP growth to slow down to 0.65 percent, dragged particularly by the poor performances of the same two sectors that boosted the TFP growth in the oil-boom era (Table I.2). The dependence of these sectors on government money from oil revenues was clearly heavy. Subsequently, the grim prospect of oil price led to the pendulum swung toward a more liberal economic sphere, relying more on market forces, export-led industrialization, and less on

[3] The usual formula, i.e., $\Delta A/A = \Delta Y/Y - a.\Delta K/K - (1-a)\Delta L/L$ is used, where the term in the left hand side represents growth in total factor productivity (TFP).

oil. Consequently, the TFP growth recovered to 3.4 percent during 1986-91 (Table I.3).

Table I.1 Decomposition of Value-Added Growth, 1970-1982

SECTOR	1970-1982			
	VA	CAP	LABOR	TFP
AGRICULTURE	0.0352	0.0553	0.0162	0.0066
MINING	0.0486	0.0571	0.1110	-0.0529
MANUFACTURE	0.1130	0.0562	0.0763	0.0396
UTILITIES	0.1362	0.0570	0.0466	0.0880
CONSTRUCTION	0.1474	0.0555	0.1104	0.0557
TRADE	0.0851	0.0556	0.0654	0.0210
TRANSPORTATION	0.1266	0.0562	0.0595	0.0665
BANKING	0.0737	0.0512	0.0173	0.0172
ALL	0.0703	0.0558	0.0245	0.0367
REALLOCATION EFF.				0.0365

Table I.2 Decomposition of Value-Added Growth, 1982-1986

SECTOR	1982-1986			
	VA	CAP	LABOR	TFP
AGRICULTURE	0.0092	0.0940	0.0262	-0.0052
MINING	0.0372	0.0189	0.0208	0.0237
MANUFACTURE	0.0881	0.0176	0.0411	0.1263
UTILITIES	-0.0604	0.0599	0.0417	-0.0760
CONSTRUCTION	-0.0011	0.0736	0.0214	-0.0259
TRADE	0.0250	0.0773	0.0299	-0.0098
TRANSPORTATION	0.0237	0.1394	0.0292	-0.0053
BANKING	0.0626	0.1946	0.3044	-0.1224
ALL	0.0420	0.0685	0.0532	0.0065
REALLOCATION EFF.				0.0042

Table I.3 Decomposition of Value-Added Growth, 1986-1991

SECTOR	1986-1991			
	VA	CAP	LABOR	TFP
AGRICULTURE	0.0289	0.0817	0.0318	-0.0172
MINING	0.0344	0.0654	0.0524	-0.0205
MANUFACTURE	0.1087	0.0252	0.0540	0.0606
UTILITIES	0.1442	0.0662	0.1370	0.0145
CONSTRUCTION	0.1000	0.1363	0.0254	0.0317
TRADE	0.0780	0.1416	0.0341	0.0035
TRANSPORTATION	0.0803	0.1386	0.0411	0.0130
BANKING	0.0665	0.0742	0.1280	-0.0066
ALL	0.0648	0.0725	0.0254	0.0343
REALLOCATION EFF.				0.0294

Table I.4 Decomposition of Value-Added Growth, 1991-1996

SECTOR	1991-1996			
	VA	CAP	LABOR	TFP
AGRICULTURE	0.0316	0.1438	-0.0175	0.0057
MINING	0.0365	0.0394	0.0652	-0.0238
MANUFACTURE	0.1077	0.1386	0.0628	0.0292
UTILITIES	0.1227	0.0707	0.0173	0.0999
CONSTRUCTION	0.1268	0.1249	0.0927	0.0216
TRADE	0.0793	0.1302	0.0709	-0.0144
TRANSPORTATION	0.0908	0.0949	0.0960	-0.0049
BANKING	0.0975	0.0789	0.0597	0.0213
ALL	0.0748	0.0756	0.0960	-0.0181
REALLOCATION EFF.				-0.0232

Then the pace of economic deregulation slowed down. This led to a disappointing performance of manufactured export, which actually has taken the lead in value added and employment creation since 1986. In turn, this caused a dramatic drop in the TFP growth by -1.81 percent (Table I.4).

From the above analysis, one of the most notable observations is the TFP trend of manufacturing sector. The growth of manufacturing TFP during the post-reform was lower than the growth in pre reform years. One possible explanation is that, despite the investment liberalization in the mid 1980s the surge in investments was largely propelled by the relocation of labor-intensive industries from East Asia including Japan, Korea, Taiwan and Hong Kong. The appreciation of real exchange rates and rising labor cost forced manufacturers of labor-intensive products in those countries to seek cheaper locations, including Indonesia. Indeed, exports of labor-intensive products, e.g., textiles, garment, footwear and wood products, began to dominate in 1986, taking over the importance of oil and gas. Most of these products are for low-end consumption, where competitiveness is primarily based on low labor costs rather than productivity. As a result, when the national minimum wage started to increase, the competitiveness of these exports began to erode.[4]

c. TFP Growth in Manufacturing Sector

For the analysis of manufacturing TFP, we used 3-digit ISIC codes in two sub-periods: pre-reform (1975-1986) and post reform (1986-1996). Looking at the value-added share in Tables A.3 and A.4 in Appendix 1, Indonesia's manufacturing sector is fairly diversified.[5]

In the pre-reform period, the sector's TFP growth is recorded at 1.6 percent. The figure dropped to .4 percent in 1986-1996 (see Tables I.5 and I.6). This is consistent with the trend of aggregate TFP growth based on the national account data discussed earlier.[6] The hypothesis proposed earlier seems to hold, i.e., the strong growth of manufacturing exports was mainly for the low-end consumption, not accompanied by an improvement in the sector's productivity of capital and labor. Even with the massive capital inflows during the 1990s, the expected spillover was not detected.

Contrary to the general hypothesis, the TFP growth of the leading foreign exchange earners such as textiles (321) and footwear (324) turned negative during the reform. Again, this confirms the premise that the sector's competitiveness has been largely based on cheap labor. Exports could surge through exploiting low labor cost, not through productivity gains. A dismal performance is also detected in the resource-based manufacturing sector such as wood products, leather products and footwear (ISIC 331, 323, 324). Indonesia's exports of these products are also sizeable.

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[4] Using 1996 and 1998 as starting and end points, respectively (proxy of the crisis period), the resulting TFP growth falls drastically by −14.20 percent, in which construction, trade and manufacturing have the lowest growth among all sectors.

[5] TFP growth based on manufacturing value-added data from the national account differs from that calculated from the Industrial Survey.

[6] Note also from the Table that there is a convergence of TFP growth (the standard deviation declines from .0026 to .0016.

Table I.5 Manufacturing Decomposition of Output Growth, 1975-1986

Industry ISIC	OUTPUT	CAPITAL	LABOR	MATER.	TFP
Food 311	0,0923	0,0923	0,0923	0,0923	-0,0261
Food 312	0,1789	0,3220	0,1228	0,1747	-0,0326
Beverages 313	0,0676	0,0672	0,0699	0,1293	-0,0243
Tobacco 314	0,0796	0,1095	0,0389	0,0606	0,0183
Textiles 321	0,1795	0,0633	0,0464	0,1181	0,0788
Garment 322	0,4873	0,4193	0,3228	0,4443	0,0817
Leather Products 323	0,1613	0,0434	0,0721	0,0896	0,0778
Footwear 324	0,0903	0,1676	0,0438	0,0711	0,0191
Wood Products 331	0,3352	0,2184	0,1821	0,2744	0,0769
Furniture 332	0,1961	0,1410	0,0919	0,1555	0,0552
Paper and paper products 341	0,1920	0,1497	0,1155	0,1647	0,0346
Printing and Publishing 342	0,1564	0,2408	0,0718	0,1208	0,0339
Basic Chemicals 351	0,2021	0,1805	0,1115	0,3486	-0,0848
Other Chemicals 352	0,1294	0,2187	0,0700	0,1276	-0,0045
Rubber Products 355	0,2000	0,1382	0,2129	0,3011	-0,0761
Plastics 356	0,1647	0,0842	0,1385	0,2311	-0,0351
Ceramics 361	0,2631	0,0839	0,2084	0,2469	0,0451
Glass Products 362	0,2067	0,0934	0,0407	0,1819	0,0525
Cement 363	0,1975	0,1943	0,0623	0,2474	-0,0235
Structural Clay 364	0,2266	0,1927	0,0964	0,3134	-0,0198
Other non-metallic mineral 369	0,2716	0,2157	0,1342	0,2562	0,0449
Metal Prodcuts 381	0,2158	0,0786	0,0815	0,1748	0,0623
Non electrical machinery 382	0,0967	0,1024	0,0395	0,0786	0,0200
Electrical Equipment 383	0.1691	0,1253	0,0994	0,1405	0,0372
Transportation equipment 384	0.1681	0,0677	0,0822	0,1730	0,0209
Professional equipment 385	0,1563	0,2663	0,1352	0,1666	-0,0180
Miscellaneous 390	0,2276	0,4302	0,1088	0,2248	0,0116
TOTAL	0,1545	0,1480	0,0797	0,1487	0,0157

Sources: calculated from Industrial Surveys

Machinery industries (ISIC 381,382,383,384), highly protected during the import substitution period, performed relatively better than the leading export industries, although the TFP growth of metal products (ISIC 381) and non electrical machinery (ISIC 382) decreased after the reform. With strong domestic demand and greater access to global market, the TFP growth of electrical equipment (ISIC 383) improved significantly from 3.7 to 6.1 percent. The transportation equipment (ISIC 384) posted a less impressive improvement, but the resulting TFP growth was higher than the sector's average. It should be noted, however, that exporters and producers of these manufacturing activities have usually very little linkages with local producers, due to the structure of protection favoring exporters, e.g., duty drawback scheme. A feature common to all these industries is their strong domestic-demand orientation.

Table I.6 Manufacturing Decomposition of Output Growth, 1986-1996

Industries ISIC	OUTPUT	CAPITAL	LABOR	MATER.	TFP
Food 311	0,1274	0,2608	0,0607	0,1495	-0,0264
Food 312	0,1481	-0,1288	0,0540	0,1759	0,0934
Beverages 313	0,1552	0,0837	0,0906	0,1345	0,0507
Tobacco 314	0,0939	0,0407	0,0117	0,0749	0,0215
Textiles 321	0,1569	0,1367	0,0728	0,1816	-0,0027
Garment 322	0,2703	0,3178	0,1964	0,2688	0,0219
Leather Products 323	0,2161	0,1066	0,2102	0,2542	-0,0205
Footwear 324	0,4308	0,4183	0,4383	0,5209	-0,0677
Wood Products 331	0,1132	0,1916	0,0930	0,1704	-0,0467
Furniture 332	0,3396	0,2245	0,2913	0,3298	0,0257
Paper and paper products 341	0,2472	0,0847	0,1419	0,2363	0,0296
Printing and Publishing 342	0,1501	-0,0532	0,0674	0,1264	0,0520
Basic Chemicals 351	0,1479	0,0606	0,0784	0,1279	0,0384
Other Chemicals 352	0,1026	0,1635	0,0545	0,1481	-0,0373
Rubber Products 355	0,0896	0,0174	0,0294	0,1332	-0,0200
Plastics 356	0,1566	0,1761	0,1295	0,1605	-0,0002
Ceramics 361	0,2661	0,1030	0,1220	0,2766	0,0363
Glass Products 362	0,1272	0,0304	0,0972	0,1525	-0,0113
Cement 363	0,0866	0,0253	0,0562	0,1224	-0,0208
Structural Clay 364	0,1263	0,0310	0,0764	0,1499	0,0042
Other non-metallic mineral 369	0,2410	0,1751	0,1313	0,3345	-0,0320
Metal Prodcuts 381	0,1585	0,3187	0,1098	0,1241	0,0159
Non electrical machinery 382	0,2333	0,0081	0,1144	0,2913	0,0122
Electrical Equipment 383	0,2892	0,0844	0,1632	0,2644	0,0607
Transportation equipment 384	0,2195	0,0907	0,0875	0,2171	0,0363
Professional equipment 385	0,3826	0,2345	0,2113	0,4203	0,0230
Miscellaneous 390	0,2412	-0,1161	0,1910	0,2220	0,0747
TOTAL	0,1614	0,1362	0,0985	0,1740	0,0037

Sources: calculated from Industrial Surveys

The economic liberalization seems to have also positive impacts on food industry (312) and beverages (313). They managed to reverse--from negative to positive—the trend of TFP growth. Their post-reform growth was higher than the average for all manufacturing sector. Again, these are domestic demand driven activities.

However, not all domestic-oriented industries improved their TFP. The group of industries producing raw materials needed by other manufacturing activities is an example. These are mostly domestic demand oriented; even if they support the exporting industries, they are only indirectly export-oriented. These industries, e.g., chemicals (ISIC 351, 352), plastics (ISIC 356) and rubber products (ISIC 355) continued to have a negative TFP growth even after the reform.

The above TFP trend in Indonesia is rather unusual because the export-oriented manufacturing sector performed worse than their domestic-oriented counterpart. The relatively strong export performance appeared to be propelled by low labor cost and abundant natural resources, not so much by improved productivity. No wonder the predominant exports have been mostly for the low-end consumption. Worse, the transition to skilled-based industrialization has been extremely slow, if not stagnated.

d. Determinants of TFP Growth

One would generally expect that there is a productivity spillover from FDI to domestic firms. Hence, FDI variable would be a reasonable candidate for one of the determinants of TFP growth. It is also widely accepted that trade orientation could have a positive impact on TFP growth. The need to compete in international markets necessitates export-oriented firms to operate more efficiently and productively. For these industries, technology can be acquired through imports of capital goods, management and professional services as well as new products and processes. On this subject, we specifically performed two regression analyses, one using all firms in the respected sample years, another is using only export-oriented firms.

Firm's age represents the maturity of the industry. One hypothesis states that, along with firms' reputation most matured industries will generate positive impacts on TFP growth. Yet, another view favors the opposite, i.e., matured industries tend to represent technological obsolescence. Hence, the sign of firms' age coefficient could not be convincingly determined.

Finally, another potential determinant of TFP growth is the financial access, i.e., access to external finance and domestic credits. The ability to obtain external fund differs between small and large firms, and between exporters and non-exporters. The credit markets usually favor large outward oriented and good reputation firms. Those possessing no such characteristics may have to pay higher cost of borrowing. In the model we used, access to external finances is represented by two variables, i.e., the ratio of domestic credit to total assets (FLDOCU), and the ratio of foreign credit to total assets (FLFOCU).

The results from modeling the TFP growth on various determinants are presented in Table I.7. The presence of foreign firms (DFDI) turns out to be negative and significant in 1986 for both the complete and restricted (only export oriented) samples. The coefficients for 1995 are insignificant, although the export-oriented category has a rather large positive coefficient. These results suggest that if we pool all firms in the manufacturing sector, foreign firms have very little, if any, productivity spillover to the domestic manufacturing industry. Only in the 1991 sample the presence of FDI has positive spillover for TFP growth. This is similar to the conclusions derived by Blomstrom and Sjoholm (1998), although they used labor productivity--rather than TFP--as the endogenous indicator.

However, if we experiment with a dummy variable representing the presence of FDI firms in a particular industry then the results are different. FDI firms have positive spillover for TFP growth in textiles (ISIC 321) and garment (ISIC 322), which are very export oriented. On the other hand, FDI firms in domestic oriented sectors like chemicals do not show positive spillover for aggregate TFP growth.

As for the dummies representing different sizes of manufacturing firms, the results in Table I.7 clearly indicate that the only positive and significant coefficient is for export-oriented firms of the medium size. The coefficients for large firms are not significant, and negative when they are. This could suggest that the improved TFP in export-oriented sector may have largely taken place in the medium-scale firms. Indeed, several studies have shown not only that most export industries are of medium-scale type, but also their exports generally performed better. Unlike in the large-scale firms, rising productivity could have been an additional important source of improved competitiveness in the medium-size firms.

Table I.7 Factors Affecting TFP Growth

	1986 sample		1991 sample		1995 sample	
	ALL FIRMS	EXPORT ORIENTED	ALL FIRMS	EXPORT ORIENTED	ALL FIRMS	EXPORT ORIENTED
C	6.145 [71.201]	10.802 [200.777]	3.221 [33.103]	-2.451 [-20.122]	4.246 [41.740]	3.537 [14.086]
AGE	-0.032 [-8.306]	0.0159 [6.439]	0.00138 [0.269]	-0.05 [-6.880]	0.062 [10.558]	0.269 [16.322]
DFDI	-1.661 [-5.527]	-1.202 [-6.439]	0.761 [2.463]	0.714 [1.956]	-0.42 [-1.342]	1.506 [1.838]
DLARGE	1.661 [7.370]	-0.149 [-1.269]	-2.648 [-11.356]	-1.243 [-5.304]	0.176 [0.692]	0.743 [1.413]
DMED	0.957 [7.055]	-0.585 [-7.735]	-0.659 [-4.409]	-0.551 [-3.179]	-0.848 [-5.189]	1.100 [2.852]
FLDOCU	-0.0745 [-0.455]	-0.18 [-1.816]	2.96E-10 [0.138]	-2.89E-01 [-1.143]	2.15E-08 [3.271]	4.77E-08 [2.813]
FLFOCU	-0.158 [-0.243]	0.49 [1.266]	-1.99E-09 [-0.398]	7.75E-09 [1.285]	1.14E-08 [1.520]	1.39E-08 [0.533]
N =	12765	3825	16494	5320	21551	6495
F =	32.29	34.80	22.24	33.79	37.56	53.32

AGE: individual firm age
DFDI: dummy for FDI firms
DLARGE: dummy for large firms (more than 100 workers)
DMED: dummy for medium firms (20-100 workers)
FLDOCU: credit from domestic banking
FLFOCU: credit from overseas

Table I.8
Factors Affecting Total Factor Productivity Growth

	1986	1991	1995
	ALL FIRM	ALL FIRM	ALL FIRM
C	6,141 [71.332]	3,210 [33.073]	4,245 [42.069]
AGE	-3,15E-02 [-8.176]	1,89E-03 [0.368]	0,0632 [10.778]
DFDI	-2,4043 [-7.766]	0,563 [4.887]	-1,982 [-6.157]
DLARGE	1,451 [6.413]	-2,528 [-10.295]	-7,54E-02 [-0.299]
DMED	0,985 [7.276]	-0,675 [-4.528]	-0,809 [-4.991]
DFDI321	7.446 [8.124]	-10,295 [8.124]	19,535 [18.592]
DFDI322	7,710 [2.355]	-4.253 [-3.611]	1,592 [1.552]
DFDI351	-4,364 [-6.410]	1,457 [1.756]	-12,834 [-5.306]
DFDI383	0,329 [0.260]	0,268 [0.238]	5,643 [6.191]
DFDI384	9,916 [5.994]	-1,743 [-1.068]	(12,735) [-8.676]
N =	12765	16494	21551
F =	38,41	27,61	45,21

AGE: individual firm age
DFDI: dummy for FDI firms
DLARGE: dummy for large firms (more than 100 workers)
DMED: dummy for medium firms (20-100 workers)
FLDOCU: credit from domestic banking
FLFOCU: credit from overseas
DFDI321: dummy for FDI firms in textiles
DFDI322: dummy for FDI firms in garments
DFDI351: dummy for FDI firms in industrial chemicals
DFDI383: dummy for FDI firms in electronic
DFDI384: dummy for FDI firms transportation equipment

C. Indonesia's TFP in an Economy-wide Setting

a. An Economy-wide Model and Baseline Scenario

Throughout this section, we used a non-linear dynamic model of a computable general equilibrium (CGE) type to generate long-term scenarios 2000-2020 (to allow the impacts of TFP to take effect on the economy).[7] The model is an extension of those developed by one of the authors (Azis, 1998, 2000, and Azis and Roland-Holst, 2000). It consists of the following components: financial/monetary, real sector, trade, labor market, and dynamic specification. The description of the model is discussed briefly in Appendix 2 (a complete list of equations is available upon request).

The recursive dynamics in the model originate in three sources: i) accumulation of productive capital and labor growth; ii) shifts in production technology; and iii) the putty/semi-putty specification of technology. In the aggregate, the basic capital accumulation function equates the current capital stock to the depreciated stock inherited from the previous period plus gross investment. However, at the sectoral level, the specific accumulation functions may differ because the demand for (old and new) capital can be less than the depreciated stock of old capital. In this case, the sector contracts over time by releasing old capital goods. Consequently, in each period, the new capital vintage available to expanding industries is equal to the sum of disinvested capital in contracting industries plus total saving generated by the economy, consistent with the closure rule of the model.

In the baseline scenario, the model is calibrated on exogenous growth rates of population, labor force, and GDP throughout 2020.[8] The dynamics of such scenarios are calibrated by imposing the assumption of a balanced growth path. This implies that the ratio between labor and capital (in efficiency units) is held constant over time.[9] When alternative

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[7] While the model's veracity rests as much on theory and data quality as any empirical economics, CGE model has three primary advantages: (1) closed-form accounting for economic activity that helps ensure consistency; (2) emphasis on linkages, capturing myriad indirect effects beyond the scope of partial equilibrium analysis or conventional intuition; (3) a simulation structure that permits extensive counterfactual analysis in support of economic policy making. Because of these structural features, CGE models are particularly useful for detailed incidence analysis, where movements in relative prices of goods and factors can have pervasive effects on incomes and employment.

[8] The annual GDP growth is assumed 5%.

[9] This involves computing in each period a measure of Harrod-neutral technical progress in the capital-labor bundle as a residual. This is a standard calibration procedure in dynamic CGE modeling — see Ballard et. al. (1985).

scenarios around the baseline are simulated, the technical efficiency parameter is held constant, and the saving/investment relation endogenously determines the growth of capital.

Given the usual trade-off between having a detailed structure of the model and able to run a set of fully dynamic simulations, we are bound to make a choice. In this case, we opted for the detailed structure. Since a fully endogenous or "closed-loop" dynamic specification is consequently not feasible, we instead chose to use a sequential static approach, computing equilibria in five-year intervals from 1995 to 2020.

The model is calibrated to the 1995 social accounting matrix (SAM) in its base year and its structure is intended to reproduce this accounting structure. Within a given equilibrium (i.e. at one five-year endpoint), model closure dictates that many components be exogenous. Between periods, however, several variables are determined by equations of motion, including population and capital accumulation. In addition to these quasi-endogenous variables, factor productivity growth (of capital and labor) is determined exogenously to reflect the policy choices.

Once this dynamic specification is achieved, the task of dynamic calibration is undertaken. This entails the determination of baseline values for one or more macro variables over the period 2000-2020. Such values of normally endogenous economic variables are then made exogenous, and the model is run over the five periods with endogenously determined factor productivities (one for each fixed macro variable). This determines the productivity scenario imputed from the GDP projections, and these become structural parameters of the model for counterfactual simulations.

Having generated the baseline, we will then be able to incorporate policy scenarios into a set of experiments that can be run against the calibrated baseline. These provide the counterfactual information needed to elucidate the long run implications of various TFP growth scenarios and the corresponding development policies.

Three sets of simulations, in addition to the baseline, are conducted on the basis of the following conditions: (1) Raising TFP of manufacturing sector and experimenting with various TFP conditions in primary sector; (2) An open door policy remains intact, and greater transparency will prevail following the post-crisis reforms and restructuring. In this case, FDI will continue to increase under two sets of scenarios, i.e., with and without marked changes in its direction, i.e., proportionally more in tertiary-infrastructure sector, including IT-related activities, and less to enclave resource-intensive sector; (3) Different changes in labor productivity. As indicated in Section II, relying on low skilled labor has put Indonesia's exports and growth sustainability into question. Hence, raising labor productivity through a more effective education/training policy would be desirable. But in real world things are more complex than that. With large rural population, Indonesia's change in labor productivity could affect, and be affected by, the dynamics of rural-urban migration. Hence, we will explore cases of labor productivity change under different rural-urban migration scenarios.

b. Changing TFP in Manufacturing and Primary Sector

Improving the productivity of manufacturing sector is always of importance. The simulations we conducted in Exp 1 and Exp 2 are looking at the impact of raising productivity growth in the manufacturing sector. In Exp 1 we imposed the productivity growth on only one manufacturing sector within which some activities are considered likely to benefit from the productivity spillover from foreign investment. In Exp 2, we run a scenario whereby the improved productivity occurs in practically all manufacturing sectors.

Figure II.1 clearly shows that the GDP growth would have been higher under the two scenarios. Table II.1 summarizes the resulting macroeconomic variables. Notice that no change in government expenditures is assumed (for the relevance of this assumption, see the discussions on income distribution in sub-section E).

Figure II.1: Real GDP Under the Assumptions of Different TFP Growth in Manufacturing Sector (billions of 1995 rupiah)

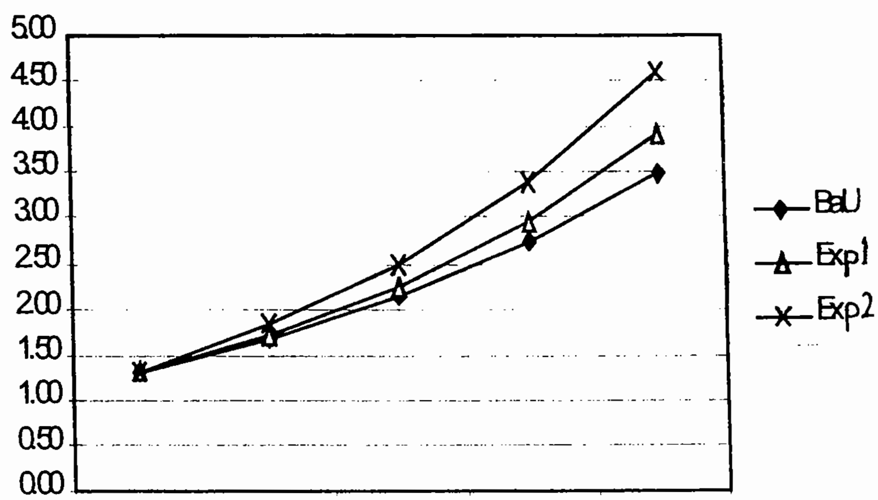


Table II.1: Real Macroeconomic Aggregates Under Different Assumptions of TFP Growth in Manufacturing Sector (% change by 2020 with respect to the Baseline)

	GDP	*Consumption*	*Investment*	*Gov Exp*	*Exports*	*Imports*
Exp1	12.51	8.67	1.76	0	26.14	12.62
Exp 2	32.77	26.76	4.73	0	109.55	49.85

Although the above is revealing, it is perhaps more useful to examine results with the baseline as a reference. We do this by measuring scenarios as *percent deviations around the baseline*. This yields Figure II.2. Interestingly, despite the constant TFP growth assumed in the scenarios, the non-linear nature of the model allows us to generate two different non-linear patterns: increasing returns for Exp 1 and decreasing returns for Exp 2.

Next is the productivity change in primary sector. There are several scenarios we can run. For presentation, we selected Food and Non Food (agricultural sector) and Mining, and to add an element of reality, some scenarios would imply a *decrease* in TFP, reflecting the country's continued *resource depletion* in the future. Indeed, for a resource-rich country like Indonesia, the alleged perspiration-based growth could have dramatic impacts not only on capital and labor, but more importantly on natural resources. Evidence is widespread that their depletion and degradation have affected the country's sustainable growth by way of reduced productivity in the primary sector. Yet, it does not seem that the long-term consequences of such scenario are being fully anticipated by the country's policy makers.

Figure II.2: Real GDP with Respect to the Baseline (BaU) Under TFP-Growth Scenarios in Manufacturing Sector

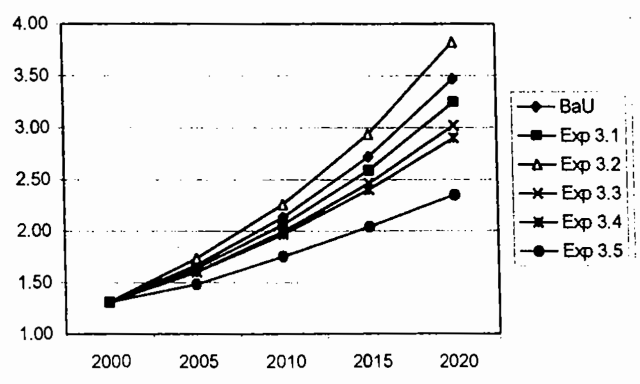
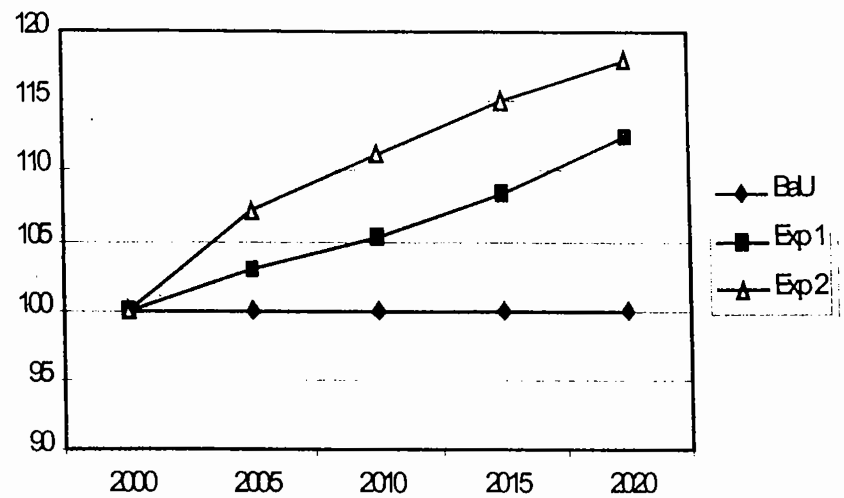


Figure II.4: Real GDP Under the Assumptions of Different TFP Growth in Primary Sector (billions of 1995 rupiah)



For a comparison purpose, in Exp 3.1 we simulate a scenario whereby TFP in the Food sector declines at a 3 percent annual rate. The driving force behind this productivity decline is hypothetical, but can reasonably be considered to arise from a variety of forces. If the sector's productivity declines even at moderate rates over the next twenty years, aggregate GDP growth will be retarded by more-than 6% (Exp 3.1 in Figure II.4).

On the contrary, a more desirable growth pattern is achieved when the government put the priority on raising the sector's productivity. But realistically, not all agricultural sector can experience an improved productivity. Hence, we selected only few that we believe would have significant economy-wide impacts, including the welfare of low-income households. One of the most important sub-sectors is Food sector. Indeed, annual productivity growth of 3% in this sub-sector (rising TFP by a total of 46 percent by 2020) can double food output and contribute more than 10% to annual GDP growth within 20 years (Exp 3.2).

The third scenario (Exp 3.3) considers a declining TFP in the Non Food sector, consisting primarily of Forestry, Fishery, and plantation products. In this scenario, we schematically depicted a long term TFP decline of 3 percent annually.

A fourth scenario (Exp 3.4) deals with the strategic mining sector, an essential but ultimately exhaustible source of purchasing power for the government's current and capital expenditures. While it constitutes a rather pessimistic specification, we look at the implications of 3 percent annual declines in TFP in this sector as a means of better understanding its myriad linkages to the rest of the economy. These insights can help policy makers anticipate adverse downstream effects and promote policies for greater real economic diversification.

Finally, Exp 3.5 combines Exps 3.1, 3.2, 3.4 in a worst case scenario to give an indication of the opportunity cost of growth-perspiring strategy through excessive uses of natural resources, and of failing to recognize sustainability as a generalized policy objective for Indonesia over the next twenty years.

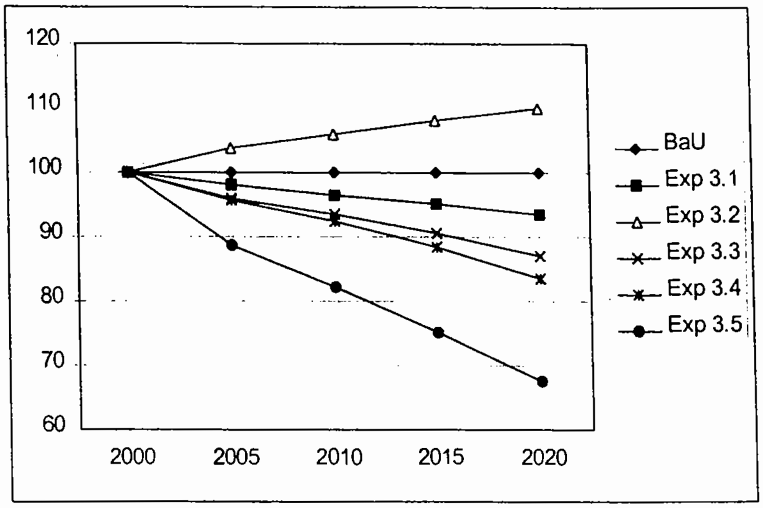
The overall results in Table II.2 summarize the macroeconomic impacts of the experiments. Clearly, only in Exp 3.2 the private final demand and real GDP increases. Trade is positively impacted in this scenario, directly increasing the country's export capacity and thereby import purchasing power. The reverse is true for other experiments, despite the fact that government expenditures are assumed raised in Exp 3.1 and Exp 3.3.

Table II.2: Real Macroeconomic Aggregates Under Different Assumptions of TFP Growth in the Primary Sector (percent change by 2020 with respect to the Baseline)

	GDP	*Consumption*	*Investment*	*Gov Exp*	*Exports*	*Imports*
Exp 3.1	-6.46	-12.05	-2.68	2.42	-5.60	-2.37
Exp 3.2	10.12	15.34	3.89	-1.11	5.60	3.35
Exp 3.3	-13.02	-19.83	-6.08	3.90	-20.34	-8.03
Exp 3.4	-16.42	-14.23	-27.94	-8.39	-23.11	-19.37
Exp 3.5	-32.33	-39.08	-33.79	-3.38	-43.26	-27.72

Figure II.5 shows the resulting outcomes with respect to BaU. This table clearly demonstrates that the long term costs of not raising the sector's TFP can be substantial. Even if the country maintains policies targeted to its ambitious 5 percent annual growth, these will be undermined significantly if TFP and resources decline in either or all of the three sub-sectors being considered. Declining TFP in the Food sector would reduce real GDP growth by about 8% annually by 2020, while a similar decline in Non Food sector could aggravate this by up to 12% more. Were the Mining sector to go into decline along the same lines, it would be dragging annual GDP growth down by over 15%. Were all these sectoral TFP problems to compound themselves, Exp 3.5 indicates that more than 30% of real GDP growth would be sacrificed.

Figure II.5: Real GDP Results with Respect to the Baseline (BaU) Under Different Assumptions of TFP Growth in Primary Sector (percent)



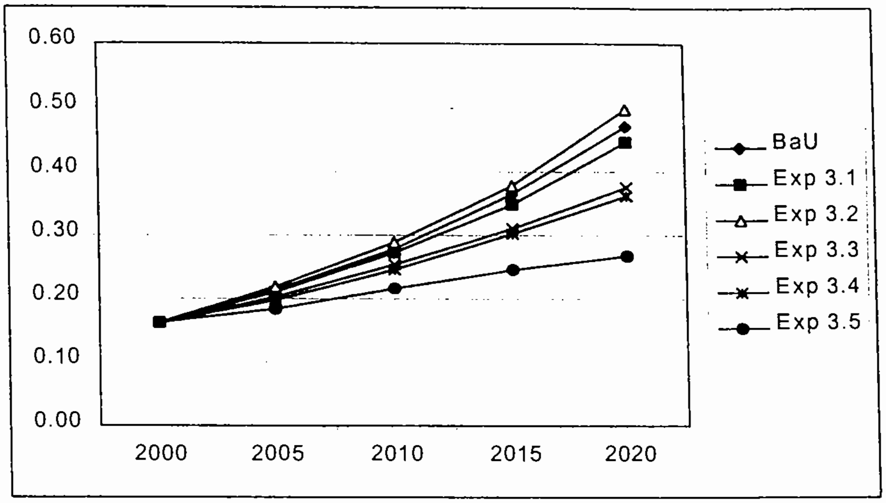
Clearly, the resource base activity provides an important source of economic security for a resource-rich country like Indonesia. If the country were to go beyond this and invest directly to raise the sector's TFP, Exp 3.2 indicates that there could be a substantial growth dividend. Were agricultural resources to be augmented by research, training, and other innovation leading to 3% annual TFP growth in the Food sector alone, real GDP for the economy would be growing 10% faster than the baseline scenario by 2020.[10]

The government would be a big loser in the event of declining TFP in either or all of the sectors being considered, particularly the Mining sector. We have assumed that public expenditures grow at the same rate as baseline GDP growth, and this would evidently be unsustainable in Exp 3.5 and seriously undermined in any of the other declining TFP scenarios. Were resources better conserved and productivity enhanced in food producing agriculture, the government's budget would strengthen 20% (by 2020) faster than a robust economy growing at 5% annually. Clearly, improving TFP is in the interest of the government.

[10] While this reasoning is relatively obvious, Indonesia's policy record does not reflect these insights. In the case of exhaustible resources, during the last three decades the government apparently feels that depletion is inevitable and therefore mining resources should simply be used as needed to support public expenditure.

Figure II.6 clearly shows how the economy's capacity to earn foreign exchange would be undermined by unsustainable resource use reflected in a decline in TFP.

Figure II.6: Total Exports Under Different Scenarios of Primary Sector's TFP Growth (1995 rupiah trillions)



Productivity growth in the Food sector (Exps 3.1 and 3.2) has the smallest effect, because Food production in Indonesia is still primarily oriented toward the internal market, which only means that adverse domestic adjustments will be more prominent than external ones in this scenario. For the more export-oriented sectors like Mining and Forestry, however, low TFP and unsustainable resource policies could reduce future GDP growth significantly by robbing the country of much needed foreign income.

c. Augmenting Foreign Direct Investment

Foreign direct investment (FDI) can benefit the economy by enhancing productivity.[11] From a macroeconomic perspective, foreign capital inflows provide an essential source of loanable funds in a poor or recession-bound developing country, where domestic savings are meager or immobilized by economic dislocation. In addition to technology diffusion and other endogenous growth influences, FDI animates the

[11] Using firms' profitability as an indicator, Reza Siregar and Damhuri Nasution (1999) found that FDI also tends to perform better than domestic firms.

Keynesian accelerator at a time when both investment and employment are stagnant.

To examine the significance of FDI for short and long term development in Indonesia, we consider six scenarios. In the baseline projections, we assume FDI grows at the same rate as the baseline GDP (5 percent). In the first experiment (Exp 4.1), we adopt a more optimistic foreign investment perspective and assume that total net foreign investment increases a twice the baseline rate of real GDP growth. This is then contrasted with a second scenario (Exp 4.2) where total net foreign investment remains constant over the entire period (zero growth). Starting at the relatively low point of 2000, this is a pessimistic vision indeed. We assume in both these cases that the sectoral composition of foreign investment remains constant over the period 2000-2020, thus imparting a structurally neutral investment effect to the overall economy.

Table II.3: Generic Sector Groups for Targeted Foreign Investment

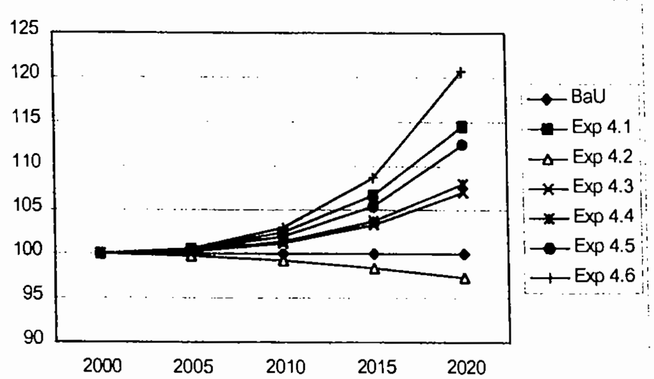
Group	*Constituent Sectors*
Rural	Food, NonFood Agriculture
Labor Intensive	Textile, Trade, Food Processing, Restaurant and Hotel
Heavy Industry	Mining, Chemical, Paper, Utility
Tertiary (incl IT)	Transport, Bank, Real Estate, Public Administration, Social Services

While such scenarios illuminate the accelerator effects of foreign capital inflows, they are neither particularly realistic nor revealing of the complex structural adjustments FDI usually induces in recipient economies. Hence, we examine four more scenarios where new FDI is targeted to generically different sector groups. In particular, we classify the sixteen sectors of the present Indonesian SAM into the groups shown in Table II.3.

In each of four scenarios (Exps 4.3-4.6), we assume that overall FDI grows at three times the baseline rate of GDP growth (5 percent) for each of the four sector groups defined above. For example, in Experiment 4.3, sectors outside group 1 above will have FDI growing at 5 percent (baseline GDP growth), but investment grows at 15 percent for the sectors in the rural group.

Although one might not argue a priori that FDI would spontaneously flow in this manner, it makes sense to analyze scenarios like these because they might justify more aggressive policies to recruit foreign partners in certain sectors. The varying incidence of such targeted investment patterns reveals much about the importance of coordinated and forward looking investment policies in line with those that currently preoccupy the new regime of government.

Figure II.7: Real GDP With Respect to the Baseline Under Different Assumptions of Alternative FDI Growth (percent)



Results for real GDP in Figure II.7 clearly reveal the vital role foreign capital can play in the development process. Beginning from a relatively small level, sectoral foreign investment grew in scenario 4.1 at twice the baseline rate of GDP growth, and this ultimately fed back to aggregate and sustained growth dividends. Less than 2% appreciation of real GDP in the first five years led ultimately to more than 20% annual appreciation by 2020. These results make it quite evident that partnership with external capital is not simply a jump-start for developing economies, but an indispensable long term asset for higher sustainable growth rates. Contrast this with the case where foreign investment remains constant (Exp 4.2). Even though it was a small percent of GDP in the baseline, it still contributed more than 4% to GDP growth over the twenty years under consideration.

Table II.4 summarizes the induced macroeconomic adjustments. The main features here are real GDP growth induced by increased foreign investment, revenue-driven government expenditure increases, and mixed trade results. The latter are driven by real exchange rate adjustments, which operate from the foreign capital inflows and increased export capacity (appreciation) and greater import dependence (depreciation), particularly for investment goods. Mainly, we see export neutrality and a surge in imports resulting from real exchange rate appreciation.

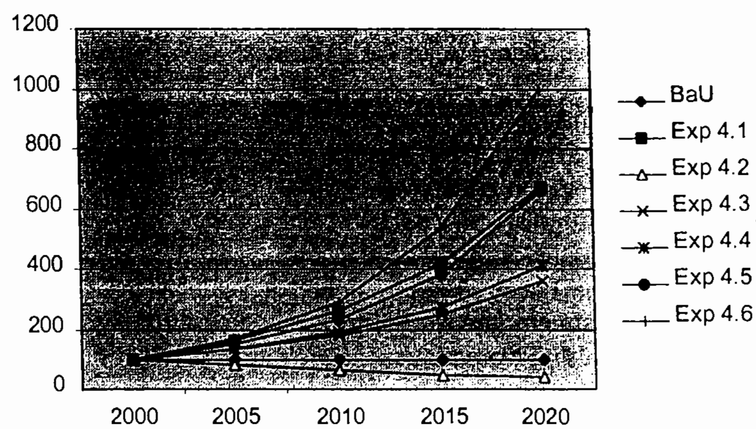
Table II.4: Real Macroeconomic Aggregates (percent change by 2020 with respect to the Baseline)

	GDP	*Consumption*	*Investment*	*Gov Exp*	*Exports*	*Imports*
Exp 4.1	14.51	14.22	67.55	10.67	-0.09	41.14
Exp 4.2	-2.68	-2.43	-8.37	-1.36	-1.18	-5.37
Exp 4.3	7.06	6.71	31.30	5.05	0.35	19.55
Exp 4.4	7.98	7.86	36.94	6.27	-1.39	21.18
Exp 4.5	12.431	2.73	64.29	11.07	-4.47	35.51
Exp 4.6	20.682	0.57	104.15	15.36	0.98	66.99

Because foreign capital inflows represent macroeconomic saving, their effect on real GDP is in some sense proportional to the total inflow. This can be seen in the targeted sector scenarios (Exps 4.3-4.6), where the size of the targeted groups initial investment determines the ultimate stock of foreign investment in these scenarios. Because they are growing faster than in scenario 4.1 and because of the size of the Tertiary sector, investments in scenario 4.6 actually overtake those in scenario 4.1, as can be seen in Figure II.8.

At the sectoral level, however, these macro differences are only apparent in some cases. For example, when Food is targeted for accelerated foreign investment, the results similar across experiments to the macro results for two reasons: initial foreign investment in this sector was very small and most of its output is driven by aggregate GDP growth.

Figure II.8: Foreign Direct Investment With Respect to the Baseline Under Different Scenarios



This result contrasts with Mining, an enclave sector with weaker linkages to the domestic economy and heavy reliance on exports. In this case, Mining benefits from direct investment (Exps 4.1 and 4.4) and investment targeted to sectors with pervasive linkages (Tertiary and Labor Intensive). When rural sectors are targeted, however, Mining output declines for two reasons: domestic resource diversion and export contraction due to an appreciating real exchange rate.

The real exchange rate effect of accelerated foreign capital inflows is an important issue, and in the case of highly exports dependent sectors, it can undermine some of the benefits of foreign investment. Consider Textiles in the Labor Intensive target group. This sector experiences relative total output declines in all but one of the scenarios, because real exchange rate appreciation undermines their export competitiveness. This issue, essentially a capital account version of "Dutch Disease," has been extensively discussed in the literature on foreign portfolio investment, but is less considered in the context of longer term FDI.[12]

What this means in practical terms is that foreign investment at the sectoral level must represent more than just loanable funds. These infusions of foreign exchange denominated capital must also represent technology transfer and other endogenous growth linkages that will improve competitiveness of domestic economic activities (IT industries fall in this category). Such micro externalities can more than offset macro effects like incremental exchange rate adjustments.

Apart from trade effects, the main lesson from this exercise may be that indirect linkages are often as important a consideration as direct targets. This is particularly apparent in the last scenario, where Tertiary sectors, presumably including the IT-related activities, are the direct target group. This is the best or second best investment scenario for nearly every other sector, the reason being the extensive linkages the target sectors maintain with the rest of the economy. Thus policies to attract foreign investment can be of special benefit if they recognize this and shift priorities from enclave (usually resource intensive) sectors to investments in the economic mainstream and the "new economy" sectors. Building upon the existing network of linkages will provide a more decentralized and sustainable basis for economic progress.

d. Labor Productivity

In most populous developing countries, internal migration exerts a profound influence on the course of economic growth. In some cases,

[12] See e.g. Reisen:1995, on the subject of FDI and exchange rate bias. In the broader context of portfolio investment and currency crises, see Aghion et al:1999, Azis:1998, and Azis:2000.

migrants provide an essential source of new workers to fuel expanding sectors, while in others migrants crowd into urban areas and undermine living standards for everyone. The implications of demographic trends are ultimately determined by a complex interplay between the quantity and quality of human and nonhuman factors of production.

In this sub-section, we consider several scenarios of leading demographic issues facing Indonesia. We begin with a scenario (Exp 6.1) that reflects dramatic shifts in rural and urban populations. In the baseline situation, we have stipulated that given the overall population growth, individuals migrate between rural and urban areas only in response to changes in real wages.[13] Using the model, we examine the effects of this by shifting population exogenously, in equal annual percentage increments, over the period 2000-2020 to achieve this reallocation.

In the next scenario (Exp 6.2) we determine what productivity increase would be required in agriculture to accommodate the outflow of labor from the previous scenario, without any decrease in total food output. Of course productivity growth in this sector can offset the output effect of the migration, but many of its other effects will still play out, albeit in slightly different ways.

In a third scenario (Exp 6.3) we further examine the pessimistic side of migration. One of the common unwelcome consequences of urban population concentration has been degradation of living conditions. As the urban environment becomes more adverse (e.g., increased pollution and other urban health risk), labor productivity ultimately must decline. In particular, we stipulate that productivity of urban workers declines by 3 percent annually over the period under consideration, i.e. at the same time as the proportion of urban dwellers is essentially doubling.

A final scenario (Exp 6.4) is intended to capture the benefits of a more effective education/training policy for sustainable Indonesian development. While the government has a long commitment to education, it is not unfair to say that the educational potential of the Indonesian population is still far from being fulfilled. This of course translates into forgone opportunity for everyone in the economy, and the sustainable living standard of the population as a whole will ultimately depend on higher productivity of its average citizen. For illustrative purposes, we examine the implications of a more human-capital oriented approach to growth policy by increasing labor productivity by 3 percent annually in all urban occupational categories.

[13] Some demographers, however, have suggested that, by 2020, the urban proportion of the Indonesian population could grow from the current level of about 27 percent to as much as 50 percent. If this were to happen, Indonesian urban areas would obviously be very different places, as would rural labor markets.

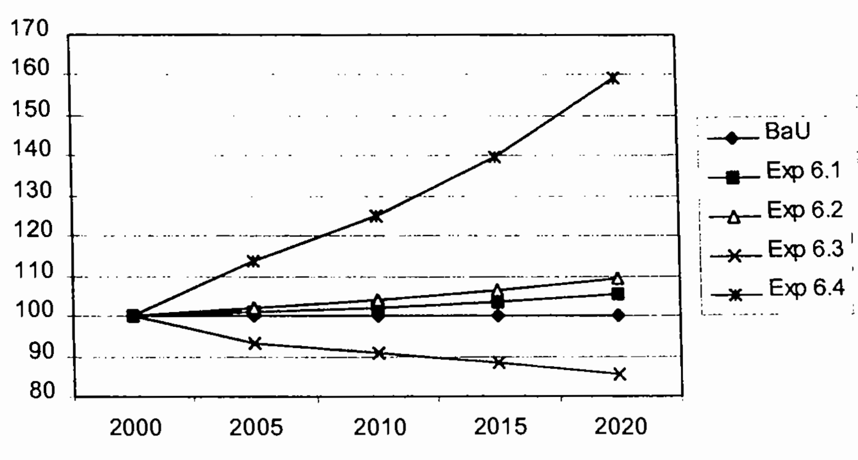
Table II.5 summarizes the macroeconomic impacts of the four demographic scenarios. Clearly, the most dramatic of these is the labor productivity growth scenario, yielding almost 60% higher real GDP by 2020 and commensurate increases in domestic and foreign demand. Other scenarios are positive or negative as intuition would dictate, but clearly the issue of human resources and productivity is an essential one for Indonesia.

Table II.5: Real Macroeconomic Aggregates (percent change by 2020 with respect to the Baseline)

	GDP	*Consumption*	*Investment*	*Gov Exp*	*Exports*	*Imports*
Exp 6.1	5.33	-0.67	6.57	0.69	10.40	8.27
Exp 6.2	9.52	6.36	8.52	-0.30	13.99	10.09
Exp 6.3	-14.71	-12.81	-10.31	13.19	-15.86	-10.02
Exp 6.4	59.26	41.61	44.88	-12.49	78.49	51.74

The real GDP in Figure II.9 immediately reveal strengths and weaknesses in both the policies and the present analysis. Judging from these results, massive rural to urban migration would not be a bad thing for Indonesia, particularly if rural exodus were accompanied by TFP growth in agriculture.

Figure II.9: Real GDP With Respect to the Baseline Under Different Assumptions of Alternative FDI Growth (percent)



There is a fallacy in both scenarios 6.1 and 6.2, however. This is the assumption (actually endemic to much pro-migration policy argumentation) that migrants will enter the urban areas with the same productivity as existing residents. There are many reasons why this in unrealistic, and therefore why the "cheap labor" path to development is often littered with policy failures. Simply opening urban labor markets for unskilled rural peasants to enter fails to recognize the specific human capital of urban dwellers, experienced workers, and the supportive roles of established urban households and communities. When these things are undermined by urban decline, Exp 6.3 becomes a more realistic one, with steadily declining average worker productivity, accounting for both inexperienced new entrants and adverse effects on the incumbent urban population.

When a government commits itself firmly and consistently to the quality of its labor force, the results can be dramatically beneficial. The "education" scenario (Exp 6.4), stipulating mass migration (Exp 6.1), rising food productivity (Exp 6.2), and 3% annual increases in labor productivity, yielded GDP growth fully 60% higher than the baseline by 2020. Certainly, this is the most graphic example of improved TFP we have considered. What this kind of policy reflects most clearly in the present context is that labor is in itself the most essential resource whose productivity can grow, seemingly without limit.

e. Implications on Income Distribution

With the new political economic sphere, the issue of distribution may have to take a center stage in any policy debate in Indonesia. Income distribution can be a critical factor for at least two reasons. First, a viable consumer society is essential for Indonesia to make the transition to a modern, diversified economy, and this is possible only with the emergence of a prominent middle class that provides both diversified consumption and sustained savings resources. Second, chronic inequality undermines the stability of policy institutions and therefore the sustainability of policy itself.

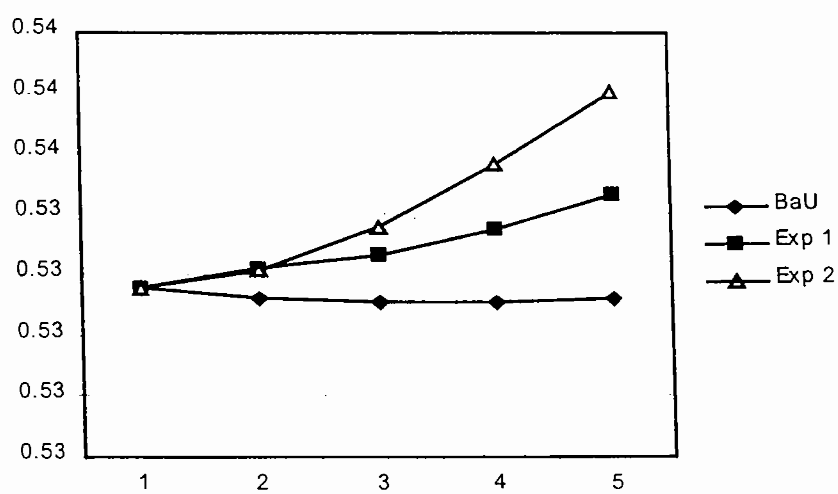
To better understand the linkages between income disparity, TFP, FDI and labor productivity, we revisit several scenarios from the previous sections and examine them more intensively in terms of their distributional consequences. To do this, we revisit all the scenarios, examining the trends in GINI coefficients that arise in each group.[14]

[14] The GINI is of course only one measure of distributional incidence, and indeed the CGE model has many ways of measuring relative income effects because it traces the myriad of income linkages from demand to production to factors to households and back again. For the present, however, we focus on the GINI as an illustrative indicator.

Let us begin with the simulation results of Exp 1 and Exp 2. While a higher GDP growth is expected when positive TFP growth is assumed, the results of simulation also clearly point to the presence of a trade-off between efficiency and equity objectives. As shown in Figure II.10, the Gini index of the two experiments is higher than under the baseline (BaU). The higher the TFP-stimulated GDP growth, the worse is the income distribution.

What needs to be realized is that, the link between growth and distribution is very complex, occurring through an intricate mechanism of transmission from real sector (commodity markets) to factor markets, before it eventually reaches the household income block of the system. In the process, the direct and indirect effects of the transmission are captured explicitly in the model. Absent of such analysis would imply a policy infeasibility, whatever the standard TFP growth would suggest.

Figure II.10: GINI Coefficients For TFP Growth in Manufacturing Sector



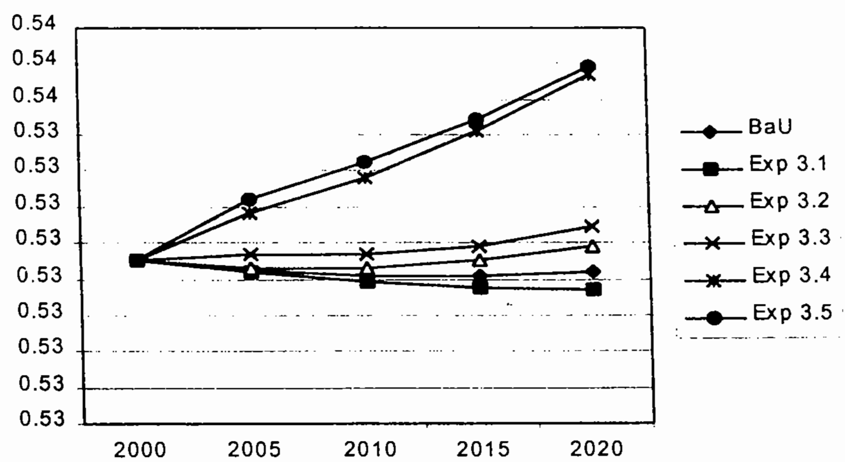
The potential trade-off described above implies that policies to raise productivity would need to be accompanied by structural policies that could minimize the consequential income disparity. One of such policies is through government expenditures. As indicated in Table II.1 in sub-section B, Exp 1 and Exp 2 are run specifically with the assumption that there is no change in the size and composition of the government expenditures, i.e., the differential between government expenditures in Exp 1, Exp 2 and the baseline (BaU) is set zero. This assumption would need to be adjusted if we wish to alter the trend of rising disparity (although the resulting GDP growth would have been lower than what is shown in Figure II.1).

For the remaining scenarios, we reproduce selected cases as shown in Table II.6.

Table II.6:Real Macroeconomic Aggregates Under Scenarios of Primary Sector's TFP, FDI and Labor Productivity (% change by 2020 with respect to the Baseline)

	GDP	*Consumption*	*Investment*	*Gov Exp*	*Exports*	*Imports*
Exp 3.1	-6.46	-12.05	-2.68	2.42	-5.60	-2.37
Exp 4.1	14.51	14.22	67.55	10.67	-0.09	41.14
Exp 5.1	2.81	1.25	4.48	-17.61	6.76	1.61
Exp 6.1	5.33	-0.67	6.57	0.69	10.40	8.27
Exp 6.4	59.26	41.61	44.88	-12.49	78.49	51.74

Figure II.11: GINI Coefficients Under Scenarios of TFP Growth in Primary Sector, FDI and Labor Productivity



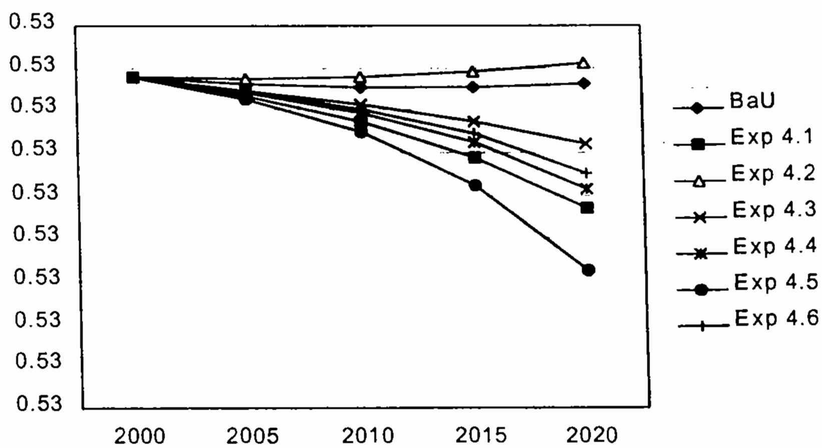
It is clear from Figure II.11, the scenario of TFP improvement in the Mining sector is most aggravating in terms of income inequality.[15] Most

[15] Note that here GINIs are measured in absolute units, not as a percent of the baseline value. This is not because of direct income effects, since this sector is relatively capital intensive, but because of the importance of energy prices in household purchasing power

of the other scenarios, including the baseline, are relatively neutral in terms of income distribution.

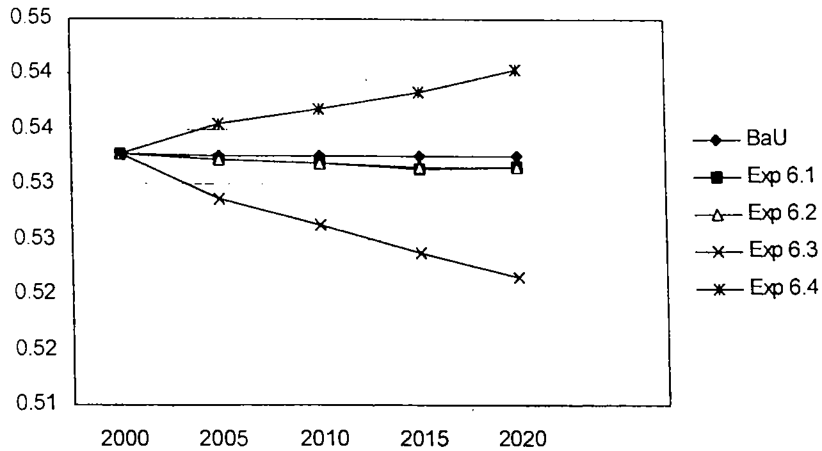
The results for the FDI scenarios are more monotone, and generally egalitarian, as can be seen in Figure II.12. The more egalitarian scenarios are the uniform increase in sectoral foreign investment and, most of all, the one favoring Heavy Industry. This latter undoubtedly benefits low income urban dwellers.

Figure II.12:GINI Coefficients for Foreign Investment Scenarios



The properties of labor productivity and migration scenarios could make for interesting distributional outcomes. Indeed, the actual results for GINI indicators might in some cases appear counterintuitive, but the linkages between the scenarios and real incomes can be complex, including direct income effects, price effects though consumption, and productivity-linked wage effects.

Figure II.13: GINI Coefficients for Labor Productivity



Note first of all that the mass migration scenarios that ignore labor productivity effects are essentially neutral growth stories like the baseline. When productivity declines because of urban problems, however, the adverse effects fall disproportionately on the higher income groups. The rising productivity scenario has the opposite effect. The reason for both is the relative scarcity of skilled labor in the urban areas. This causes their wages to rise and fall faster with respect to average labor productivity movements. In any case, it is worth noting that the "education" scenario is slightly regressive, but in reality it is likely that a broad based education reform would raise productivity more in the low income and in the high-income groups, offsetting the kind of effect seen here. Certainly, the absolute and sustained income gains seen in the previous sub-section provide ample justification for scenario 6.4.

D. Closing Remarks

Like in most analyses, the ultimate value of TFP growth exercise is its policy relevance. In analyzing the TFP growth and its policy implications, we adopted an approach that goes beyond just a simple TFP growth accounting. The alternative model is capable of embracing the economy-wide consequences of TFP-related policies in a pre-determined future time-frame (2000-2020).

In this manuscript, we evaluated the implications of TFP-related policies using Indonesia as a case study. The policy scenarios are carefully selected to reflect the country's new political economy after the fall of Suharto in 1998. We gave special attention to the detailed incidence of development policies, not only in relation to growth and TFP but also to issues of migration, education and income distribution. The interrelations between these variables are complex and yet important to analyze. The scenarios incorporating rural-urban migration, for example, suggest that what is needed to offset such demographic pressures is to have productivity improvement at both ends of the migratory channel. Thus, productivity gains in, say, agricultural sector, can "free" rural labor without compromising the country's food security.

On equity issues, the results of model simulations indicate that indirect measures, targeted to general economic growth and facilitation of market forces, are more effective in the long run than targeted income policies. Such policies include investments in infrastructure and education. These may be less politically expedient than transfer payments or fiscal favoritism, but they are the only way to achieve sustainable reductions in inequality.

The model simulations also demonstrate that a continued growth to be leveraged on external markets will require the economy to diversify, particularly giving greater priority to non-primary resources like human capital. This is in contrast with the past experience of Indonesia discussed in Section II, whereby growth and export competitiveness relied heavily on cheap labor rather than improved productivity. When greater emphasis is given to "services" sector including IT-related activities, e.g., through redirecting investment and FDI from primary to tertiary sector oriented, the outcomes are generally favorable from the efficiency as well as equity perspectives.

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Appendix 1

Table A.1:
SHARE OF VALUE ADDED

SECTOR	1970	1982	1986	1991	1996
AGRICULTURE	0.3471	0.2503	0.2314	0.1955	0.1595
MINING	0.2417	0.2034	0.1916	0.1663	0.1322
MANUFACTURE	0.0692	0.1191	0.1724	0.2116	0.2563
UTILITIES	0.0033	0.0073	0.0050	0.0073	0.0098
CONSTRUCTION	0.0259	0.0642	0.0541	0.0639	0.0937
TRADE	0.1351	0.1715	0.1580	0.1685	0.1793
TRANSPORTATION	0.0282	0.0561	0.0548	0.0591	0.0642
BANKING	0.0883	0.0987	0.1093	0.1106	0.0947
ALL	1.0000	1.0000	1.0000	1.0000	1.0000

Government sector and other services are excluded

Table A.2:
SHARE OF LABOR FORCES

SECTOR	1971	1982	1985	1991	1996
AGRICULTURE	0.7507	0.6234	0.6178	0.6174	0.5100
MINING	0.0024	0.0077	0.0075	0.0085	0.0105
MANUFACTURE	0.0761	0.1188	0.1230	0.1191	0.1457
UTILITIES	0.0011	0.0012	0.0013	0.0023	0.0022
CONSTRUCTION	0.0192	0.0424	0.0414	0.0365	0.0513
TRADE	0.1208	0.1688	0.1691	0.1713	0.2177
TRANSPORTATION	0.0270	0.0354	0.0354	0.0374	0.0533
BANKING	0.0027	0.0022	0.0045	0.0077	0.0093
ALL	1.0000	1.0000	1.0000	1.0000	1.0000

Government sector and other services are excluded

Table A.3
Manufacturing Sector: Value Added Shar

Industry	SHARE75	SHARE80	SHARE86	SHARE91	SHARE96
Food	0.2008	0.1291	0.1027	0.1004	0.0988
Food	0.0254	0.0220	0.0301	0.0318	0.0347
Beverages	0.0192	0.0114	0.0077	0.0066	0.0094
Tobacco	0.2474	0.1840	0.1112	0.0774	0.0791
Textiles	0.1213	0.1116	0.1444	0.1378	0.1798
Garment	0.0011	0.0038	0.0167	0.0372	0.0531
Leather Products	0.0025	0.0026	0.0025	0.0060	0.0051
Footwear	0.0072	0.0046	0.0036	0.0169	0.0376
Wood Products	0.0199	0.0555	0.0925	0.1177	0.0783
Furniture	0.0017	0.0014	0.0023	0.0122	0.0124
Paper and paper products	0.0128	0.0156	0.0171	0.0428	0.0452
Printing and Publishing	0.0152	0.0133	0.0146	0.0133	0.0171
Basic Chemicals	0.0340	0.0443	0.0499	0.0569	0.0575
Other Chemicals	0.0582	0.0523	0.0430	0.0410	0.0331
Rubber Products	0.0299	0.0738	0.0430	0.0016	0.0006
Plastics	0.0182	0.0103	0.0189	0.0341	0.0004
Ceramics	0.0010	0.0017	0.0025	0.0210	0.0378
Glass Products	0.0051	0.0065	0.0079	0.0054	0.0302
Cement	0.0198	0.0304	0.0279	0.0058	0.0076
Structural Clay	0.0009	0.0007	0.0016	0.0207	0.0075
Other non-metallic mineral	0.0006	0.0005	0.0016	0.0011	0.0186
Metal Prodcuts	0.0061	0.0254	0.0672	0.0030	0.0016
Non electrical machinery	0.0599	0.1064	0.0996	0.1187	0.0114
Electrical Equipment	0.0123	0.0118	0.0066	0.0105	0.0555
Transportation equipment	0.0274	0.0468	0.0296	0.0363	0.0179
Professional equipment	0.0514	0.0340	0.0550	0.0159	0.0547
Miscellaneous	0.0004	0.0004	0.0004	0.0280	0.0149
TOTAL	1.0000	1.0000	1.0000	1.0000	1.0000

Sources: calculated from Industrial Surveys

Table A4:
Manufacturing Sector: Employment Shar

Industry	SHARE75	SHARE80	SHARE86	SHARE91	SHARE96
Food	0.1454	0.1114	0.1140	0.0876	0.0875
Food	0.0344	0.0329	0.0527	0.0481	0.0380
Beverages	0.0061	0.0060	0.0055	0.0048	0.0056
Tobacco	0.2029	0.1799	0.1323	0.0686	0.0633
Textiles	0.2840	0.2478	0.2005	0.1794	0.1723
Garment	0.0047	0.0176	0.0440	0.1060	0.1125
Leather Products	0.0028	0.0032	0.0025	0.0079	0.0073
Footwear	0.0080	0.0082	0.0055	0.0510	0.0890
Wood Products	0.0391	0.0625	0.1055	0.1243	0.1093
Furniture	0.0072	0.0058	0.0081	0.0392	0.0443
Paper and paper products	0.0098	0.0115	0.0140	0.0186	0.0225
Printing and Publishing	0.0227	0.0193	0.0209	0.0140	0.0171
Basic Chemicals	0.0116	0.0164	0.0159	0.0138	0.0144
Other Chemicals	0.0401	0.0390	0.0361	0.0267	0.0261
Rubber Products	0.0141	0.0403	0.0504	0.0006	0.0001
Plastics	0.0181	0.0203	0.0322	0.0428	0.0005
Ceramics	0.0023	0.0073	0.0079	0.0386	0.0287
Glass Products	0.0090	0.0088	0.0060	0.0115	0.0464
Cement	0.0189	0.0192	0.0157	0.0068	0.0106
Structural Clay	0.0128	0.0089	0.0151	0.0126	0.0065
Other non-metallic mineral	0.0026	0.0027	0.0045	0.0089	0.0116
Metal Prodcuts	0.0030	0.0082	0.0089	0.0066	0.0135
Non electrical machinery	0.0353	0.0437	0.0358	0.0086	0.0065
Electrical Equipment	0.0131	0.0111	0.0086	0.0031	0.0081
Transportation equipment	0.0188	0.0374	0.0229	0.0341	0.0043
Professional equipment	0.0322	0.0294	0.0329	0.0104	0.0432
Miscellaneous	0.0009	0.0010	0.0015	0.0255	0.0109
TOTAL	1.0000	1.0000	1.0000	1.0000	1.0000

Sources: calculated from Industrial Surveys

Appendix 2

A. Financial/Monetary Sector

The construction of the financial/monetary block begins with financial balance sheets of six institutions in the economy, i.e., central bank, commercial banks, foreign sector, government sector, households, and production sector. The model's saving-investment closure departs from a neo-classical specification, in which private domestic investment and capital inflows that set the size of foreign investment are determined through independent functions.

In order to translate a financial shock to welfare indicators one needs to specify agents' behavior of in determining their wealth, based upon which the stream of incomes (earnings) to different agents could be determined. Following James Tobin (1970), Brunner & Meltzer (1972) and Bernanke & Blinder (1988), we choose to abandon the perfect substitutability assumption in the portfolio allocation.

The non-household (production sector) selection of foreign or domestic time deposits 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 formed (by narrow money and time deposit), and so is the amount of loanable funds demand --hence, bank loans--after taking into account the commercial bank's borrowing and reserve requirement.

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 non-interest 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 household behavior changes considerably. Therefore, money multipliers are allowed to change freely, influenced among others by government's policy such as reserve requirements (see Harberger, 2000 for the discussions of flexible multipliers during a crisis).

The specification of domestic investment reflects the nature of financing in most developing countries (i.e., bank-dependent) except that it is added with balance-sheet constraints that will take effect when there is massive exchange rate depreciation (e.g., the crisis episode in 1997, see Krugman, 1999). The influence of interest rates and production capacity are therefore combined with the direct effect of (depreciating) exchange rate on domestic investment.

Foreign capital inflow is modeled as a function of interest rate differentials and the country's risk, the latter measured in terms of debt exposure. Labeled as RISK, this is primarily determined by the service-debt ratio. Foreign investment tends to rise as capital inflows increase. In this way, the trend in trade patterns (esp. exports) will have some implications on the country's total investment. From the saving side, the trade will also determine the foreign saving, after discounting for the net transfer. Corporate saving is specified as a proportion of the after-tax corporate income, the latter jointly determining household incomes.

B. Real Sector

The real side of the economy is modeled with standard neoclassical production and consumption specifications. Our Indonesian database is the 1995 official SAM, aggregated to include 16 production activates, 8 household groups, 8 labor categories, and factor categories for land and productive capital.

Production

Production technology is modeled by a nesting of constant-elasticity-of-substitution (CES) functions. In each period, the aggregate supply of nonhuman factors is predetermined, while that of labor is subject to a logistic labor force participation function (capital supply is influenced by the previous period's level of investment). The model includes adjustment rigidities in labor markets via imperfect substitution between occupation groups and migration elasticities. Once the optimal combination of inputs is determined, sectoral output market-driven prices are calculated assuming competitive supply (zero-profit) conditions in all markets.

Consumption and Closure Rule

All income generated by economic activity is assumed to be distributed to consumers. Each representative consumer allocates optimally his/her disposable income among the different commodities and saving.

The government collects income taxes, indirect taxes on intermediate inputs, outputs and consumer expenditures. The default closure of the model assumes that government deficit/saving is exogenously specified.

The current account surplus (deficit) is fixed in nominal terms. The counterpart of this imbalance is a net outflow (inflow) of capital, which is subtracted (added to) the domestic flow of saving. In each period, the model equates gross investment to net saving (equal to the sum of saving by households, the net budget position of the government and foreign capital inflows). This particular closure rule implies that saving drives investment.

Foreign Trade

Goods are assumed to be differentiated by origin. In other words, goods classified in the same sector are different according to whether they are produced domestically or imported. This assumption is frequently known as the *Armington* assumption. The degrees of substitutability, as well as the import penetration shares are allowed to vary across commodities. The model assumes a single Armington agent. This strong assumption implies that the propensity to import and the degree of substitutability between domestic and imported goods is uniform across economic agents. This assumption reduces tremendously the dimensionality of the model. In many cases this assumption is imposed by the data. A symmetric assumption is made on the export side where domestic producers are assumed to differentiate the domestic market and the export market. This is modeled using a *Constant-Elasticity-of-Transformation* (CET) function.

Labor Markets

The present model contains two special labor market features that depart from simpler neoclassical CGE models: aggregate labor supply functions and rural-urban migration. Both of these phenomena are essential to understanding the Indonesian development process, and we describe them briefly below.

As in most developing countries at the early stages of industrialization, the rate of aggregate Indonesian participation in the formal labor force has been steadily rising with real wages. This positive relationship can be expected to continue as real wages rise, but to level off as dependency limits are reached in the population. We capture this phenomenon in the model with a logistic labor supply function. Assume that households elect to supply labor in response to the average real wage in their labor market, discounted by their household consumer price index. Formally, the labor force participation rate of a given household, r_h, is given by the calibrated logistic function

$$r_h = \alpha + \frac{\beta}{1+\gamma e^{-\delta \bar{w}_h}}$$

where

$$\bar{w}_h = \sum_l w_l \frac{\theta_{lh}}{CPI_h}$$

and θ_{lh} denotes the share of workers of occupation l in household h. Schematically, this function looks like

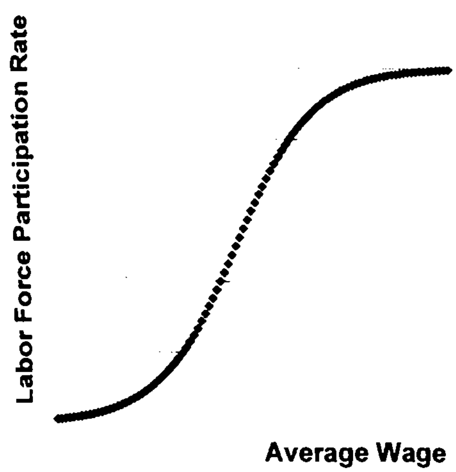

Figure 2.1: Aggregate Labor Supply

The calibrated upper bound for this function is one minus the household dependency ratio, i.e. the total percentage of eligible workers in each household group. The calibrated inflection point is the observed base year participation rate at the observed real wage.

Thus we assume that labor supply elasticity is highest around the observed wage (i.e. a labor surplus economy) and decreases as wages rise, becoming completely inelastic as labor force participation rates exhaust the eligible labor force. The current implementation of the model uses an economy-wide aggregate labor supply function, i.e. all household are aggregated together.

Migration is modeled with a simple variant of the Harris-Todaro paradigm, where workers move between regions in response to relative wages in those labor markets. For this implementation of the Indonesia model, we make five assumptions:

1. Workers migrate, leaving and joining their respective households.
2. Migrants seek new employment in the same labor classification they left.
3. Each occupational group has it's own migration function.
4. There are two regions, Rural and Urban.
5. Workers consider only relative market wages in the migration decision.

This leads to two regions (Rural, Urban), three labor classifications (Manual, Clerical, Professional) and the following constant elasticity calibrated migration function

$$\frac{L_{lr}}{L_{lu}} = \alpha_l \left(\frac{W_{lr_{rk}}}{W_{lu}} \right)^{\mu_l}$$