Chapter 4 Medium-Run Prospects of Viet Nam's Economy: CGE Simulation Analysis of the 7th Five-Year Plan

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1. Introduction

The purpose of this paper is, first, to trace the macro-economic numeric values targeted in the 7th Five-Year Plan (7FYP) for 2001-2005 of the Socialist Republic of Viet Nam at the macro-industrial level (i.e., consistency check) and, second, to investigate the relation between poverty reduction strategy and economic growth (i.e., trade-off analysis). For this purpose, a computable general equilibrium (CGE) model of multiple sectors will be constructed based on the 1996 input-output table and applied to the simulation analysis of the Viet Nam's economy for the period of 15 years from 1996 to 2010.

According to the macro-economic target values in the 7FYP, a GDP growth rate of 6.7% for 2001-2005 is expected to be realized by appropriating 30% of its GDP for domestic investment with the incremental capital output ratio (ICOR) set at a fairly high level of 4.5, as seen in the targets of the national income flows in Table 1, which is quoted from S. Ishikawa (2000). Concerning the finance of domestic investment, one-third is expected to come from the overseas savings, of which 1/2 is from ODA and 1/2 from FDI and other sources. This paper first presents how the macro-economic target values relate to other macro-economic variables such as the exchange rate and inflation, on the one hand, and to the production, employment, and prices in different industries, on the other, in the reference simulation or base run. We then focus on the finance of domestic investment to do a "consistency check" by evaluating and comparing the reference and alternative simulations in light of the domestic and overseas sources of finance.

In regard to the relation between poverty reduction and economic growth, this paper focuses on how the impact on the GDP growth rate is different among different public investment categories. We present the results of simulation in terms of investment multipliers to do a "trade-off analysis" by comparing different scenarios. In the trade-off analysis, public investment or infrastructure investment by government is classified into four categories: investment into the road system (IG1), power and water (IG2), transportation and telecommunications (IG3), and education and health (IG4). In this paper, the strategy for economic growth is represented by the increases in the public investment into economic infrastructures, while the strategy for poverty reduction is through increases in public investment into education and health, though the treatment of poverty reduction strategy in this manner is partial and limited.

2. CGE model for the Vietnamese economy

The CGE model covers 24 industries based on the 1996 input-output table. See Appendix 2-1 for the industry classification and the input-output table. To do the trade-off analysis, we divide government investment into four categories as mentioned above (i.e., road construction, power and water utilities, transportation and telecommunications, and public education and health) and estimate the corresponding stocks based on its time series data. Except for that of roads, the stock of each investment category constitutes part of the stock of one of the 24 industries. This means that the capital stock of each industry consists of the capital stock by the government and that by the private sector (including the FDI stock). See Appendix 2-2 for the capital stock data of each industry. In appendix 2-2, the road stock is included in the category of transport and telecommunication sector. However, in the model, it is separated from this category and treated as public goods related to all industries to affect their productivity (TFP). Appendix 2-2 has the employment data of each industry, whereas Appendix 2-3 has the macro-economic data.

The equation system in Appendix 1-1 describes the framework of the model, the fundamental features of which are as follows.

(1) The nominal investment is treated as an exogenous variable. The equation of the balance between savings (domestic and foreign) and investment is excluded from the system based on Warlas's law. Domestic savings (governmental and private) are treated as endogenous variables determined by the savings rate multiplied by income, whereas foreign savings (inflow of foreign capital such as ODA and FDI) are treated as exogenous variables.

(2) The inflow of foreign capital (foreign savings) is an exogenous variable. The nominal exchange rate is determined endogenously using the floating system of exchange rate. However, the international prices for imports are exogenous variables set at 1.0.

(3) The wages in the 23 non-agricultural sectors are exogenous variables. The labor demand in each sector is determined by the marginal condition. The labor in the agricultural sector is determined by the residual (i.e., total labor supply minus non-agricultural labor demand). The wage in the agricultural sector is set equal to the marginal labor productivity.

(4) The capital stock in each industry is given at the beginning of the year. The total capital stock at the beginning of the next year, which is determined by the total investment in the current year, is allocated to each industry in proportion to the rate of return.

(5) The production function, the composite goods function (Armington assumption), and the transformation curve are all of the CES and CET types. The consumption function is of the Cobb-Douglas type.

As the numeraire is the amount of savings (or currency) whose price is unity (1.0) from the first fundamental feature (1) above, the price variables of the model, such as product prices and wages, are all determined at the

absolute level to enable us to analyze the resulting inflation. From the second fundamental feature (2) above, the nominal exchange rate is endogenous. This gives the real exchange rate when divided by an appropriate price. This enables analysis of upward revaluation and devaluation of VN dong in nominal and real terms. Fundamental feature (3) above assumes a framework that corresponds to a Lewis type dual economymodel in regards to the labor market.

3. Reference simulation (base run)

Appendix 3 presents the base run simulation (or reference simulation) based on the above data and framework of the model, in which macro-economic key variables are predicted as closely to the 7FYP target values (e.g., 6.7% for GDP growth) in Table 1 as possible. Appendix 3 shows the detailed results of reference simulation covering major macro-economic variables as well as production, prices, employment, exports and imports in various industries. Table 3 includes also some results related to the macro-economy.

According to the reference simulation of the macro-economy, the average GDP growth rate is 6.7% (just the same as the target rate), the average rate of increase of the GDP deflator is 7.8%, and the average rate of increase of the nominal exchange rate is 6.6% for five years from 2001 to 2005. Therefore, the exchange rate decreases in nominal terms and slightly increases in real terms. The ratio of the nominal investment to the nominal GDP is a little over 30% on average for the same period. As for the finance, the ratio of governmental savings to GDP is 5%, whereas the corresponding figure for private savings is 15%, which approximately agrees with the numeric macro target values in the 7FYP. The ratio of the foreign savings to GDP is set to be exactly 10% for the base run under this condition. In this sense, the foreign savings in the base run is not exactly an exogenous variable.

The reference simulation was derived by the following procedures. The values of the exogenous variables for 1996 to 1999 are actual records. For 2000 to 2010, the nominal domestic investment was extrapolated at the growth rate of 15%, the labor supply assumed a growth rate of 3%, and the growth rate for the nominal wage rate in the non-agricultural sectors was assumed to be 9%. The rate of increase of the parameter TFP was assumed to be 4% for light industries, 2% for heavy industries, and 1% for other industries. The expansion rate of the export size parameter was assumed to be 10% for light industries and 5% for other industries. The elasticity parameters for substitution and transformation were 1.2 for labor-capital, 0.8 for import goods-domestic goods, and 0.75 for export goods-domestic goods. The government savings rate and private savings rate were fixed at the 1996 level, or 25.0% and 17.5%, respectively.

4. Alternative simulations

This study did 15 alternative simulations (Simulations 1 to 15) for consistency checks and trade-off analysis, which are briefly explained in Table 2. Table 3 summarizes the simulation results related to major macro-economic variables.

Consistency check

Simulations 1 to 3 in Table 3 correspond to consistency checks, which are related to financing domestic investment. They are to confirm that the 7FYP numerical target values are viable. These checks deal with the cases where (1) the ratio of foreign savings to GDP increases from 10% to 20%, (2) the domestic private saving rate increases from 17.5% to 20%, and (3) the government saving rate increases from 25.0% to 30%. In (2), the ratio of domestic private savings to GDP increases 2.1 percentage points from 15.1% to 17.3% averaged for the period of the plan. In (3), the ratio of government savings to GDP increases 1.0 percentage point from 5.3% to 6.3% averaged for the period of the plan. As a result, the GDP growth rate increases 0.5 percentage points from 6.7% to 7.2% in case (1), it increases 0.3 percentage points from 6.7% to 7.0% in case (2), and increases 0.1 percentage point from 6.7% to 6.8% in case (3) averaged over the period of the plan.

In other words, the foreign, domestic private and government savings increase GDP by 0.5%, a little less than 0.3% and 0.2%, respectively, when their ratios to GDP increase by the same amount of 2%. This means that it is more difficult to attain the target growth rate by using self-reliance efforts for investment finance than it is by relying on the ODA and other foreign savings. Of course, this depends on the target rate of GDP growth. As a matter of fact, the ratio of foreign savings to GDP at the end of the 1990s was far lower than 10%, which was the set target. The relatively larger contribution of foreign savings to the growth rate of GDP has been brought about by the lower inflation rate, lower exchange rates (nominal and real), decreased imports, and increased exports. It can be discussed also from the viewpoint of production and employment (industrial structure) in different industries.

Trade-off analysis

The other 12 simulations (Simulations 4 to 15) in Table 3 correspond to the trade-off analysis for strategies for growth and reduction of poverty. As mentioned above, this model divides the government investment into that for the construction of roads (IG1), power and water (IG2), transportation and telecommunications (IG3), education and health (IG4), and other purposes (IG5), all of which except IG1 are allocated to the corresponding industries. Therefore, the increases in IG2 to IG5 contribute to growth through increases in the capital stock of the corresponding industries. As the investment of IG1 constitutes public goods, its increase contributes to growth through the increased productivity of all industries. The contribution of road stock at the level of all industries or the whole economy is estimated as:

$$\ln (Y/L) = 0.4039 \ln (K/L) + 0.07234 \ln (KROAD) - 0.0123 \text{ Trend} - 0.0176 \text{ Dummy} - 0.5438$$

(7.48) (1.86) (2.20) (1.86) (1.88)

1986-1998, R2=0.998, DW=2.9

In other words, the value of the GDP elasticity of road stock is 0.07, which means that an increase of 1% in the road stock increases the GDP growth rate (or the TFP growth rate) by 0.07%. As this will overestimate the GDP growth, if this value of elasticity is applied to all industries, the elasticity of road stock in the TFP of each industry is set at 0.01 in the reference simulation. (For instance, the GDP growth rate will be near 8% at the elasticity value of 0.07.) In trade-off analysis, the value of elasticity largely influences the effect of road stock on growth. This study adopts a relatively conservative value.

In the 12 alternative simulations for trade-off analysis, the amount of investment is increased by 100 billion VN dong from 2000 for each of the four categories of public investment (IG1 to IG4). This increase is done by (1) decreasing the public investment of other categories by 100 billion VN dong, (2) decreasing the private investment by 100 billion VN dong, and (3) increasing ODA (or foreign savings) by 100 billion VN dong with the FDI level unchanged. When the results of simulations in Table 3 concerning the 12 (= 4 x 3) alternative cases are compared with the results of the reference simulation, the average multipliers can be calculated by allowing for the cumulative effect for 10 years from 2001 to 2010. This is shown in Table 4. Table 4 indicates that, of the various types of public investment that are increased, the most desirable is to finance the investment by ODA from the viewpoint of the contribution to GDP. This is indicated in the third column because all of the multipliers are positive. Financing the investment by decreasing the private investment is the most undesirable method because all the multipliers in the second column are negative, which means that the government investment and private investment are in a trade-off relation at the national economic level. The case where the amount is redistributed among different categories of public investment, as shown in the first column, is a trade-off for development policy (public investment policy) at the governmental level. In other words, the investment into social services (education and health) or utilities (power and water) at the expense of the investment into transportation, telecommunications or roads is not desirable from the viewpoint of the growth of GDP. Of course, the evaluation solely in terms of the increase in GDP is superficial. Also, there is a limit to representing the strategy to mitigate poverty through public investment into education and health. It must be noted that even in the case where ODA is increased, the multiplier does not exceed 1. This is because the supply is restricted (as an effective demand model is not considered) and because the exchange rate appreciates due to the increase in the inflow of ODA, resulting in the decrease in exports and the increase in imports.

5. Conclusions

Based on a CGE model of the Vietnamese economy, this study quantitatively analyzed the consistency of the numerical target values in the 7th Five-Year Plan (2001-2005) from the relation between the domestic investment financing and the growth of GDP. We also analyzed the trade-off relation between the strategies for poverty reduction and growth from the viewpoint of the redistribution of public investment and the growth of GDP. Because there were limits in the viewpoint and framework of the analysis, direct and sufficient solutions were not obtained for the set problems. However, Tables 3 and 4 summarize the important results of our analyses that indicate the relatively large role of the ODA or foreign savings.

Table 1 7 FYP (draft) estimates for macroeconomic figures for 2001-2005:

National income flows

	(USD billion in 2000 prices)	(%)
1. GDP	190.9	100
2. Gross domestic saving	36.0	19
Government savings	7.0 - 7.5	4
Private sector + Households	28.5 - 29.0	15
3. Foreign saving	20.0 - 21.0	10 - 11
ODA	9.0	5
FDI	10.0 - 11.0	5-6
Borrowing from	1.0	
4. Gross domestic investment	56.0 - 57.0	29 - 30

Source: S. Ishikawa, "Appendix: Macroeconomic checking of the 7 FYP strategy," 2000, Table 1.

Table 4 Multipliers of public investments (Simulations 4 - 15):

Average for 2001-2010

	Other infrastructure investments decreased	Private investment decreased	ODA increased
IG1: Investment in road system	Simulation 4 0.085	Simulation 8 -0.399	Simulation 12 0.737
IG2: Investment in utilities	Simulation 5 -0.156	Simulation 9 -0.583	Simulation 13 0.553
IG3: Investment in transport and telecommunication	Simulation 6 0.359	Simulation 10 -0.160	Simulation 14 0.976
IG4: Investment in education and health	Simulation 7 -0.167	Simulation 11 -0.588	Simulation 15 0.548

Table 2 Baseline and alternative simulations: 1996-2010

Simulation 0	Base Run
Simulation 1	Increase in foreign capital inflow (F$). Share of foreign savings (F = F$xER) in nominal GDP increases from 10% to 12% for 2000-2010.
Simulation 2	Increase in private savings. Rate of private savings (sP=SH/YH) increases from 17.5% to 20% for 2000-2010.
Simulation 3	Increase in government savings. Rate of government savings (sG=SG/YG) increases 25% to 30% for 2000-2010.
Simulation 4	Increase in road investment (IG1). Public investment in road system increases +100 billion dong with proportionate reduction in other public infrastructure investments (IG2, IG3 and IG4) keeping the remaing public investments unchanged fo0r 2000-2010.
Simulation 5	Increase in utility investment (IG2). Public investment in utilities (electricity and water supply) increases +100 billion dong for 2000-2010 with proportionate reduction in other public infrastructure investments (IG1, IG3 and IG4), keeping the remaining public investments unchanged.
Simulation 6	Increase in transportation and telecommunication investment (IG3). Public investment in transportation and telecommunication increases +100 billion dong for 2000-2010 with proportionate reduction in other public infrastructure investments (IG1, IG2 and IG4) keeping the remaining public investments unchanged.
Simulation 7	Increase in public service investment (IG4). Public investment in public services (education and health, etc.) increases +100 billion dong for 2000-2010 with proportionate reduction in other public infrastructure investments (IG1, IG2 and IG3) keeping the remaining public investments unchanged.
Simulation 8	IG1 increases +100 billion dong with private investments (IP) decreased by the same amount.
Simulation 9	IG2 increases +100 billion dong for 2000-2010 with private investments (IP) decreased by the same amount.
Simulation 10	IG3 increases +100 billion dong for 2000-2010 with private investments decreased by the same amount.
Simulation 11	IG4 increases +100 billion dong for 2000-2010 with private investments decreased by the same amount.
Simulation 12	IG1 increases +100 billion dong for 2000-2010 with ODA decreased by the same amount.
Simulation 13	IG2 increases +100 billion dong for 2000-2010 with ODA decreased by the same amount.
Simulation 14	IG3 increases +100 billion dong for 2000-2010 with ODA decreased by the same amount.
Simulation 15	IG4 increases +100 billion dong for 2000-2010 with ODA decreased by the same amount.

Table 3. Simulation Results based on CGE Model for Viet Nam's Economy: 1996-2010

(Units: billion VN dong at constant prices of 1996; %)

SIMULATION 0: Base Run

Year	1996	2000	2005	2010	Average growth rates 1996-2000	2000-2005	2005-2010
GDP Deflator	1.0000	1.1373	1.6560	2.3988	3.3	7.8	7.7
Exchange Rate	1.0000	1.0830	1.4938	2.0223	2.0	6.6	6.2
Nominal GDP	277521.0	388383.3	782042.4	1573714.8	8.8	15.0	15.0
Real GDP	277521.0	341508.4	472255.8	656045.0	5.3	6.7	6.8
Total Imports	150337.1	192537.8	279427.9	411362.3	6.4	7.7	8.0
Total Exports	111176.9	142453.4	202785.0	285091.6	6.4	7.3	7.1
Private Consumption	202509.0	242153.7	331091.1	461820.8	4.6	6.5	6.9
Investment Financing (% GDP)	1996-2000	2000-2005	2005-2010	2000-2010			
Total Real Investment	28.6	32.6	34.7	33.8			
Total Nominal Investment	28.7	30.4	30.4	30.4			
Government Savings	7.0	5.3	5.2	5.2			
Private Savings	14.6	15.1	15.2	15.2			
Foreign Savings	7.1	10.0	10.0	10.0			

SIMULATION 1: Capital Inflow (share of foreign savings(F$)) increases from 10% to 12% of GDP.

Year	1996	2000	2005	2010	1996-2000	2000-2005	2005-2010
GDP Deflator	1.0000	1.0600	1.5161	2.1838	1.5	7.4	7.6
Exchange Rate	1.0000	0.8352	1.2442	1.7118	-4.4	8.3	6.6
Nominal GDP	277521.0	358985.9	725383.9	1460847.0	6.6	15.1	15.0
Real GDP	277521.0	338668.2	478450.5	668959.3	5.1	7.2	6.9
Total Imports	150337.1	209997.2	298945.4	438601.2	8.7	7.3	8.0
Total Exports	111176.9	132508.0	196787.2	279145.6	4.5	8.2	7.2
Private Consumption	202509.0	257087.4	346334.4	482819.3	6.1	6.1	6.9
Investment Financing (% GDP)	1996-2000	2000-2005	2005-2010	2000-2010			
Total Real Investment	28.6	35.5	37.5	36.7			
Total Nominal Investment	28.7	32.3	32.3	32.3			
Government Savings	7.0	5.1	5.1	5.1			
Private Savings	14.6	15.2	15.2	15.2			
Foreign Savings	7.1	12.0	12.0	12.0			

SIMULATION 2: Private Saving Rate Increases from 17.5% to 20%

Year	1996	2000	2005	2010	1996-2000	2000-2005	2005-2010
GDP Deflator	1.0000	1.0644	1.5345	2.2158	1.6	7.6	7.6
Exchange Rate	1.0000	0.9646	1.3762	1.8784	-0.9	7.4	6.4
Nominal GDP	277521.0	358626.8	723486.2	1456586.1	6.6	15.1	15.0
Real GDP	277521.0	336922.7	471492.3	657371.4	5.0	7.0	6.9
Total Imports	150337.1	193928.8	279554.3	410890.8	6.6	7.6	8.0
Total Exports	111176.9	139193.6	202902.0	286940.9	5.8	7.8	7.2
Private Consumption	202509.0	238816.9	323847.4	450582.5	4.2	6.3	6.8
Investment Financing (% GDP)	1996-2000	2000-2005	2005-2010	2000-2010			
Total Real Investment	28.6	34.3	36.4	35.6			
Total Nominal Investment	28.7	32.6	32.5	32.6			
Government Savings	7.0	5.2	5.2	5.2			
Private Savings	14.6	17.3	17.3	17.3			
Foreign Savings	7.1	10.0	10.0	10.0			

SIMULATION 3: Government Saving Rate Increases from 25% to 30%

Year	1996	2000	2005	2010	1996-2000	2000-2005	2005-2010
GDP Deflator	1.0000	1.1067	1.6048	2.3222	2.6	7.7	7.7
Exchange Rate	1.0000	1.0336	1.4447	1.9633	0.8	6.9	6.3
Nominal GDP	277521.0	375870.2	757487.0	1525129.7	7.9	15.0	15.0
Real GDP	277521.0	339643.6	472001.3	656750.6	5.2	6.8	6.8
Total Imports	150337.1	193067.9	279469.2	411144.8	6.5	7.7	8.0
Total Exports	111176.9	141157.2	202894.2	285989.5	6.2	7.5	7.1
Private Consumption	202509.0	240739.8	328163.9	457324.0	4.4	6.4	6.9
Investment Financing (% GDP)	1996-2000	2000-2005	2005-2010	2000-2010			
Total Real Investment	28.6	33.3	35.4	34.5			
Total Nominal Investment	28.7	31.3	31.2	31.3			
Government Savings	7.0	6.3	6.3	6.3			
Private Savings	14.6	15.0	15.0	15.0			
Foreign Savings	7.1	10.0	10.0	10.0			

SIMULATION 4: Public inv. in road increases 100 billion dong each year with proportionate reduction in other Igs

Year	1996	2000	2005	2010	1996-2000	2000-2005	2005-2010
GDP Deflator	1.0000	1.1373	1.6559	2.3987	3.3	7.8	7.7
Exchange Rate	1.0000	1.0830	1.4939	2.0224	2.0	6.6	6.2
Nominal GDP	277521.0	388383.3	782043.2	1573716.6	8.8	15.0	15.0
Real GDP	277521.0	341508.4	472265.4	656059.6	5.3	6.7	6.8
Total Imports	150337.1	192537.8	279424.4	411357.3	6.4	7.7	8.0
Total Exports	111176.9	142453.4	202793.8	285104.7	6.4	7.3	7.1
Private Consumption	202509.0	242153.7	331089.6	461819.4	4.6	6.5	6.9
Investment Financing (% GDP)	1996-2000	2000-2005	2005-2010	2000-2010			
Total Real Investment	28.6	32.6	34.7	33.8			
Total Nominal Investment	28.7	30.4	30.4	30.4			
Government Savings	7.0	5.3	5.2	5.2			
Private Savings	14.6	15.1	15.2	15.2			
Foreign Savings	7.1	10.0	10.0	10.0			

SIMULATION 5: Public inv in pub utilities increases 100 billion dong each year with proportionate reduction in other Igs

Year	1996	2000	2005	2010	1996-2000	2000-2005	2005-2010
GDP Deflator	1.0000	1.1373	1.6560	2.3989	3.3	7.8	7.7
Exchange Rate	1.0000	1.0830	1.4937	2.0221	2.0	6.6	6.2
Nominal GDP	277521.0	388383.3	782038.8	1573706.6	8.8	15.0	15.0
Real GDP	277521.0	341508.4	472240.4	656018.6	5.3	6.7	6.8
Total Imports	150337.1	192537.8	279431.1	411367.3	6.4	7.7	8.0
Total Exports	111176.9	142453.4	202773.5	285072.3	6.4	7.3	7.1
Private Consumption	202509.0	242153.7	331091.2	461820.4	4.6	6.5	6.9
Investment Financing (% GDP)	1996-2000	2000-2005	2005-2010	2000-2010			
Total Real Investment	28.6	32.6	34.7	33.8			
Total Nominal Investment	28.7	30.4	30.4	30.4			
Government Savings	7.0	5.3	5.2	5.2			
Private Savings	14.6	15.1	15.2	15.2			
Foreign Savings	7.1	10.0	10.0	10.0			

SIMULATION 6: Public inv in trans&tel increases 100 billion dong each year with proportionate reduction in other Igs

Year	1996	2000	2005	2010	1996-2000	2000-2005	2005-2010
GDP Deflator	1.0000	1.1373	1.6559	2.3986	3.3	7.8	7.7
Exchange Rate	1.0000	1.0830	1.4940	2.0225	2.0	6.6	6.2
Nominal GDP	277521.0	388383.3	782053.0	1573739.3	8.8	15.0	15.0
Real GDP	277521.0	341508.4	472290.0	656104.1	5.3	6.7	6.8
Total Imports	150337.1	192537.8	279424.9	411356.1	6.4	7.7	8.0
Total Exports	111176.9	142453.4	202806.5	285131.1	6.4	7.3	7.1
Private Consumption	202509.0	242153.7	331097.1	461828.3	4.6	6.5	6.9
Investment Financing (% GDP)	1996-2000	2000-2005	2005-2010	2000-2010			
Total Real Investment	28.6	32.6	34.7	33.8			
Total Nominal Investment	28.7	30.4	30.4	30.4			
Government Savings	7.0	5.3	5.2	5.2			
Private Savings	14.6	15.1	15.2	15.2			
Foreign Savings	7.1	10.0	10.0	10.0			

SIMULATION 7: Public inv in pub services increases 100 billion dong each year with proportionate reduction in other Igs

Year	1996	2000	2005	2010	1996-2000	2000-2005	2005-2010
GDP Deflator	1.0000	1.1373	1.6560	2.3989	3.3	7.8	7.7
Exchange Rate	1.0000	1.0830	1.4938	2.0222	2.0	6.6	6.2
Nominal GDP	277521.0	388383.3	782037.9	1573704.6	8.8	15.0	15.0
Real GDP	277521.0	341508.4	472239.1	656017.6	5.3	6.7	6.8
Total Imports	150337.1	192537.8	279430.0	411366.0	6.4	7.7	8.0
Total Exports	111176.9	142453.4	202773.6	285071.8	6.4	7.3	7.1
Private Consumption	202509.0	242153.7	331088.4	461817.2	4.6	6.5	6.9
Investment Financing (% GDP)	1996-2000	2000-2005	2005-2010	2000-2010			
Total Real Investment	28.6	32.6	34.7	33.8			
Total Nominal Investment	28.7	30.4	30.4	30.4			
Government Savings	7.0	5.3	5.2	5.2			
Private Savings	14.6	15.1	15.2	15.2			
Foreign Savings	7.1	10.0	10.0	10.0			

SIMULATION 8: Public inv. in road system increases 100 billion dong each year with private investment decreased.

Year	1996	2000	2005	2010	1996-2000	2000-2005	2005-2010
GDP Deflator	1.0000	1.1373	1.6561	2.3990	3.3	7.8	7.7
Exchange Rate	1.0000	1.0830	1.4938	2.0222	2.0	6.6	6.2
Nominal GDP	277521.0	388383.3	782050.0	1573723.1	8.8	15.0	15.0
Real GDP	277521.0	341508.4	472211.8	655999.5	5.3	6.7	6.8
Total Imports	150337.1	192537.8	279427.9	411362.2	6.4	7.7	8.0
Total Exports	111176.9	142453.4	202741.3	285049.1	6.4	7.3	7.1
Private Consumption	202509.0	242153.7	331091.5	461816.8	4.6	6.5	6.9
Investment Financing (% GDP)	1996-2000	2000-2005	2005-2010	2000-2010			
Total Real Investment	28.6	32.6	34.7	33.8			
Total Nominal Investment	28.7	30.4	30.4	30.4			
Government Savings	7.0	5.3	5.2	5.2			
Private Savings	14.6	15.1	15.2	15.2			
Foreign Savings	7.1	10.0	10.0	10.0			

SIMULATION 9: Public inv. in transport and telecom. increases 100 billion dong each year with private inv. decreased.

Year	1996	2000	2005	2010	1996-2000	2000-2005	2005-2010
GDP Deflator	1.0000	1.1373	1.6562	2.3991	3.3	7.8	7.7
Exchange Rate	1.0000	1.0830	1.4937	2.0221	2.0	6.6	6.2
Nominal GDP	277521.0	388383.3	782063.3	1573751.6	8.8	15.0	15.0
Real GDP	277521.0	341508.4	472193.4	655966.7	5.3	6.7	6.8
Total Imports	150337.1	192537.8	279427.9	411362.2	6.4	7.7	8.0
Total Exports	111176.9	142453.4	202728.9	285027.4	6.4	7.3	7.1
Private Consumption	202509.0	242153.7	331088.9	461812.0	4.6	6.5	6.9
Investment Financing (% GDP)	1996-2000	2000-2005	2005-2010	2000-2010			
Total Real Investment	28.6	32.6	34.7	33.8			
Total Nominal Investment	28.7	30.4	30.4	30.4			
Government Savings	7.0	5.3	5.2	5.2			
Private Savings	14.6	15.1	15.2	15.2			
Foreign Savings	7.1	10.0	10.0	10.0			

SIMULATION 10: Public investment in public utilities increases 100 billion dong each year with private inv. decreased.

Year	1996	2000	2005	2010	1996-2000	2000-2005	2005-2010
GDP Deflator	1.0000	1.1373	1.6561	2.3988	3.3	7.8	7.7
Exchange Rate	1.0000	1.0830	1.4938	2.0223	2.0	6.6	6.2
Nominal GDP	277521.0	388383.3	782054.5	1573726.5	8.8	15.0	15.0
Real GDP	277521.0	341508.4	472233.5	656038.7	5.3	6.7	6.8
Total Imports	150337.1	192537.8	279429.1	411364.1	6.4	7.7	8.0
Total Exports	111176.9	142453.4	202752.2	285071.1	6.4	7.3	7.1
Private Consumption	202509.0	242153.7	331098.5	461826.7	4.6	6.5	6.9
Investment Financing (% GDP)	1996-2000	2000-2005	2005-2010	2000-2010			
Total Real Investment	28.6	32.6	34.7	33.8			
Total Nominal Investment	28.7	30.4	30.4	30.4			
Government Savings	7.0	5.3	5.2	5.2			
Private Savings	14.6	15.1	15.2	15.2			
Foreign Savings	7.1	10.0	10.0	10.0			

SIMULATION 11: Public investment in public services increases 100 billion dong each year with private inv. decreased.

Year	1996	2000	2005	2010	1996-2000	2000-2005	2005-2010
GDP Deflator	1.0000	1.1373	1.6562	2.3991	3.3	7.8	7.7
Exchange Rate	1.0000	1.0830	1.4937	2.0222	2.0	6.6	6.2
Nominal GDP	277521.0	388383.3	782059.7	1573744.9	8.8	15.0	15.0
Real GDP	277521.0	341508.4	472192.7	655966.6	5.3	6.7	6.8
Total Imports	150337.1	192537.8	279428.0	411362.3	6.4	7.7	8.0
Total Exports	111176.9	142453.4	202728.6	285026.9	6.4	7.3	7.1
Private Consumption	202509.0	242153.7	331087.6	461810.6	4.6	6.5	6.9
Investment Financing (% GDP)	1996-2000	2000-2005	2005-2010	2000-2010			
Total Real Investment	28.6	32.6	34.7	33.8			
Total Nominal Investment	28.7	30.4	30.4	30.4			
Government Savings	7.0	5.3	5.2	5.2			
Private Savings	14.6	15.1	15.2	15.2			
Foreign Savings	7.1	10.0	10.0	10.0			

SIMULATION 12: Public investment in road system increases 100 billion dong each year, financed by ODA.

Year	1996	2000	2005	2010	1996-2000	2000-2005	2005-2010
GDP Deflator	1.0000	1.1366	1.6548	2.3974	3.3	7.8	7.7
Exchange Rate	1.0000	1.0810	1.4922	2.0210	2.0	6.7	6.3
Nominal GDP	277521.0	388133.6	781633.7	1573113.1	8.7	15.0	15.0
Real GDP	277521.0	341486.7	472329.1	656178.0	5.3	6.7	6.8
Total Imports	150337.1	192648.8	279538.5	411472.9	6.4	7.7	8.0
Total Exports	111176.9	142383.6	202772.8	285115.6	6.4	7.3	7.1
Private Consumption	202509.0	242244.8	331182.0	461914.9	4.6	6.5	6.9
Investment Financing (% GDP)	1996-2000	2000-2005	2005-2010	2000-2010			
Total Real Investment	28.6	32.6	34.7	33.8			
Total Nominal Investment	28.7	30.4	30.4	30.4			
Government Savings	7.0	5.3	5.2	5.2			
Private Savings	14.6	15.1	15.2	15.2			
Foreign Savings	7.1	10.0	10.0	10.0			

SIMULATION 13: Public investment in public utilities increases 100 billion dong each year, financed by ODA increase.

Year	1996	2000	2005	2010	1996-2000	2000-2005	2005-2010
GDP Deflator	1.0000	1.1366	1.6549	2.3976	3.3	7.8	7.7
Exchange Rate	1.0000	1.0810	1.4922	2.0209	2.0	6.7	6.3
Nominal GDP	277521.0	388133.6	781646.9	1573141.7	8.7	15.0	15.0
Real GDP	277521.0	341486.7	472310.7	656145.2	5.3	6.7	6.8
Total Imports	150337.1	192648.8	279538.5	411472.8	6.4	7.7	8.0
Total Exports	111176.9	142383.6	202760.3	285093.8	6.4	7.3	7.1
Private Consumption	202509.0	242244.8	331179.4	461910.1	4.6	6.5	6.9
Investment Financing (% GDP)	1996-2000	2000-2005	2005-2010	2000-2010			
Total Real Investment	28.6	32.6	34.7	33.8			
Total Nominal Investment	28.7	30.4	30.4	30.4			
Government Savings	7.0	5.3	5.2	5.2			
Private Savings	14.6	15.1	15.2	15.2			
Foreign Savings	7.1	10.0	10.0	10.0			

SIMULATION 14: Public inv. in trans&telecom increases 100 billion dong each year with private investment decreased.

Year	1996	2000	2005	2010	1996-2000	2000-2005	2005-2010
GDP Deflator	1.0000	1.1366	1.6548	2.3972	3.3	7.8	7.7
Exchange Rate	1.0000	1.0810	1.4923	2.0210	2.0	6.7	6.3
Nominal GDP	277521.0	388133.6	781638.1	1573116.5	8.7	15.0	15.0
Real GDP	277521.0	341486.7	472350.7	656217.2	5.3	6.7	6.8
Total Imports	150337.1	192648.8	279539.7	411474.7	6.4	7.7	8.0
Total Exports	111176.9	142383.6	202783.6	285137.6	6.4	7.3	7.1
Private Consumption	202509.0	242244.8	331189.0	461924.7	4.6	6.5	6.9
Investment Financing (% GDP)	1996-2000	2000-2005	2005-2010	2000-2010			
Total Real Investment	28.6	32.6	34.7	33.8			
Total Nominal Investment	28.7	30.4	30.4	30.4			
Government Savings	7.0	5.3	5.0	5.1			
Private Savings	14.6	15.1	15.1	15.1			
Foreign Savings	7.1	10.0	10.0	10.0			

SIMULATION 15: Public inv. in public services increases 100 billion dong each year with private inv. decreased.

Year	1996	2000	2005	2010	1996-2000	2000-2005	2005-2010
GDP Deflator	1.0000	1.1366	1.6549	2.3975	3.3	7.8	7.7
Exchange Rate	1.0000	1.0810	1.4922	2.0209	2.0	6.7	6.3
Nominal GDP	277521.0	388133.6	781643.4	1573135.0	8.7	15.0	15.0
Real GDP	277521.0	341486.7	472309.9	656145.1	5.3	6.7	6.8
Total Imports	150337.1	192648.8	279538.6	411472.9	6.4	7.7	8.0
Total Exports	111176.9	142383.6	202760.1	285093.3	6.4	7.3	7.1
Private Consumption	202509.0	242244.8	331178.0	461908.6	4.6	6.5	6.9
Investment Financing (% GDP)	1996-2000	2000-2005	2005-2010	2000-2010			
Total Real Investment	28.6	32.6	34.7	33.8			
Total Nominal Investment	28.7	30.4	30.4	30.4			
Government Savings	7.0	5.3	5.2	5.2			
Private Savings	14.6	15.1	15.2	15.2			
Foreign Savings	7.1	10.0	10.0	10.0			

APPENDIX 1-1

A CGE Model of Viet Nam: Equations of the Model

A. Systems of Equations

Price Relations:

(1) $PM_i = \overline{PM\$}_i * ER * (1+ tm_i)$

(2) $PE_i = PE\$_i * ER * (1+ te_i)$

(3) $P_i = (PD_i * D_i^D + PM_i * M_i) / Q_i$

(4) $PX_i = (PD_i * D_i^S + PE_i * E_i) / X_i^S$

(5) $PN_i = PX_i - \sum_i iocf_i * P_i - PX_i * tind_i$

Production functions

(6) $X_i^S = ad_i * (alphl_i * L_i^{-\rho_i} + (1- alphl_i) * K_i^{-\rho_i})^{-1/\rho_i}$

(7) $D_i^S = at_i^{\gamma_i/(1-\gamma_i)} * ((1-gamma_i) * PX_i / PD_i)^{1/(1-\gamma_i)} * X^S{}_i,$

(8) $E_i = at_i^{\gamma_i/(1-\gamma_i)} * (gamma_i * PX_i / PE_i)^{1/(1-\gamma_i)} * X^S{}_i,$

Labor market conditions

(9) $L_i = ad_i^{-\rho_i/(1+\rho_i)} * (alphl_i * PN_i / W_i)^{1/(1+\rho_i)} * X^S{}_i,$

here W_i = exogenous (i = $\overline{2.24}$)

(10) $L_1 = \overline{L^S} - \sum_i L_i$ (i = $\overline{2.24}$)

(9-1)' $L_i = ad_i^{-\rho_i/(1+\rho_i)} * (alphl_i * PN_i / W_i)^{1/(1+\rho_i)} * X^S{}_i$ (i = $\overline{2.24}$)

(9-2)' $W_i = wagcf_i * W_n,$ here $wagcf_i$ = constant

(10-1)' $\sum_i L_i = L^n$ and $W_n = W^e{}_n$ (i = $\overline{2.24}$)

where $W^e{}_n$ = equilibrium wage for non-agricultural sectors

(10-2)' $L_n = \overline{L^S} - L_1$, here L_1 = exogenous

(11) $W_1 = ad_1^{-\rho_1} * alphl_i * PN_1 * (X^S{}_1 / L_1)^{1+\rho_1}$

(12) $W = \sum_i W_i * L_i / \overline{L^S}$

Capital market conditions

(13) $KG_i = \overline{KG_i}$

(14) $KP_i = \overline{KP_i}$

(15) $K_i = ak_i * (lamda_i * KG_i^{-\lambda_i} + (1 - lamda_i) * KP_i^{-\lambda_i})^{-1/\lambda_i}$

(16) $RG_i = ak_i^{-\lambda_i} * lamda_i * R_i * (K_i / KG_i)^{1+\lambda_i}$

(17) $RP_i = ak_i^{-\lambda_i} * (1 - lamda_i) * R_i * (K_i / KP_i)^{1+\lambda_i}$

(18) $R_i = ad_i^{-\rho_i} * (1 - alphl_i) * PN_i * (X_i^S / K_i)^{1+\rho_i}$

(19) $R = \sum_i R_i * K_i / \overline{K^S}$, where $\overline{K^S} = \sum_i K_i$

(20) $RP = \sum_i RP_i * KP_i / \overline{KP^S}$, where $\overline{KP^S} = \sum_i KP_i$

Income and saving

(21) $YH = (\sum_i \overline{K}_i * PK_i + \sum_i L_i * W_i) * (1 - td) + GOVTR$

(22) $YG = (\sum_i M_i * \overline{PM\$_i} * ER) * tm_i +$
$\sum_i X_i * PX_i * tind_i +$
$\sum_i E_i * PE_i * te_i +$
$td * (\sum_i \overline{K}_i * PK_i + \sum_i L_i * W_i)$

(23) $SH = s_p * YH$

(24) $SG = s_g * YG$

(25) $S = SH + SG$

Consumers

(26) $C_i = cpcf_i * (1 - s_p) * YH / P_i$

(27) $C = \sum_i C_i$

(28) $PC = (1 - s_p) * YH / C$

Government

(29) $G = c_g * YG / PG$

(30) $G_i = cgcf_i * G$

(31) $PG = \sum_i P_i * cgcf_i$

(32) $GOVTR = YG - G * PG - SG$

Capital formation

(33) $IG^n = SG + CREDIT + ODA * ER$

(34) $IP^n = I^n - IG^n$ I^n is exogenous

(35) $\overline{IG} = IG^n / PI$ $\overline{IG}$ is exogenous

(36) $IG_i = igcf_i * IG$

(37) $IROAD = roadcf * IG$ $\sum_i igcf_i + roadcf = 1$

(38) $IP = IP^n / PI$

(39) $I = IP + \overline{IG}$

(40) $I_i = invcf_i * I$

(41) $DEPG = \sum_i \overline{KG_i} * depr_i$

(42) $DEPP = \sum_i \overline{KP_i} * depr_i$

(43) $DEPROAD = \overline{KROAD} * deprroad$

(44) $V_i = X^s_i * invtr_i$

(45) $PI = \sum_i invcf_i * P_i$

Foreign capital inflows

(46) $F\$ = F / ER$

(47) $F = fscf * GDP^n$

(48) $ODA = odacf * F\$$

(49) $FDI = F\$ - ODA$

External sectors

(50) $$\frac{E_i}{\overline{E0_i}} = \left(\frac{\overline{PE\$0_i}}{PE\$_i} \right)^{\eta_i}$$

(51) $$Q_i = \sum_j X_j * iocf_{ij} + C_i + G_i + I_i + V_i$$

(52) $$d_i = 1/(1 + \frac{PD_i}{PM_i} * \frac{delta_i}{1 - delta_i})^{1/(1+\delta_i)}$$

(53) $$D_i^D = Q_i * d_i$$

(54) $$M_i = D_i^D * (\frac{PD_i}{PM_i} * \frac{delta_i}{1 - delta_i})^{1/(1+\delta_i)}$$

Equilibrium conditions

(55) $$D_i^S = D_i^D$$

(56) $$\sum_i M_i * \overline{PM\$_i} - \sum_i E_i * \mathrm{PE\$}^i - \overline{F\$_i} = 0$$

(57) $$W * (\sum_i L_i - \overline{L^S}) + R * (\sum_i K_i - \overline{K^S}) + \sum_i PD_i * (D_i - D_i^S) +$$
$$(S + F - I^n - \sum_i P_i * V_i) + ER * (\sum_i M_i * \overline{PM\$_i} - \sum_i E_i * \mathrm{PE\$}^i - \overline{F\$_i}) \equiv 0$$

Inter-temporal change (t= 1996,1997,...,2010)

(58) $$KG^S_{t+1} = KG_t^S + IG_t - DEPG_t$$

(59) $$KG_{i,t+1} = KG_{i,t} * (1 - depr_i) + IG_{i,t}$$

(60) $$KP^S_{t+1} = KP_t^S + IP_t - DEPP_t$$

(61) $$KP_{i,t+1} / KP^S_{t+1} = (KP_{i,t} / KP_t^S) * (1 + \mu * (RP_{i,t} - RP_t) / RP_t)$$

(62) $$KROAD_{t+1} = KROAD_t + IROAD_t - DEPROAD_t$$

(63) $$TFPGR_{t+1} = elas_r * (KROAD_t - KROAD_{t-1}) / KROAD_t$$

GDP identity

(64) $$E = \sum_i E_i$$

(65) $$PE = \sum_i PE_i * E_i / E$$

(66) $$M = \sum_i M_i$$

(67) $$PM = \sum_i (PM_i / (1 + tm_i)) * M_i / M$$

(68) $$V = \sum_i V_i$$

(69) $$PV = \sum_i P_i * V_i / V$$

(70) $$GDP^n = YH + YG$$

$$= \sum_i (PX_i - \sum_j P_j * iocf_{ji}) * X^S{}_i + \sum_i tm_i * \overline{PM\$}_i * ER * M_i + \sum_i te_i * PX_i * E_i$$

$$= PC * C + PG * G + PI * I + PV * V + PE * E - PM * M$$

(71) $$GDP = C + G + I + V + E - M$$

(72) $$PGDP = GDP^n / GDP$$

(73) $$GDP_i^n = (PX_i - \sum_j P_j * iocf_{ji}) * X_i^S$$

(74) $$GDP_i = (1 - \sum_j iocf_{ji}) * X_i^S$$

(75) $$PGDP_i = GDP_i^n / GDP_i$$

APPENDIX 1-2

A CGE Model of Viet Nam: Notation of the System

Notes: (1) super-bar means exogenous variable; (2) suffix 'i' means industry

Price Variables

$\overline{PM\$_i}$	world price of imports
$PE\$_i$	world price of exports
PX_i	output prices
PD_i	domestic prices for domestically produced products
PM_i	domestic prices of imports
PE_i	domestic prices of exports
P_i	prices of composite goods
PN_i	value added prices by sectors
W_i	wage rates by sectors
W_n	equilibrium wage for non-agricultural sectors
R_i	capital rents by sectors
RG_i	sectoral capital rents in government sector
RP_i	sectoral capital rents in private sector
R	average capital rent
RP	average capital rent in private sector
PI	investment price index
PC	consumer price index for private consumption
PG	consumer price index for government consumption
PM	average import price
PE	average export price

ER	exchange rate

Quantity variables

X^S_i	domestic output by sector
L_i	labor demand by sector
$\overline{L^S}$	total labor supply
$\overline{K_i}$	capital stock by sector
$\overline{KG_i}$	sectoral capital stock in government sector
$\overline{KP_i}$	sectoral capital stock in private sector
$KROAD$	road stock
$\overline{K^S}$	total capital stock
$\overline{KG^S}$	total capital stock in government sector
$\overline{KP^S}$	total capital stock in private sector
Q_i	composite good demand
D_i^D	domestic demand for domestically produced products
D_i^S	domestic supply for domestically produced products
E_i	exports by sectors
E	total export
M_i	imports by sectors
M	total import
C_i	private consumption by sectors
C	total demand for private consumption
G_i	demand for government consumption
G	total demand for government consumption
GDP^R	real GDP

I	total real fixed investment
$\overline{IG}$	real fixed government investment
IG_i	government investment by sector
$IROAD$	government investment in road
IP	real fixed private investment
I_i	demand for real fixed investment
V_i	demand for inventory investment by sectors
$DEPG$	total depreciation expenditure in government sectors
$DEPP$	total depreciation expenditure in private sectors
$DEPROAD$	depreciation expenditure on road
$TFPGR_i$	growth rates of scale parameters in production functions

Nominal variables

YH	private income
YG	government revenue
$GOVTR$	government revenue transferred to households
S	domestic savings
SG	government savings
SP	private savings
$\overline{F\$}$	foreign savings in U.S. dollar
F	foreign savings in domestic currency
ODA	inflow of foreign aid in U.S. dollar
FDI	other inflows of foreign capital in U.S. dollar
I^n	total nominal fixed investment
IG^n	nominal fixed government investment

IP^n nominal fixed private investment

$CREDIT$ government borrowings from private sector

GDP^N nominal GDP

Parameters

Functional Parameters

ad_i scale parameters in production function

$alphl_i$ share parameters in production function

ρ_i exponent parameters in production function

ak_i scale parameters in composite capital function

$lamda_i$ share parameters in composite capital function

λ_i exponent parameters in composite capital function

$iocf_{ij}$ intermediate input coefficient of good j in industry i

ac_i scale parameters in composite good function

$delta_i$ share parameters in composite good function

δ_i exponent parameters in composite goods function

at_i scale parameters in export supply function

$gamma_i$ share parameters in export supply function

γ_i exponent parameters in export supply function

$\overline{E0}_i$ scale parameter of export demand function

$\overline{PWE0}_i$ parameter of export demand function

η_i price elasticity of export demand function

Shares and Ratios:

$cpcf_i$ quantity ratio to real private consumption

$cgcf_i$ quantity ratio to real government consumption

$invcf_i$ quantity ratio to real investment

$invtr_i$	ratio of inventory investment to real production
$depr_i$	ratio of depreciation expenditure to capital stock by sector
$deprroad$	ratio of depreciation expenditure to road stock
$wagcf_i$	relative wage coefficients
$igcf_i$	sectoral shares of government investment
$roadcf$	share of government investment in road
s_p	private saving rate
s_g	government saving rate
$fscf$	ratio of foreign savings (F) to nominal GDP
$odacf$	share of the ODA in flow in total foreign savings (F)
$elas_r$	elasticity of TFP with respect to road stock

Tax parameters

tm_i	import tariff rate
te_i	export duty rate
$tind_i$	indirect tax rate in production
td_i	direct tax rate

APPENDIX 2-1

INPUT-OUTPUT TABLE 1996, AGGREGATED FOR 24 SECTORS, producer prices

(Unit: million VN dong)

Code of sectors	1	2	3	4	5	6	7	8	9	10	11
1. Agriculture	12006175	52842	0	80472	45168945	1909580	3106625	1057241	619	352201	7341
2. Fishing	209942	1917951	0	0	4827251	36714	418	6	0	234458	303
3. Petroleum	0	0	0	0	351	0	162	13470	0	504	160
4. Other mining	115116	2548	3395	1416941	54989	15126	201554	2804063	362785	221100	7407
5. Food processing	100403	16236	1	234467	5512642	573447	9606	28189	3666	30034	1534
6. Beverage & Tobacco	9549	23359	3	9807	8877	452483	4443	5311	308	5782	2385
7. Wood & paper	387071	123187	966	200240	446372	329459	6191280	1470394	24875	286259	73624
8. Construction Materials	310162	34328	624	66317	41831	225942	142671	1524077	28007	148883	18459
9. Fertilizers	12577567	56296	0	0	16078	0	2441	0	459411	10519	0
10. Chemicals	394068	158700	114519	1863631	1013884	548994	974569	824381	710481	6048914	107561
11. Motorbike and transport means	186804	548981	14517	295913	70597	50065	291269	209388	5081	29844	2539079
12. Electrical equipment	39622	2072	13367	166672	16752	4283	34850	63659	8472	12543	59199
13. Other machinary and equipt.	589467	39683	54175	353848	67002	56307	288491	230698	38840	52768	134002
14. Metals	432456	83791	16206	523262	284284	448824	328892	358838	42417	368436	1344176
15.. Textile & clothing	22647	18955	12070	50746	23171	31767	218756	18362	1513	42393	8063
16. Leather	829	12	0	1651	3118	116	2594	352	37	12999	1767
17. Other manufactures	2245613	378095	15859	295657	126049	325615	306937	136968	8813	124464	83428
18. Electricity, water & gas	979775	1516481	11866	1256684	849803	278836	896854	1260700	98575	471547	166298
19. Constructions	113930	465	106277	46948	26051	20211	27000	74203	4428	15069	21720
20. Trade, hotel & restaurant	8367545	1240017	2026605	1152808	4087508	802467	2863411	1587635	740389	2894939	789075
21. Transports & telecommunications	2138692	282419	347336	1204586	2185350	250738	1519225	1785610	319187	591216	297630
22. Banking	169705	31982	3149	96396	170119	60853	156019	120091	11399	68297	40836
23. Public services	31864	554	955896	41699	82978	134914	55504	31738	6380	33784	31520
24. Other services	19776	500438	664240	732195	163264	296619	133440	94805	17947	160753	61739
98. Intermediate cost	41448778	7029392	4361071	10090940	65247266	6853360	17757011	13700179	2893630	12217706	5797306
99. Compensation of producer	63094293	9502919	1671379	1725628	6377072	1793803	1661340	1724564	310034	1308650	612349
100. Tax on production	3621045	633036	3570577	463412	1451050	2917430	415958	1202536	118172	593039	105864
101. Depreciation of fixed asset	2181997	742811	1983574	527259	1343905	528172	366338	1149434	48261	274121	89389
102. Operating surplus	945052	159602	5695825	217635	1357413	1300534	463215	1200437	71605	379717	36428
103. Gross domestic product	69842387	11038368	12921355	2933934	10529440	6539939	2906851	5276971	548072	2555527	844030
104. Gross output	1.11E+08	18067760	17282426	13024874	75776706	13393299	20663862	18977150	3441702	14773233	6641336

12	13	14	15	16	17	18	19	20	21	22	23	24	Total Intermediate cost
1169	1780	1419	887247	31155	1182971	8855	103019	610136	9004	332	299817	339831	67218776
0	0	0	610	777	97	21	52	143218	0	27	3690	0	7375535
0	5	7	6	0	0	153162	6910	45	0	0	0	0	174782
17879	14804	304703	15960	1204	107649	107550	4067228	59284	14781	18	50719	87998	10054801
347	1845	904	7791	1352	623450	4025	16770	2349195	10498	1473	186172	22944	9736991
285	1111	459	13259	1278	2325	3925	17509	410343	31872	3156	150547	32462	1190838
12533	137963	92818	442146	150524	912461	9952	1482631	505096	110847	54572	1130230	692715	15268215
8748	2194	29083	50869	2350	50986	39566	15723252	222109	227958	16502	329534	591347	19835799
0	11	0	53	16	4439	0	439	12433	118	8	340504	15354	13495687
93286	437567	26557	1324046	1302546	2177260	205008	1362588	522365	359044	11240	1138560	557140	22276909
10277	100452	35576	58360	5213	68480	218579	988786	517825	2059677	41522	330288	219819	8896392
337769	35940	22572	35983	6284	25016	2591194	887132	138921	174169	15298	101033	114005	4906807
6806	2196175	14467	263973	26380	305773	608100	448770	1382355	468937	101225	860434	771222	9359898
620241	1110168	2619327	264713	46833	1265431	394540	6646477	366060	423899	6182	106415	223480	18325348
2909	23181	2048	9415836	689342	423112	216469	76378	220733	36741	3952	115841	42995	11717980
1	659	146	61278	661435	52934	15383	6893	10396	3122	583	10393	16	846714
60502	80461	43450	301317	439187	1662982	325523	299401	187594	105083	143892	1828490	396595	9921975
47504	108353	333077	1479529	144542	336937	2225469	2302311	2062117	2289563	78144	1754436	951210	21900611
1113	4684	1460	70810	4316	26348	196000	412101	199062	148372	35469	434118	176491	2166646
270057	2251906	744108	2193794	518504	1348232	559827	219427	826646	176138	110121	942507	254907	36968573
119145	290456	557006	1640972	504632	435323	185710	664949	3622456	1987573	120443	1068108	556923	22675685
11281	22551	39478	247215	51982	114223	11996	432595	779479	70438	887881	783968	89616	4471549
5615	19185	10257	83745	6360	31515	53415	124835	304848	99353	44920	2561452	180191	4932522
7803	156150	19820	257901	32283	86966	36187	664021	973014	1274687	193873	770073	519752	7837746
1635270	6997601	4898742	19117413	4628495	11244910	8170456	36954474	16425730	10081874	1870833	15297329	6837013	3.32E+08
213182	1079452	1010090	2884768	1881847	2665180	4475169	10373984	19662280	5114580	2832453	23698691	9285344	1.75E+08
115271	218733	157511	551266	327688	767533	616152	1584428	4511486	3664063	132415	364967	1964145	30067777
26081	163119	244658	902367	267953	676740	349227	1903868	2835318	2278335	190834	407693	9642167	29123621
59938	254545	232541	540117	129997	486617	902613	2893295	6698314	1155426	1329195	949291	911181	28370533
414472	1715849	1644800	4878518	2607485	4596070	6343161	16755575	33707398	12212404	4484897	25420642	21802837	2.63E+08
2049742	8713450	6543542	23995931	7235980	15840980	14513617	53710049	50133128	22294278	6355730	40717971	28639850	5.94E+08

Total Final demand	Private consumption	Social consumption	Total capital formation	Gross fixed capital formation	Changes in Stocks	Export	Import	GO, Total	Code of sectors
37318128	37318128	0	1412149	90000	1322149	16565753	11223641	111291165	1. Agriculture
7652074	7652074	0	16670	0	16670	3037885	14404	18067760	2. Fishing
1784	1784	0	184826	0	184826	17141790	220756	17282426	3. Petroleum
370070	370070	0	354879	0	354879	2549150	304026	13024874	4. Other mining
48461129	48461129	0	706976	0	706976	23225056	6353446	75776706	5. Food processing
12023098	12023098	0	480075	0	480075	638639	939351	13393299	6. Beverage & Tobacco
3136932	3136932	0	90519	0	90519	6177243	4009047	20663862	7. Wood & paper
1014050	1014050	0	949302	0	949302	1178698	4000699	18977150	8. Construction Materials
0	0	0	130197	0	130197	299384	10483566	3441702	9. Fertilizers
6052140	6052140	0	1272437	0	1272437	1938570	16766823	14773233	10. Chemicals
5207711	5207711	0	1655244	1254165.6	401078.392	1713089	10831100	6641336	11. Motorbike and transport means
865881	865881	0	1046378	1057170.4	-10792.406	6338	4775662	2049742	12. Electrical equipment
10588030	10588030	0	13629369	12981161	648208.332	804908	25668755	8713450	13. Other machinary and equipt.
490555	490555	0	630727	0	630727	91700	12994788	6543542	14. Metals
6389843	6389843	0	521805	0	521805	14308918	8942615	23995931	15.. Textile & clothing
1701076	1701076	0	457713	0	457713	6224761	1994284	7235980	16. Leather
5522540	5522540	0	653665	0	653665	1689844	1947044	15840980	17. Other manufactures
5407760	5407760	0	713616	0	713616	34681	13543051	14513617	18. Electricity, water & gas
0	0	0	51543403	51543403	0	0	0	53710049	19. Constructions
10958371	10958371	0	0	0	0	5707184	3501000	50133128	20. Trade, hotel & restaurant
3068806	3068806	0	0	0	0	1829795	5280008	22294278	21. Transports & telecommunications
2151181	2151181	0	0	0	0	3075000	3342000	6355730	22. Banking
35885449	17080339	18805110	0	0	0	1436000	1536000	40717971	23. Public services
20964604	17047502	3917102	0	0	0	1502500	1665000	28639850	24. Other services
2.25E+08	2.03E+08	22722212	76449950	66925900	9524050.32	1.11E+08	150337066	594077761	98. Total

APPENDIX 2-2

Capital, Investment and Employment, 1996

Unit: billion VN dong

	total capital stock	*capital stock in state sector*	*capital stock in private sector*	*Government investment*	*Employment*
1. Agricururе	59640.2	2614.8	57025.4	2882.4	24152.8
2. Fishing	6862.9	272.2	6590.7	161.6	622.5
3. Petroleum	17249.5	201.7	17047.8	46.0	104.0
4. Other mining	8787.3	8406.1	381.2	611.5	107.8
5. Food processing	9753.5	4816.0	4937.5	555.8	891.6
6. Beverage & Tobacco	2991.7	2858.6	133.1	532.5	251.0
7. Wood & paper	26499.3	17442.2	9057.1	231.7	232.5
8. Construction Materials	11329.1	7679.3	3649.9	2834.7	241.3
9. Fertilizers	435.5	295.2	140.3	141.3	43.4
10. Chemicals	2309.7	1606.6	703.1	749.5	183.1
11. Motorbike and transport means	754.7	482.0	272.7	10.2	85.7
12. Electrical euipment	287.3	162.3	124.9	92.6	29.8
13. Other machinary and equipt.	3644.2	2962.8	681.4	71.6	151.1
14. Metals	2280.8	1519.3	761.6	245.7	141.3
15. Textile & clothing	26708.4	21878.9	4829.5	726.2	401.8
16. Leather	3331.5	1535.4	1796.1	144.5	263.3
17. Other manufactures	4592.5	3112.9	1479.5	284.3	373.0
18. Electricity, water & gas	34274.9	32110.2	2164.7	5147.2	153.8
19. Constructions	20156.0	15732.9	4423.1	854.9	975.1
20. Trade, hotel & restaurant	40450.0	21243.8	19206.2	891.6	2676.9
21. Transports & telecommunications	36058.9	33504.4	2554.5	7016.5	855.6
22. Banking	951.9	688.0	263.9	31.2	125.3
23. Public services	71236.9	67675.1	3561.8	5147.0	1637.4
24. Other services	38307.7	23861.7	14446.0	780.1	1091.9
TOTAL	428894.4	272662.4	156232.1	30190.6	35791.9

Notes: Government investment in sector 21 include the investment of 4502.4 billion VN dong in road

APPENDIX 2-3

Macro benchmark data, 1996

Unit: billion VN dong

Total domestic investment	76450.0
- Government	30640.6
- Private	45809.4
Financing investment	
- Government	17340.0
- Private	34949.8
- Foreign saving	24160.2
ODA inflow	4157.4
Others	20002.8
Total tax revenue	58167.8
- Indirect taxes	29967.8
- Corporate tax	13100.0
- Import and export duties	15100.0
Total public expenditure	
- Current expenditure	22722.2
- Savings	17340.0
- Others	18105.6

APPENDIX 3

A CGE MODEL FOR VIET NAM'S ECONOMY: SIMULATION RESULTS

SIMULATION 0: Base Run

Units: billion VN dong at constant prices of 1996; %

Years	1996	2000	2005	2010	Average Growth Rates 1996-2000	2000-2005	2005-2010
A. Prices							
Average Wage	4.8882	6.0948	10.9132	19.4712	5.7	12.4	12.3
Wage of Agr. Labor	2.9302	3.3090	6.7481	13.5331	3.1	15.3	14.9
Wage of Non-agr. Labor	9.2915	12.6410	19.4497	29.9258	8.0	9.0	9.0
Average Capital Rent	0.1413	0.1363	0.1585	0.1904	-0.9	3.1	3.7
Consumption Index	1.0000	1.1541	1.7115	2.5041	3.6	8.2	7.9
GDP Deflator	1.0000	1.1373	1.6560	2.3988	3.3	7.8	7.7
Investment Deflator	1.0000	1.1075	1.5086	2.0409	2.6	6.4	6.2
Exchange Rate	1.0000	1.0830	1.4938	2.0223	2.0	6.6	6.2
B. Growth							
Nominal GDP	277521.0	388383.3	782042.4	1573714.8	8.8	15.0	15.0
Real GDP	277521.0	341508.4	472255.8	656045.0	5.3	6.7	6.8
Total Imports	150337.1	192537.8	279427.9	411362.3	6.4	7.7	8.0
Total Exports	111176.9	142453.4	202785.0	285091.6	6.4	7.3	7.1
Private Consumption	202509.0	242153.7	331091.1	461820.8	4.6	6.5	6.9
C. Income and Saving							
Government Revenue	58167.8	82236.9	164420.2	327447.9	9.0	14.9	14.8
As % of GDP	21.0	21.2	21.0	20.8			
Government Saving	17340.0	20559.2	41105.0	81862.0	4.3	14.9	14.8
Private Income	237458.8	335699.7	676709.5	1363941.1	9.0	15.1	15.0
Private Savings	34949.8	58747.4	118424.2	238689.7	13.9	15.1	15.0
Foreign Savings (in dollars)	24160.2	35860.4	52351.2	77819.3	10.4	7.9	8.3
Total Savings	76450.0	118145.0	237733.4	477923.1	11.5	15.0	15.0
D. Investment							
Total Real Investment	76450.0	106998.6	157339.8	232877.1	8.8	8.0	8.2
Real Fixed Investment	66925.9	94592.4	139668.6	207655.6	9.0	8.1	8.3
State Investment	30640.6	61306.0	85984.8	120598.1	18.9	7.0	7.0
Private Investment	36285.3	33286.4	53683.8	87057.5	-2.1	10.0	10.2

Investment Financing (% GDP) Years	1996-2000	2000-2005	2005-2010	2000-2010
Total Real Investment	28.6	32.6	34.7	33.8
Total Nominal Investment	28.7	30.4	30.4	30.4
Government Savings	7.0	5.3	5.2	5.2
Private Savings	14.6	15.1	15.2	15.2
Foreign Savings	7.1	10.0	10.0	10.0

DOMESTIC PRODUCTION

Years	1996	2000	2005	2010	Average Growth Rates 1996-2000	2000-2005	2005-2010
1. Agriculture	111291.2	132575.0	163921.6	202338.7	4.5	4.3	4.3
2. Fishing	18067.8	19776.8	27566.1	38630.5	2.3	6.9	7.0
3. Petroleum	17282.4	31265.2	47053.8	64962.2	16.0	8.5	6.7
4. Other mining	13024.9	17669.0	25381.8	36618.5	7.9	7.5	7.6
5. Food processing	75776.7	94641.1	127339.2	170568.9	5.7	6.1	6.0
6. Beverage & Tobacco	13393.3	18759.8	27938.8	40301.5	8.8	8.3	7.6
7. Wood & paper	20663.9	25919.2	37603.7	54872.6	5.8	7.7	7.9
8. Construction Materials	18977.2	26518.3	39190.1	57917.2	8.7	8.1	8.1
9. Fertilizers	3441.7	4149.0	5157.1	6370.6	4.8	4.4	4.3
10. Chemicals	14773.2	19408.4	27523.0	39190.0	7.1	7.2	7.3
11. Motorbike and transport	6641.3	8643.8	12023.6	16961.9	6.8	6.8	7.1
12. Electrical equipment	2049.7	2705.1	3954.7	5770.6	7.2	7.9	7.9

13. Other machinary and equipt.	8713.5	11190.1	15979.9	23184.7	6.5	7.4	7.7
14. Metals	6543.5	8658.9	12579.5	18269.7	7.3	7.8	7.7
15. Textile & clothing	23995.9	30920.5	48582.5	76766.4	6.5	9.5	9.6
16. Leather	7236.0	9544.1	15649.4	25540.6	7.2	10.4	10.3
17. Other manufactures	15841.0	19472.8	27247.0	38306.3	5.3	6.9	7.1
18. Electricity, water & gas	14513.6	18682.6	27375.2	39745.2	6.5	7.9	7.7
19. Constructions	53710.0	75560.1	111445.3	165492.0	8.9	8.1	8.2
20. Trade, hotel & restaurant	50133.1	61318.5	85397.4	119455.6	5.2	6.8	6.9
21. Transports & telecommunications	22294.3	27420.8	38915.3	55439.2	5.3	7.3	7.3
22. Banking	6355.7	7149.4	9819.9	13689.3	3.0	6.6	6.9
23. Public services	40718.0	41504.9	58279.9	81530.9	0.5	7.0	6.9
24. Other services	28639.9	30184.0	41610.5	62200.7	1.3	6.6	8.4

DOMESTIC PRICES

Years	1996	2000	2005	2010	Average Growth Rates 1996-2000	2000-2005	2005-2010
1. Agriculture	1.0000	1.1310	1.9716	3.4025	3.1	11.8	11.5
2. Fishing	1.0000	1.2885	1.7974	2.4822	6.5	6.9	6.7
3. Petroleum	1.0000	0.9140	1.1467	1.5117	-2.2	4.6	5.7
4. Other mining	1.0000	1.2326	1.7265	2.4119	5.4	7.0	6.9
5. Food processing	1.0000	1.1074	1.6925	2.5923	2.6	8.9	8.9
6. Beverage & Tobacco	1.0000	0.9682	1.3097	1.8326	-0.8	6.2	6.9
7. Wood & paper	1.0000	1.1204	1.5873	2.2219	2.9	7.2	7.0
8. Construction Materials	1.0000	0.9892	1.3310	1.8271	-0.3	6.1	6.5
9. Fertilizers	1.0000	1.0754	1.4842	2.0349	1.8	6.7	6.5
10. Chemicals	1.0000	1.0499	1.4787	2.0682	1.2	7.1	6.9
11. Motorbike and transport	1.0000	1.0952	1.5608	2.1760	2.3	7.3	6.9
12. Electrical equipment	1.0000	1.0691	1.4702	2.0076	1.7	6.6	6.4
13. Other machinary and equipt.	1.0000	1.1541	1.6360	2.2597	3.6	7.2	6.7
14. Metals	1.0000	1.0984	1.4913	2.0242	2.4	6.3	6.3
15. Textile & clothing	1.0000	1.0934	1.4730	1.9544	2.3	6.1	5.8
16. Leather	1.0000	1.0738	1.3929	1.7978	1.8	5.3	5.2
17. Other manufactures	1.0000	1.1020	1.5462	2.1663	2.5	7.0	7.0
18. Electricity, water & gas	1.0000	1.0383	1.3934	1.8849	0.9	6.1	6.2
19. Constructions	1.0000	1.1106	1.5038	2.0299	2.7	6.2	6.2
20. Trade, hotel & restaurant	1.0000	1.1866	1.6873	2.3535	4.4	7.3	6.9
21. Transports & telecommunications	1.0000	1.1378	1.5689	2.1474	3.3	6.6	6.5
22. Banking	1.0000	1.1097	1.5841	2.2075	2.6	7.4	6.9
23. Public services	1.0000	1.3991	2.0054	2.8694	8.8	7.5	7.4
24. Other services	1.0000	1.3955	2.0692	2.7199	8.7	8.2	5.6

EMPLOYMENT

Years	1996	2000	2005	2010	Average Growth Rates 1996-2000	2000-2005	2005-2010
1. Agriculture	24152.8	27611.0	30737.6	33986.0	3.4	2.2	2.0
2. Fishing	622.5	641.5	801.1	1000.1	0.8	4.5	4.5
3. Petroleum	104.0	153.5	180.1	206.2	10.2	3.2	2.7
4. Other mining	107.8	169.4	218.5	289.7	12.0	5.2	5.8
5. Food processing	891.6	853.7	853.4	866.8	-1.1	0.0	0.3
6. Beverage & Tobacco	251.0	199.3	193.6	198.0	-5.6	-0.6	0.4
7. Wood & paper	232.5	255.6	322.5	395.1	2.4	4.8	4.1
8. Construction Materials	241.3	156.3	146.0	156.0	-10.3	-1.4	1.3
9. Fertilizers	43.4	40.2	43.0	46.9	-1.9	1.3	1.8
10. Chemicals	183.1	179.5	219.0	276.7	-0.5	4.1	4.8
11. Motorbike and transport	85.7	107.2	135.1	169.1	5.8	4.7	4.6
12. Electrical equipment	29.8	30.4	38.7	50.3	0.5	5.0	5.4
13. Other machinary and equipt.	151.1	185.6	242.7	315.3	5.3	5.5	5.4
14. Metals	141.3	159.0	198.3	252.7	3.0	4.5	5.0
15. Textile & clothing	401.8	444.1	592.0	766.6	2.5	5.9	5.3
16. Leather	263.3	290.2	388.0	510.7	2.5	6.0	5.6
17. Other manufactures	373.0	409.0	494.2	604.8	2.3	3.9	4.1
18. Electricity, water & gas	153.8	156.6	198.8	255.4	0.5	4.9	5.1
19. Constructions	975.1	1209.5	1560.9	2025.9	5.5	5.2	5.4
20. Trade, hotel & restaurant	2676.9	2907.0	3737.9	4748.6	2.1	5.2	4.9
21. Transports & telecommunications	855.6	891.2	1126.3	1449.1	1.0	4.8	5.2
22. Banking	125.3	106.3	132.2	164.1	-4.0	4.5	4.4
23. Public services	1637.4	1907.6	2513.1	3309.6	3.9	5.7	5.7
24. Other services	1091.9	1220.5	1627.4	2094.8	2.8	5.9	5.2

EXPORTS

Years	1996	2000	2005	2010	Average Growth Rates 1996-2000	2000-2005	2005-2010
1. Agriculture	16565.8	15837.4	18029.3	20415.8	-1.1	2.6	2.5
2. Fishing	3037.9	2625.9	3515.8	4704.5	-3.6	6.0	6.0
3. Petroleum	17141.8	31017.7	46661.6	64398.2	16.0	8.5	6.7
4. Other mining	2549.2	3493.1	4770.5	6486.6	8.2	6.4	6.3
5. Food processing	23225.1	29602.4	40870.1	55847.0	6.3	6.7	6.4
6. Beverage & Tobacco	638.6	924.6	1434.0	2135.6	9.7	9.2	8.3
7. Wood & paper	6177.2	7865.7	11714.9	17468.7	6.2	8.3	8.3
8. Construction Materials	1178.7	1688.7	2611.7	3975.3	9.4	9.1	8.8
9. Fertilizers	299.4	404.3	507.7	632.1	7.8	4.7	4.5
10. Chemicals	1938.6	2774.6	3746.1	5043.8	9.4	6.2	6.1
11. Motorbike and transport	1713.1	2380.4	3176.9	4278.9	8.6	5.9	6.1
12. Electrical equipment	6.3	9.1	12.6	17.3	9.5	6.7	6.5
13. Other machinary and equipt.	804.9	1097.0	1480.8	2022.7	8.0	6.2	6.4
14. Metals	91.7	130.3	180.3	247.6	9.2	6.7	6.5
15. Textile & clothing	14308.9	18613.7	29562.5	47110.0	6.8	9.7	9.8
16. Leather	6224.8	8237.8	13559.4	22193.7	7.3	10.5	10.4
17. Other manufactures	1689.8	2282.9	3059.4	4081.8	7.8	6.0	5.9
18. Electricity, water & gas	34.7	38.2	53.4	73.4	2.5	6.9	6.6
19. Constructions	0.0	0.0	0.0	0.0			
20. Trade, hotel & restaurant	5707.2	5828.5	7734.0	10289.0	0.5	5.8	5.9
21. Transports & telecommunications	1829.8	1901.9	2583.1	3498.9	1.0	6.3	6.3
22. Banking	3075.0	3169.8	4207.2	5643.6	0.8	5.8	6.1
23. Public services	1436.0	1222.2	1621.6	2131.3	-4.0	5.8	5.6
24. Other services	1502.5	1307.2	1692.2	2395.9	-3.4	5.3	7.2

IMPORTS

Years	1996	2000	2005	2010	Average Growth Rates 1996-2000	2000-2005	2005-2010
1. Agriculture	11223.6	14498.5	23917.3	39753.5	6.6	10.5	10.7
2. Fishing	14.4	20.1	28.5	41.1	8.7	7.2	7.6
3. Petroleum	220.8	316.7	448.1	622.7	9.4	7.2	6.8
4. Other mining	304.0	480.5	711.4	1078.5	12.1	8.2	8.7
5. Food processing	6353.4	8002.8	11540.5	16881.7	5.9	7.6	7.9
6. Beverage & Tobacco	939.4	1200.8	1756.6	2596.7	6.3	7.9	8.1
7. Wood & paper	4009.0	5132.9	7515.4	11140.6	6.4	7.9	8.2
8. Construction Materials	4000.7	5190.5	7495.1	11173.6	6.7	7.6	8.3
9. Fertilizers	10483.6	12436.3	15442.2	19176.9	4.4	4.4	4.4
10. Chemicals	16766.8	21373.9	30898.8	45109.6	6.3	7.6	7.9
11. Motorbike and transport	10831.1	13821.3	19869.9	28910.2	6.3	7.5	7.8
12. Electrical equipment	4775.7	6260.0	9140.0	13397.4	7.0	7.9	7.9
13. Other machinary and equipt.	25668.8	33806.8	49248.4	72590.0	7.1	7.8	8.1
14. Metals	12994.8	17298.4	24952.1	36315.1	7.4	7.6	7.8
15. Textile & clothing	8942.6	11445.1	17342.8	26578.4	6.4	8.7	8.9
16. Leather	1994.3	2557.5	3890.8	5987.0	6.4	8.8	9.0
17. Other manufactures	1947.0	2383.6	3384.9	4873.8	5.2	7.3	7.6
18. Electricity, water & gas	13543.1	16577.4	23506.5	34100.9	5.2	7.2	7.7
19. Constructions	0.0	0.0	0.0	0.0			
20. Trade, hotel & restaurant	3501.0	4692.6	6721.2	9662.2	7.6	7.5	7.5
21. Transports & telecommunications	5280.0	6838.8	9726.9	14015.2	6.7	7.3	7.6
22. Banking	3342.0	4104.1	5916.9	8617.2	5.3	7.6	7.8
23. Public services	1536.0	1931.9	2800.9	4100.8	5.9	7.7	7.9
24. Other services	1665.0	2167.5	3172.5	4639.1	6.8	7.9	7.9

Part 2 Scenario-Making of Vietnamese Industrialization under the Constraint of Globalization

Part 2. Scenario-Making of Vietnamese Industrialization under the Constraint of Globalization

(Introduction by Professor Shigeru Ishikawa)

The title of this Part "Scenario-making of Vietnamese Industrialization under the Constraint of Globalization" is the subject of the study that was selected for the General Commentary Group in Phase 3 on the basis of the agreement of both Vietnamese and Japanese sides. (The subject of study in Chapter 1-1-1 is, on the other hand, essentially the topic of the final report which the Japanese side co-chair of JVJR was requested to make to the leaders of the Vietnamese government at the closing stage of JVJR") . While the subject is itself relevant for the JVJR's study on the 7th Five-year Plan, the idea relating to "scenario-making" originates from one of the policy conclusions of this study group in the Follow-Up to Phase 2. Namely, while under the economic situation in and after 1997 several *ad hoc* measures to safeguard against the adverse external economic conditions seem very necessary, the government might explicitly declare its intention to resume its basic policy toward marketization once external economic situation will have been normalized. Government might also endeavor to make clear and announce the economy's steps toward reaching the state of the economy where the goal of marketization was achieved it. We call these goal and steps toward it in described combination as scenario.

Relating to this topic of scenario-making, we have selected three particular sub-topics. First, the natural resources and capital-intensive industries for which Viet Nam is endowed with mineral resources (and additionally the automotive industry). Second, the export promotion industries and third, the small and medium industry (including rural industry).

Chapter 1 Import Substitution/Capital Intensive Industry

1 − 1

Long-term Scenario on Capital-intensive/Infant Industry Furtherance (Summary)*

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At present, Viet Nam is facing the consequences of solid progress by AFTA in the ASEAN arena. Globally, it is in the process of negotiating membership into the WTO. In the face of such integration with the global economy, Viet Nam is making a push toward industrialization, by promoting its export industries and, at the same time, by nurturing capital-intensive and infant industries. As job creation is always important in each stage of economic development, promotion of small industries must also be the priority consideration of the government. Beyond Viet Nam's boundaries, the world is in the throes of an IT revolution. While it is of course important that Viet Nam catches up to the rest of the world on the IT front, Viet Nam must develop a variety of industries in the long run, given the size of its population.

This paper examines the long-term scenario of capital-intensive and infant industries. On the export-promoting area, Viet Nam is targeting about one hundred billion dollars in export in 2020. The long-term development of export-promoting industries must also be accompanied with the proper development of capital intensive and infant industries to secure more added-value accumulation inside Viet Nam. For this reason, Viet Nam also plans to develop heavy and chemical industries, especially where it has domestic reserves such as iron ore and oil. It must be noted, however, that experience of other Asian countries often shows that the existence of these reserves is no guarantee of enhanced international competitiveness.

While capital-intensive and infant industries induce a variety of favorable ripple effects on other areas of the economy, they require enormous up-front investment and take time to produce a return on that investment. Additionally, miniscule disparities in per unit production costs determine the success or failure of operations. Products of such industries are often traded internationally, and prices are highly sensitive to global economic

* This summary is expected to be read by the readers in connection with the analysis by industry (Iron & Steel, petroleum refinery, petrochemical, urea fertilizer, cement and automobile & parts) which is presented in Annex to Volume 1 on General Commentary. This is also party based on the information as of December 2000.

[1] Employed by the Development Bank of Japan at the onset of this study, but currently working as General Manager of KDDI Co. Ltd.

conditions and trends in supply and demand. The domestic demand in Viet Nam for products of capital-intensive industries is to fall below required levels of capital investment, then new plants coming on line will find themselves exposed to international market forces to a greater degree. As a result, careful consideration must be made of the timing of investment, the state of international product supply and demand, and the feasibility of each individual project, and if need be, some form of furtherance provisions may need to be adopted over a fixed period. Such furtherance provisions can act not only to protect local interests, but also to entice foreign investment. It goes without saying, however, that any form of industry furtherance must conform to the rules of institutions such as AFTA and the WTO. To avoid conflict here, Viet Nam should incorporate future plans for individual industry furtherance,into negotiations with AFTA and WTO.

In this summary, we analyze six representative capital-intensive/infant industries that are particularly pertinent to Viet Nam (iron & steel, petroleum refinery, petrochemicals, urea fertilizer, cement and automobiles & car parts). For each industry type, we peruse the current level of awareness in Viet Nam, basic ways of thinking, and long-term scenarios and options for industry furtherance. Particular emphasis is placed on what sort of industry furtherance policy Viet Nam should adopt, in light of the changed regional economic conditions resulting from the East Asian currency crisis and also global economic conditions relating toAFTA/CEPT and the WTO.

Iron and steel

In the early stages of economic growth, the iron and steel industry is perceived as a symbol of a nation's successful industrialization, and crude steel production levels are often used as an indicator of the industrial strength of a country. As a result, governments of developing countries seeking to industrialize have used different levels and means of promotional and furtherance policy to develop a local steel industry. In countries throughout Asian, blast furnace-based integrated production facilities in particular have been set up through state-owned companies as part of national projects, due to the high levels of investment they involve and the sizeable influence they have on other industries. In Viet Nam's case, an additional motivation for wanting to set up a blast furnace-based integrated steel mill, is to make good use of domestic reserves of the feedstock resources needed to make steel, such as iron ore and coal. Based on the experiences of countries such as Japan and South Korea, however, the existence of the resources needed for a given industry is no guarantee of enhanced international competitiveness, and cost reductions can be achieved by establishing large-scale coastal production facilities and importing the desired type of iron ore in vast quantities using dedicated ships.

The level of consumption of steel products in Viet Nam has gradually risen over the years to 2.39 megatons (1999), although this is still the smallest of all the 6 ASEAN nations. Per capita steel product consumption is around 31 kg, quite low when compared to neighboring countries.[2] There would thus appear to be considerable

[2] The per capita consumption in the Philippines, China, Thailand and Japan is 70kg, 100 kg, 200 kg and 600 kg, respectively.

scope for growth. At current production capacity, steel imports around 2010 will amount to 4 Mt of steel products and 1.9 Mt of crude steel, pointing to the necessity of long-term furtherance for the steel industry in order to generate local supplies of steel.

A nation's demand for steel grows with advances in industrialization and the level of transference of industrial structure. As a rough generalization, steel consumption starts rising sharply around the point when the per capita GDP exceeds USD1,000. Rises in steel demand tend to outstrip the speed of economic growth from when growth in demand starts to rise sharply until the per capita GDP reaches USD10,000. At the onset of industrialization, the industrial structure begins to shift from an agricultural to a manufacturing base, infrastructure development takes off, and demand for steel bars for use in the construction of factories and hotels jumps up. At this stage, large numbers of small-scale operators emerge, which produce steel bars by basic hot rolling or electric furnace-based production. As industrialization continues, demand for steel sheets for use in the manufacture of cans, electrical appliances, cars, and the like, kicks in to complement the demand for steel bars, further boosting steel demand. At this time, steel producers are made to scale up operations in order to provide stable supplies of steel sheets, buoyed by the burgeoning steel demand and general growth in the local economy. The pattern of development for steel production operations is to enter the industry downstream and incrementally develop operations back upstream, adopting increasingly capital-intensive production methods on the way, along the path of: basic hot rolling → electric furnace-based bar steel production → steel sheet surface treatment → steel sheet milling → blast furnace-based integrated production. In an alternative pattern of development, steel operations bypass intermediate steps and progress directly to blast furnace-based integrated production from an early stage. Either way, project feasibility, the timing of market entry and nature of furtherance measures must be determined with prudence.

At present, the 10 main steel producers in East Asia[3] account for more than one third of global steel demand and production,[4] and are also seen as having the greatest potential for future growth. On the other hand, under the effects of the Asian economic crisis, a decline in demand for steel has been seen in the area, leading to corporate restructuring and mergers between steel companies. Restructuring of large-scale steel consumers such as the car industry has put pressure on the steel industry to reduce prices, and further industry restructuring is expected in the future. Russian and Ukrainian steel products have a considerable impact on the Asian steel market. Technological levels are relatively low in the two countries, with heavy use made of old-fashioned open-hearth furnaces, but factors such as fully depreciated production facilities and the existence of energy subsidies, lead to high price competitiveness. Asia, including Viet Nam, imports large quantities of steel from Russia and Ukraine in the form of low value-added products (such as semi-finished products, hot coils, and steel bars), where a low price is of maximum importance. The two countries have been the target of

[3] Japan, China, South Korea, Taiwan and the 6 ASEAN nations.

[4] The 10 producers accounted for 36% of global crude steel output in 1999 (282.42 Mt), and 35.9% of global apparent steel consumption.

more than 40 anti-dumping cases throughout the world, but as long as the current state of gross excesses in production capacity (peaking at 160 Mt/year) continue, they are expected to keep exporting with vigor in order to earn foreign revenue.

Crude steel production is well below the level of apparent crude steel consumption in ASEAN countries, and the demand structure is heavily geared toward imports. The import ratio for steel products in 1998 was 62.8% overall in the ASEAN forum, with Singapore (97.1%), Malaysia (70.5%), and Thailand (64.1%) being particularly dependent on imports. One reason for this marked dependence on imports is burgeoning demand for high-quality steel sheets in the motor vehicle and machinery (electronic and electrical) industries in Thailand and Malaysia, and difficulty in establishing local production facilities for steel products of this type. A number of projects were either abandoned or postponed in ASEAN countries as a result of the economic crisis, although new facilities are gradually coming on line. In Thailand, one large-scale cold rolling mill came on line in 1997 and another in 1998 (each 1.0 Mt/year), through joint ventures with Japanese blast furnace manufacturers, and a hot rolling mill came on line in 1999 (1.5 Mt/year). Similarly in Malaysia, Megasteel-the country's first local hot rolling mill-commenced business-level production in October 2000. Although this hot rolling mill is a state-of-the-art thin slab casting type electric furnace-based plant, is having trouble getting off the ground. The Malaysian government has forged policy to protect the local industry, including enforcing effective import bans on products which Megasteel is able to produce, but the steel industry is expected to continue to have a rough ride for some time yet.

Thai Nguyen Iron & Steel Corp. (TISCO) operate existing steel mills in Viet Nam. TISCO produces a total of 100 Mt/year of crude steel (production capacity: 150 Mt/year) and 170 Kt/year of hot coils (production capacity: 250 Mt/year), and has a payroll of 11,000 employees (1999). It is plagued by problems such as being overstaffed due to aging equipment and a bloated corporate structure, and is in need of enhancements to productivity, cost competitiveness, and product quality, as well as needing to improve its environmental record. TISCO's steelworks urgently need modernizing and streamlining, and it is set to be the target of provisions aimed at trimming staff surpluses and expanding its crude steel production capacity.

The next item of capital investment in the Vietnamese steel industry is a small-scale, highly value-added cold rolling mill of annual production capacity 200-250 Kt. The plan is to build the mill in the Phu My industrial zone, south of Ho Chi Min City, to which end a feasibility study has been carried out by JICA. A key issue with this project is how to build a robust, competitive cold rolling mill that will be able to compete with low-priced imports from other ASEAN nations and Russia. It will be vital to determine the plant composition so as to allow the cheap production of a product that can operate at profit in the domestic market with maximum efficiency and stability. In the feasibility study, it was recommended that production focused on galvanized iron sheeting at a production capacity of a little under 210 Kt/year, based on predictions for demand in 2004, the year the plant is scheduled to come on line. Total investment is expected to amount to around USD130M, which it is recommended should be procured through funding from national Vietnamese

organizations such as VSC, as well as low-interest loans from the Development Assistance Fund. However, with the still weak domestic financial system, it is uncertain whether it will be possible to procure the required capital.

There are also plans to build an electric furnace-based billet center in Phu My, at a cost of around USD140M. The underlying objective of the project is to resolve the unbalance that exists between Viet Nam's milling and crude steel production capacities. This is an admirable pursuit, but there are still a number of issues to be resolved, including locating a power supply and scrap supply route, as well as doubts as to the general profitability of the project. The project is conditional on a power generation project currently under consideration for Phu My going ahead, and also approval being given for a sizeable reduction in electricity tariffs. It is also doubtful whether a stable supply route for scrap could be located, with stable price levels guaranteed over the long term. If both the billet center and cold rolling mill are to be built, then VSC must find some way of procuring capital totaling nearly USD300M, which would not be an easy task.

Slightly prior to 1997, an import restriction was imposed on steel bars in order to save the troubled VSC. Under the current system, a tariff of 0-5% is applied to billet, 10-40% to steel bars, and 0% to steel sheets. This tariff schedule seems to be designed to protect domestic bar steel production. Under the terms of AFTA, Viet Nam is obliged to remove all import duties and non-tariff-based trade barriers by 2006. While it obviously cannot go to the extreme of applying a tariff on all steel products, it could lower the tariff on steel bars in return for raising the tariff on steel sheets, once the cold rolling mill comes on line. Having said this, it is possible that such measures will not be approved, as after AFTA comes into effect, any adjustment of import duties must be in a downward direction. Alternative means of fixed-term promotion for the production of steel sheets may therefore become necessary, such as the combined use of a local consumption tax and subsidies.

The following points can be made regarding the medium and long-term furtherance of the Vietnamese steel industry.

First, local production of downstream operations should be established as a first step (cold coil operations → hot coil operations), and industry development should then gradually progress upstream as local demand for the output of that sector is established. This is the standard model of industry development adopted in neighboring countries.

Second, at each stage of development, the latest proven facilities should be installed at the optimal size, and tailored to local needs. The size of facilities should be determined in consideration of international competitiveness. It should be possible to protect the industry through tariffs to some extent, in order to help new facilities compete with foreign products produced at plants where depreciation is well advanced. However, tariffs should not be imposed lightly as protection can have negative side effects. Any industry protection must be of a form conformant with AFTA and WTO requirements, and should be implemented for a pre-determined period only.

Third, in deciding on the location for downstream operations, thought should be given to the timing of construction of an efficient blast furnace-based integrated steel plant. Generally speaking, a blast furnace should be located on the same site as downstream operations to maximize price competitiveness. However, if the timing of construction between hot rolling facilities and a blast furnace differ considerably, then hot rolling facilities should be located near other preceding facilities if that choice is economically justifiable.

Lastly, effective use should be made of foreign technical expertise and capital backing. Due to heavy capital restriction in Viet Nam, it is imperative that foreign capital is availed through the medium of a joint venture or similar. Here, the joint venture agreement should facilitate the smooth passage of technical transfer, while providing foreign interests with a cut of profits.

The risks associated with building a large-scale blast furnace-based integrated steel facility are great. Such a venture should be entered into only when demand in industries requiring high-priced, high-quality steel sheets (e.g. the motor vehicle and electrical appliance industries) has developed sufficiently, and domestic demand for steel products is around 10 Mt/year. Viet Nam must bear all of this in mind in formulating a long-term plan aimed at the eventual construction of a blast furnace facility. In terms of funding, the annual cash flow of VSC is a mere USD10-15M, and the company does not have the corporate strength to be able to withstand the mammoth investment required to build a blast furnace, in the order of USD6 billion. This figure is greater even than the annual fiscal expenditure of the Vietnamese government,[5] and well beyond the reach of Viet Nam at present. Looking toward 2006, the cold milling plant should first be got up and running, and if possible, effort put into establishing the billet center as soon as possible, for which purpose, the government must put together a solid support package including policy-based assistance.

Petroleum refinery

To date, Viet Nam has exported its full production output of crude oil and imported its full requirement of petroleum products, the situation of which the Vietnamese government has been on the constant lookout to rectify by way of constructing an oil refinery. Expected benefits of substituting imports with local petroleum products are many and varied, including (1) an improvement in the trade balance, (2) local retention of value added, and (3) energy security. These will have considerable ramifications over the long term if substitution of imports is carried out with economic efficiency. At the same time, however, the oil refinery industry requires phenomenal amounts of investment,[6] is highly competitive on a global scale, and is associated with great risk. Additionally, relative increases in gasoline and diesel prices, for example, due to the failure of oil

[5] Viet Nam's Total Expenditure and Capital Expenditure of 1998 amounted respectively to USD5,348 millions and USD1,675 millions (Viet Nam Public Expenditure Review 2000).

[6] The initial investment required building an oil refinery of size 130,000 B/D (barrels/day) is said to be between USD1,000 and USD1,500 million.

refinery operations, would inhibit the growth of the Vietnamese economy. The government must therefore tread carefully in involving the country in the oil refinery industry.

Low profitability and the necessity for close proximity to large-scale consumer precincts characterize oil refineries. They are highly capital intensive, calling for extraordinarily high levels of up-front investment. Additionally, they are intrinsically linked to economy of scale,[7] and it is difficult to generate product discrimination, in terms of product quality or otherwise. This makes for stiff price competition and means that oil refineries tend to operate at near breakeven levels. Governments are occasionally called upon to fashion policy to suppress prices of essential petroleum commodities such as gasoline, diesel, and kerosene. Consequently, oil refineries tend to operate at low profit levels, and are unable to recoup fixed costs through oil refinery operations alone. This has led large numbers of oil companies to supplement profits through direct involvement in the upstream and distribution sectors.[8] While actual oil refinery margins in the past have shown momentary highs, they have tended to be around USD1 per barrel on the whole, enough to cover running costs but making it extremely difficult to recover fixed costs. Looking at the profit structure of major players such as BP-Amoco or Exxon-Mobil, almost 70% of profits come in upstream sectors, with the profit contribution of downstream sectors such as refinery operations and gasoline sales being a mere 30%. For a 130,000 B/D refinery costing USD1.3 billion to build, assuming fixed annual depreciation over a 15-year period, USD2.30 per barrel is necessary simply to cover the cost of depreciation. One gets an idea of just how tight the accounts of a refinery are when additional costs such as interest, repair costs, labor costs, electricity and indirect costs, are factored into calculations.

In terms of refining capacity, Asia is in a state of vast over-capacity. Despite demand having dropped in 1998, refining capacity rose by around 620,000 B/D to 18.48 million B/D.[9] In the term between 1996 and 2002 also, growth in production capacity of 2.6 million B/D is expected, exceeding growth in demand. It is apparent that the countries with the greatest prospects of growth in demand, are also those which are expanding refining capacity most avidly. Inspection of the outlook for the balance of supply and demand in Asia reveals that for Asia as a whole, demand will exceed supply by 250,000 B/D in 2002, but that in East Asia (including the ASEAN forum), supply will exceed demand by a massive 700,000 B/D. Forthe medium- to long-term future, refinery margins are expected to be slight.

Singapore is the only ASEAN nation to have a petroleum industry that operates under truly free competition, from production all the way through to distribution. Singapore is Asia's largest exporter of petroleum products, and has a clear advantage over its competitors in terms of price. The production cost for petroleum in Singapore,

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[7] In order to be internationally competitive, an oil refinery must have a capacity of at least 300,000 B/D.

[8] In the distribution sector even, unless competition is regulated in some way, profits are not huge. The greatest profits are in upstream operations such as oil production.

[9] Source: Annual issues of the "BP Amoco Statistical Review of World Energy"

[10] The production cost of USD40/Kl corresponds to a barrel price of USD6.40; the refining margin in the Singaporean market has traditionally been around USD1 perbarrel.

for example, is said to be less than half that of Japan where refining cost is around USD40/Kl (the price per barrel is about one sixth of this).[10] Despite this, corporate restructuring efforts, including staff cuts and capital rationalization, are underway in Singapore in order to cope with diminished margins. China has implemented a range of policies aimed at enhancing international competitiveness. Such policies include (1) large-scale amalgamation and streamlining of administrative organizations, (2) reorganization of state-owned companies into "the Majors of China" that integrates the upstream and downstream sectors, (3) the liquidation/ amalgamation of small-scale, inefficient refineries, (4)firming up of sales management, and (5) relaxation of price control.

The decision whether or not to use locally produced crude oil as part of refinery construction plans must be made through purely economic rationale. Bach Ho crude oil (the most prominent brand of Vietnamese crude oil, accounting for 70-80% of the total output) trades at around USD2/barrel more than Dubai crude due to its low sulfur content and low density. Viet Nam's crude oil output at the end of 1999 was over 300,000 B/D. However, Bach Ho is said to have peaked out already, and levels of development/production at other oil fields are not what they could be. Key foreign investors are already pulling out of the Vietnamese market, and it is impossible at this point to predict levels of crude oil reserves and the size of future production. If an oil refinery is started up geared toward domestic crude oil feedstock, then there is the possibility that it will have to switch across to using imported crude oil at some future point, and foot a huge re-equipment bill in the process

Domestic demand for petroleum products that topped little over 130,000 B/D in 1999 (based on market predictions) are mostly imported. Changes in domestic demand show the smooth recovery and increase from 85,800 B/D in 1995 despite some effects from the economic crisis. Predictions for future demand after the year 2000 are 221,680 B/D in 2005, and 298,700 B/D in 2010. More than half of domestic demand for petroleum products is for gasoline and middle distillates (diesel and kerosene), with consumption of diesel being particularly high. The Vietnamese government estimates that the demand for petroleum products will reach 15-17 Mt/yearin 2010,[11] and currently has plans for the local construction of two refineries.

The first refinery is currently under construction as a joint venture between PetroVietnam and Zarubezhneft- a Russian state-owned enterprise-in the Dung Quat sector, on the eastern seaboard of Central Viet Nam. The plant is scheduled to come on line in 2004, and will have a processing capacity of 130,000 B/D (6.5 Mt/year), at expected total cost of USD1.3 billion. The refinery will principally produce more than 2 Mt of diesel and just under 2 Mt of gasoline. At present, PetroVietnam and Russian concerns[12] are expected to provide USD800M each of the overall investment, and it is hoped that the remaining USD500M can be procured through tendering

[11] According to PetroVietnam estimations, the domestic consumption of petroleum products will be 12.4 Mt in 2005, 17.2 Mt in 2010 and 29.8 Mt in 2020 (VIR No. 447, May 8-14 2000).

[12] "Russian concerns" refers to Vietsovpetro (a joint venture between Zarybezneft and PetroVietnam producing crude oil at the Bach Ho oil field), which plans to use part of its USD150M/year export revenue to capitalize the plant.

companies. There is uncertainty as to the final construction cost, and also fund procurement methods. The Dung Quat site is far from areas of large-scale consumption and associated with high distribution costs, diminishing the profitability of the project. An IRR of around 15% is predicted for the plant, but there are a number of potential problem areas in addition to the final construction cost and uncertainties with regard to funding. First is the question of assumed import duty levels. The project feasibility study was carried out at a time when crude oil prices were low and import duties on petroleum products were around 60-70%. However, it is unclear just how things will be changed with present inflated crude oil prices and an effective duty of 0% on most petroleum products. There is also the issue of what level of duties will be possible after the imminent initiation of the AFTA/CEPT framework in 2006. The cap on domestic fuel prices is relatively low, and it will not be possible to bump up domestic prices in light of jumps in international crude oil prices. In the case of this year's rising crude oil prices, petroleum product importers such as Petrolimex have had to shoulder losses (around 600 billion VND in the case of Petrolimex alone). It is difficult to gauge exactly what margin will be possible in the future for oil refinery operations, and it will be difficult for Viet Nam to compete with Singapore under free competition. With all these doubts hanging over the refinery project, it will be interesting to see how the tender process pans out and whether the USD500M finance can be procured under favorable conditions. Foreign investors are keeping a close eye on the state of things in Viet Nam, and may well be more particular in their demands on investment conditions in the future.

A second refinery is planned for construction in the Nghi Son-Tihn Gia region of Thanh Hoa Province, in Northern Viet Nam, to complement the first refinery (expected completion date 2005-2008). This second project is at a disadvantage in the sense that it is far from both domestic crude oil production centers and consumer areas. There is no local infrastructure in existence, and the cost of investment is high. The processing capacity of this second facility will be 5-7 Mt/year, and rely on sources of both local Vietnamese light crude and the Middle East heavy crude; overall investment is expected to total USD1.8-2.0 billion. Rational economic analysis of the viability of the project is desperately needed before going any further.

Energy security is certainly important, and was a principal cause of Japan entering WWII more than half a decade ago, for example, in reaction to a ban by the US on gasoline exports to Japan. Having said this, looking back over the past few decades, it has never happened that it has not been possible to import petroleum products, and it was quite possible to import refined oil during the oil shocks of the 1970's and the Gulf War even. For the present, the real-world benefit to be gained by substituting imports of petroleum products with locally produced products is outweighed by the potential negative consequences of such a move to the national economy. Thus, for the time being, keeping energy costs down to international market levels has much greater merit for general economic development. As a result, the immediate heading of the Vietnamese petroleum refinery industry should not be to insist on constructing a refinery as soon as possible, but rather to keep on exporting all locally produced crude oil, and importing Viet Nam's full component of diesel and other petroleum products. This could be said as a perfectly valid alternative to constructing a refinery.

In order to build and run an oil refinery, Viet Nam must introduce foreign capitals. Capital procurement ability and technical and marketing prowess of foreign companies are indispensable in minimizing the associated risk. For this purpose, it is imperative that Viet Nam wastes no time in creating investment conditions that are attractive to foreign companies. The government should consider providing whatever assistance it can, and facilitate linkage with profitable upstream operations, in order to keep the price of petroleum products internationally competitive. Protection by import duties or similar has serious negative consequences for other industries, and should not be entered into lightly. If, however, a refinery is to be built then it may be necessary to protect the local industry through high-level duties at least until the CEPT deadline of 2006, and there may be room to negotiate for the postponement of CEPT at that point. While there are doubts over the viability of the first refinery currently being built, if the project is to benefit from large-scale foreign investment then it may be possible to start up a plant, even with PetroVietnam's current profit level. The project is expected to suffer from low profitability, however, and contributions from PetroVietnam to national reserves are expected to drop off as a result. The progress of the first refinery should be followed closely for the first 4-5 years, and construction plans for a second refinery evaluated based on the performance of the first. Similar levels of foreign investment as for the first refinery will be essential for the second refinery.

Petrochemicals

Due to the status of the petrochemical industry as a symbol of industrialization, along with steel, it has received active promotion by countries such as Japan and South Korea. Singapore was the first ASEAN country to start up a petrochemical complex in 1984, drawing on Japanese and European capital. Thailand, Malaysia, and Indonesia have since followed suit.

Upstream petrochemical operations fall into two types: ethylene plants and major resin (polymer) plants, both of which are capital intensive and have high scale merit. The construction cost for an ethylene center, for example, is USD1.0-1.5 billion, the construction cost for a diversified petrochemical complex based around an ethylene center is USD2-3 billion. The construction cost for a major resin facility is USD100-500 million for a monomer plant and USD20-40 million for a polymer plant (around USD50-100 million /10 Kt). At the same time, there have been no significant technological advances within core ethylene plant technologies of late, and there is little difference in cost structure between different plants. As a result, the industry is associated with over-competition, due to little technological discrimination of plants and the high device dependence of the industry pushing the weight of fixed costs up, providing strong incentive to maintain high operating levels. Petrochemical plants are also highly vulnerable to international market fluctuations, and hence associated with high operational risks.

There is a strong correlation between the domestic demand for petrochemical products (domestic consumption + indirect exports) and the GDP, and increases in the per capita consumption of petrochemicals

are proportional to increases in the per capita GDP. Specifically, growth in domestic consumer industries such as construction materials, daily commodities, textiles, and clothing, and export industries such as textiles, motor vehicles and motor vehicle parts, electrical goods and electronics, all produce growth in the domestic demand for petrochemical products.

Development of a supply system for ethylene and other upstream products should be started upon only once domestic demand for downstream petrochemical products has reached a certain level. This is how ASEAN countries other than Singapore have gone about initiating a local petrochemical industry. If an ethylene plant or petrochemical complex is built before domestic demand matures, the facility will have to look to exports and be exposed to cut-throat competition on the international market. In general, the local consumption capacity of upstream products such as ethylene is determined by technological expertise and sales prowess pertaining to downstream derivative products, and has a considerable effect on plant profits. For the upstream petrochemical sector, it is vital that entry into the market is timed prudently, due to the high commercial risk of any such venture. Note that in the case of Singapore, incentives for the petroleum refinery industry were stipulated as an item of priority as early as 1967, soon after Singapore gained independence. The local petrochemical industry grew up in tandem with the refinery industry, which is the reason why a petrochemical complex was successfully established early on in one piece. Singapore is an exception in East Asia in the sense that it has limited domestic demand and the industry was always directed at exports.

The developmental pattern of the petrochemical industry in developing countries is to first promote indirect exports of labor-intensive products such as clothing or textiles, or direct exports of low-technology, labor-intensive plastic products (basic plastic packaging or daily commodities such as plastic buckets). The next step is then to wait for domestic demand to expand, and progressively expand the scope of operations up the product stream to major resin plants and ethylene centers. As the petrochemical industry generates few jobs and is largely insensitive to the effects of low wages, petrochemical industrialization in ASEAN countries (i.e. moves toward domestic production) has focused on establishing stable domestic demand, attracting foreign investment and fostering a supply systemin accordance with government policy to protect and promote the industry.

Since the first petrochemical complex started up in Singapore in 1984, the petrochemical industry in ASEAN nations has thrived. In the first half of the 1990's, Thailand, Malaysia, and Indonesia started up one petrochemical complex after another. In all ASEAN countries, the government has taken the initiative in participating in joint ventures with foreign companies, and various policies have been adopted to protect and promote the local industry. These policies included developing infrastructure (Singapore), providing stable supplies of feedstock (Thailand and Malaysia), imposing high duties on imports (Thailand and Indonesia), and offering reductions in corporate tax levels (Malaysia and other countries). All countries other than Singapore timed the construction of ethylene centers to coincide with domestic demand for ethylene derivative products reaching 400-500 Kt/year in ethylene consumption terms, and major resin plants, which use ethylene derivatives,

developed well ahead of other plant types. Singapore is attempting to establish 3 Mt/year ethylene production facilities in the form of a chemical island (Jurong Island). The petrochemical industry in Malaysia is controlled by PETRONAS, and a second ethylene plant (600 Kt/year) fed by locally produced natural gas is scheduled for completion in 2001. As ethylene is produced from locally produced natural gas in Malaysia, variable costs are much lower than in the case of naphtha, and price competitiveness is high.

Domestic demand for petrochemical products in Viet Nam is still low at around 290 Kt for ethylene derivative products (1998 calendar year, ethylene consumption basis). This figure is expected to grow in the future, in line with increases in the per capita GDP.

Of all ethylene derivative products, PE and PVC have the greatest demand, based on a breakdown of the major resin types. PVC is used primarily as a construction material and as agricultural sheeting, and sees the greatest demand in the early stages of economic development. One feature particular to Viet Nam is that the relative weighting of PP, propylene resins increases with growth in demand for cement and rice bags, household utensils, and daily commodities.

Only one full-scale resin plant is in current operation (80 Kt/year), and 98% of ethylene derivatives are imported. The Mitsui Vina Plastics Joint Venture Company PVC plant (80 Kt/year) was the first large-scale petrochemical plant in Viet Nam. However, due to a depressed international market and a flood of cheap imports into Viet Nam, Mitsui Chemicals and Mitsui & Co. (owning a combined 46% share in Mitsui-Vina) transferred their stake in Mitsui-Vina to the remaining foreign partner in the joint venture partnership, Thai Plastics and Chemical Corporation (TPC), thereby withdrawing all involvement in PVC production through Mitsui-Vina. Factors contributing to its lack of international price competitiveness include production levels being too low to achieve economy of scale, and that the plant was cursed by a rise in VCM prices and fall in PVC prices at start-up, when it was at its most vulnerable.

In other ASEAN countries, a range of protective and furtherance measures were adopted when starting up the local petrochemical industry. In the case of a PVC plant-generally the entry-level plant type-the local product is usually protected by a tariff on PVC imports in the range 20-40%. At the planning stage of the PVC plant, Mitsui-Vina assumed that a 25% import duty would be in place. A 25% import duty translates to a price difference of as much as USD100-200 per ton. In actuality, however, the import tariff was 0% when the plant started up, and despite a tariff being introduced later, it was at an effective level of only 8%. Interest and depreciation at the Mitsui-Vina plant were around USD150 per ton, assuming full operation levels, and the 17% difference between the expected import levy and that actually imposed, proved fatal for the plant.

Petrochemical industry furtherance and domestic resin finishing industry furtherance are opposing forces and cannot co-exist. If petrochemical industry furtherance is opted for, then some form of government protection must be offered for the first five or so years of operation, to buffer the local industry from the effects of changing international price levels. Unless such protection is offered, small stand-alone plants have no hope of competing directly with large-scale, highly efficient foreign companies. In the case of the Philippines, the

Philippines Resins Industries plant which came on line in 1999 (PPII: 70 Kt/year) performed well under the effects of a government duty of 20%, to the degree that an expansion of production capacity (to 140 Kt/year) is being considered.

There is still time left before the AFTA/CEPT time limit (2006) to selectively apply import duties on products originating from both within and outside the ASEAN region to protect and promote local industry. If import duties are to be enforced and midstream industries such as PVC production are to be prioritized, then measures must simultaneously be adopted to shield downstream industries such as PVC finishing from being disadvantaged, as countries such as Thailand have done. Examples of such measures are reimbursing the equivalent amount of duties applied to a product at the time of export, or indirectly reducing the costs in downstream industries by providing cheap raw materials to midstream industries. In terms of the WTO, it is possible to protect the petrochemical industry through non-tariff-based means by calling on the exceptional measures contained in GATT Article 18C for member countries in the early stages of development. This has been the case with the Malaysian import control system on petrochemical products (PE and PP).

The most effective policy direction for the present is to set the lone PVC plant in current operation back on track, and at the same time form a beachhead for PP and PE production before 2006. Only when downstream sectors have become established and shown signs of growth, should the furtherance of upstream industries be considered. Premature large-scale investment and duplicate investment such as in a second PVC plant should be avoided at all costs.

If PE and PP production are to be promoted in Viet Nam in the future, then the following sequence of development should be adopted: ① expand domestic demand through the promotion of resin finishing industries (electrical appliances, etc.), relying on imports, and ② build an internationally competitive resin plant once domestic demand has reached a certain level. The economically optimal scale of PP production operations is internationally held to be 200-300 Kt per facility. In 1998 (calendar year), domestic demand for PP was 162 Kt, which was filled exclusively through imports. Given the current state of the Vietnamese petrochemical industry, the first step towards beefing up the industry should be to produce supplies of PP resin for cement and rice sacks. While demand for PP resin is relatively high in volume, there is little demand for high quality resin. As such, it makes much more economic sense to purchase low-grade products cheaply from foreign resin producers, than to go to the bother of investing in a local plant. If demand is to be focused at low-quality, low-priced PP, then the chances of successfully establishing domestic ethylene operations are slim, even if local demand is to reach a certain quantitative level.

Apparently, there are plans afoot to build a 150 Kt/year PP plant as part of the Dung Quat first oil refinery complex, at a cost of USD200M. Here, material costs would be kept to an absolute minimum due to the plant drawing on gas byproducts produced in the refining process. However, one must bear in mind that it is extremely difficult to recover fixed costs in the Vietnamese market.

The future course of international capital will be a vital issue in determining the prospects of survival of the

Vietnamese petrochemical industry. As trade within the ASEAN forum is freed up under the terms of AFTA and borders are removed, the decision as to which country to locate a production base in will be made based simply on the competitiveness of that nation. Negative factors abound in Viet Nam, including the cost of investment being inflated due to underdeveloped infrastructure, utility costs being relatively high, and core user industries being immature and the general market being underdeveloped. As such, there is very little possibility of petrochemical production facilities being developed in Viet Nam even if it were to deregulate the local industry. In order for Viet Nam to tap into the potential of its natural gas, crude oil and other energy resources, it must look hard at its current position, lay out long-term, well-documented industry furtherance policy, and actively seek to attract foreign investment so as to gain access to foreign capital, technical expertise and sales prowess. In light of the current state of domestic demand, infrastructure and other key areas in Viet Nam, there is little hope of attracting foreign investment, no matter how much potential the market may hold. To make itself into a more attractive investment prospect, Viet Nam must adopt a range of limited industry protective measures as conform with AFTA and WTO requirements (e.g. import duties, corporate tax reductions/ waivers, infrastructure development, low-cost/stable supplies of feedstock, and subsidies).

Urea fertilizer

Current imports of urea into Viet Nam amount to 2.3 Mt (for the 1998 calendar year), making Viet Nam almost entirely dependent on imports to fill its domestic demand. Urea fertilizer is essential to the production of rice, Viet Nam's principal export commodity. Therefore, construction of a urea fertilizer plant has long been on the Vietnamese government's agenda, in the interests of self-sufficient in order to enhance food security, and also in an attempt to make good use of domestically produced natural gas. On a unit area basis, the amount of urea fertilizer used in Viet Nam is around 20-30% that used in large-scale rice producing countries such as Japan, South Korea and China, and productivity levels are also around 60% of those in such countries. Given that the rice variety used in Viet Nam is a higher consumer of fertilizer than that used in countries such as Japan, it would appear that there is significant potential for rice production increases through increasing the amount of fertilizer input.

At present technological levels, a 570,000 t/year capacity plant is considered to be the most technically sound and economically efficient (combining a 1,725 t/day capacity urea plant and 1,000 t/day ammonia plant, at an initial outlay of around USD240M including utility development, or depending on the grade of the facility and timing of construction, up to USD400M including interest). In building a plant of this size, however, the lead time before the plant can begin operation is estimated to be between 5 and 6 years, including a little under 3 years of construction time. Urea production is therefore a highly capital-intensive industry involving high levels of initial investment, and it takes around 10 to 20 years to recover the total investment amount. As such, it is costly to both enter and get out of the urea industry, and extremely difficult to adjust

production capacity dynamically. If there is a surplus of capacity, the temptation is to ignore fixed costs, and continue operating at break-even variable costs.

In the drawn-out market depression of the 1980's, the price of urea fluctuated in the range of USD100 to USD150/tonne (marking a low of USD70/tonne), but the market turned around in 1995, reaching around USD200/tonne at the beginning of that year. This can be attributed to the solid purchases on the part of import giants China and India due to favorable exchange rates. However, since May 1997 when China—the top urea consumer—adopted import bans in order to reduce foreign expenditure, the market has weakened, and the price of urea was down to around USD70/tonne at the end of 1999. The policies of China and India led to demand equal to the output of around 13 standard-sized plants, evaporating in a two-year period.

Demand for urea fertilizer is predicted to rise constantly in the future, centering on the Asia region. But at the same time, marginal profit exports from the Middle East and former member nations of the Soviet Union (FSU) are expected to increase, and the international market for urea is likely to remain weak for the time being. The competitiveness of FSU-produced urea was boosted by the devaluation of the ruble in 1998, and export volumes have increased by around 30% over what they were before the devaluation. By way of tapping into cheap supplies of natural gas, the FSU is expected to further increase its urea market share in the future. Indonesia and Malaysia are the main urea suppliers for the Asian area. Based on 1998 (calendar year) figures, Indonesia provided 1.56 Mt and Malaysia 0.38 Mt of the total 2.50 Mt output from Asia. Indonesia's abundant natural gas resources and low feedstock costs place it in a strong position.

Demand for urea fertilizer shot up in the 1990's due to its use as a principal additive in rice production, with imports growing from 760,000 t in 1990 to 2,310,000 t in 1998. In response to the rapid expansion of domestic demand, VinaChem's coal-based Habac plant (current production capacity: 130,000 t/year) operated at full production rates at one time, but the remainder and bulk of Viet Nam's urea intake is covered through imports. Note that Viet Nam is the second largest importer of urea in the world, at 2.3 Mt to America's top-ranking figure of 3.4 Mt. The main proportion of imports into Viet Nam originates in Indonesia, accounting for 44% of total imports at 1.02 Mt. From the perspective of Indonesia, a remarkable 65% of the total export volume of 1.56 Mt finds its way to Viet Nam. (All figures are based on the 1998 calendar year, and taken from FERTECON materials.)

Due to a lack of local natural gas reserves, the Habac plant is coal-based and operates at extremely high production costs, such that it is reliant on government subsidies to sell its product. The Habac plant has an annual production capacity of 130,000 t (current September 2000) and planned to be increased to 150,000 t as a result of technical assistance from China. The plant is currently effectively at an operational standstill due to the extremely weak state of the urea fertilizer market. The plant is scheduled for refurbishment in an attempt to bring the production cost down by around USD40 per ton, at a total cost of USD35 million.

In order to start up a urea fertilizer plant in Viet Nam, assistance from foreign chemical companies must be sought, from financial and technical perspectives, and also in terms of the running of the plant. Even if the

Vietnamese government were able to attract foreign investors to participate in its urea plant construction plans, the plant would have a difficult time operating under current international market conditions. At current international market prices, and assuming a competitively-priced supply of natural gas, guaranteed sales of urea at USD160/t (FOB in bulk) would be required for between 10 and 15 years to return a profit on investment, allowing for depreciation. In order for a urea fertilizer plant to return a profit, industry protectionary policy must be adopted, such as protecting the domestic product from imports by way of import duties, or regulating prices to keep retail prices at a constant level, as in the case of India.

In the case of Viet Nam, a gas pipeline is to be built as far as the outskirts of Ho Chi Min City, such that the gas supplier would have scope to opt to sell the gas to power stations at a higher price than the USD1/mmBtu or less that a urea plant would be prepared to pay. Indeed, the pipeline owners would appear to have signed a contract with a power station to supply gas at around USD2.70/mmBtu. Consequently, the proposal to build a natural gas pipeline as far as the outskirts of a large consumer area such as Ho Chi Min City, in order to build a urea plant, would be overshadowed by any project to build a power plant or equivalent.

One can take the view that by building an 0.8 Mt/year plant domestically, the current import level of 2.3 Mt will be reduced by that amount. However, comparison of the actual cost of producing 0.8 Mt/year domestically over importing that same amount, points to imports as the more economically rational approach. There is also the argument that the extra cost is justifiable in the pursuit for food self-sufficiency, and that the project should go ahead. However, even if a war were to break out, it is hard to imagine a scenario in which Viet Nam would not be able to import urea fertilizer from any producing country, added to which, urea is not an essential component of rice production.

We can realistically expect Indonesia to maintain its 2.0 Mt export potential for the foreseeable future. Additionally, Viet Nam is Indonesia's best customer for urea, and is expected to be able to procure stable supplies of urea from Indonesia for the foreseeable future. As Viet Nam is a major rice producing nation and relies heavily on rice exports to procure foreign currency, any further increases in rice production or the amount of fertilizer added to the rice crop, may in fact produce negative consequences. That is, it is certainly the case that current levels of fertilizer usage are low and an increase could bump up rice production, but this may simply result in a drop in international rice prices, acting to Viet Nam's disadvantage. For Viet Nam in particular, producing rice using fertilizer priced above international market levels is not advisable, as it will simply diminish its international competitiveness as a rice producer.

In conclusion, while some may argue that the construction of a urea plant is justifiable in the interests of pursuing food self-subsistence: (1) it will be difficult to guarantee the profitability of the plant given current international price levels; (2) the natural gas required in the production of urea could be put to better use (e.g. power production); (3) placing a burden on agriculture to protect a urea plant (increasing fertilizer prices) is a case of putting the cart before the horse; and (4) it is difficult to image a future scenario where Viet Nam would not be able to import urea. In light of these reasons, the economically rational path is to continue

procuring low-priced urea from the international market.

If now is not the right time to build a urea plant, then when in the long-term industrial plan of Viet Nam is going to be right time? Assuming that Viet Nam is not to follow the lead of China in banning imports and artificially inflating urea prices, or follow the lead of India in keeping down the price of urea by subsidizing urea production (neither of which course is advisable, of course), then the correct setting for the construction of a urea plant requires the following three conditions:

(1) Reserves of natural gas are found at a location far from consumer areas (big cities such as Ho Chi Min City), in quantities not large enough to convert into liquid natural gas (LNG). Here, the options for use of the natural gas are limited, and it becomes possible for a urea plant to avail itself of the natural gas at cheap prices. This is the situation with the Indonesian urea plants.

(2) A situation arises where the international price level for urea is expected to remain high over the long term. Given the global trend for population growth, food consumption is certain to rise in the future, which will be associated with an increased demand for urea. Determination of the optimal time to be getting into urea production is possible through careful observation of the international demand for urea fertilizer and urea plant construction/expansion plans.

(3) Sufficient capital can be secured from foreign sources, PetroVietnam or similar, and the relative proportion of debt subject to interest must be kept down as much as possible. Given that there is little hope of urea fertilizer prices reaching and staying at levels where fixed costs can be recovered, urea plants must be able to survive at subsistence levels. In practice, this equates to keeping interest-paying debt to a bare minimum, establishing a basic corporate structure, and cementing links with private corporations which will be able to stand up to low urea price levels around USD70/t over a prolonged period.

Any premature entry into urea fertilizer production in the absence of these pre-conditions must be made with due regard for the serious consequences it will most likely have for the Vietnamese economy as a whole, and should not be entered into lightly.

Cement

Cement is a basic support material for economic development. Of the heavy industries, cement is generally the first to take off, followed in sequence by the steel, electric equipment, and petrochemical industries. At present, cement is consumed in over 200 countries throughout the world, and produced in around 130 of these. The cement industry is said to be relatively easy to break into via local capital, but at the same time, production is becoming increasingly intensive, with 7 cement giants producing around one third of the global output of cement. It is predicted that these 7 companies will expand their market share in producing over half of all cement produced throughout the world, by the end of the 21st century.

Three key characteristics of cement as a product are: (1) it is not possible to store cement over the long term, as it degrades with time; (2) cement is bulky as compared to other construction material types (cheap per unit volume); and (3) it is difficult to produce a markedly high-quality product. These characteristics make cement an item not viable for export, and mean that consumption should ideally occur within 100 miles (around 160 km) of the cement plant. This has caused the big cement companies to expand operations overseas by way of establishing local production facilities.

Supply features of cement include: (1) the optimum plant capacity is 2 Mt/year, and plants are capital intensive, costing more than USD300M each; (2) it is difficult to dynamically adjust production capacity, as there is a long lead time from commencement of plant construction until the plant begins operating (3-4 years); and (3) the weighting of fixed costs in the overall production cost is high, such that there is a strong incentive to continue producing and selling cement even if the selling price is much lower than the total cost of production, as long as variable costs are covered. Some demand features are (1) demand skyrockets during the early stages of economic development; and (2) demand for cement closely emulates fluctuations in GDP. In the Asian experience, the cement industry can be seen to follow the following developmental pattern. Demand spirals during the industrialization period at the onset of economic development, and tends to continue growing until the per capita GDP reaches USD10,000. The combination of the above product, supply and demand features mean that the cement industry is susceptible to drastic price swings and is highly localized in nature. In Viet Nam, mid 1990's marked a period of rapid inflation in cement prices.

Rapidly increasing demand led countries throughout South East Asia to actively increase cement production facilities, until the currency crisis when the cement industry suddenly found itself in a position of oversupply. Prior to the currency crisis, local capital in each country had reaped the profits of the cement industry, but post-crisis recession caused finances to take a turn for the worse, and cement companies were faced with over-production and unpayable debts. Cement companies were not able to keep their head above water, and forced into selling off shares as a last resort. European and Mexican cement companies seized upon this opportunity, and bought out an increasing number of South East Asian cement manufacturers from the autumn of 1997 onward. This resulted in the share of 5 European and Mexican cement companies in 4 South East Asia countries (Thailand, Indonesia, the Philippines, and Malaysia) leaping up to more than 60% in under a year.

Naturally, the arrival of the Western companies has not altered the state of oversupply. Since 1999, Thailand and Indonesia have been the leading cement exporters in the world, with Thailand posting exports of 16.2 Mt (no. 1 exporter globally; 68.8% increase over the previous year) and Indonesia 9.0 Mt (no. 2 exporter globally; 100% increase over the previous year) in 1999. One feature of the export records of these two countries is that the bulk of exports are to countries outside the Asian region (Thailand: 6.0 Mt to U.S., 4.0 Mt to Africa, and 4.5 Mt within Asia; Indonesia: 5.2 Mt within Asia).[13] Factors contributing to this export bias include

[13] Cement Shinbun Editing Dept (ed.) Cement Annulus, Vol. 52 (2000), Chapter 6 "Cement Trends in Asia"

improvements to distribution facilities and enhancement of marketing prowess due to the recent acquisition of local cement firms by European and Mexican concerns, and also falling exchange rates since the currency crisis and a widening of the cement supply-demand gap in Asia. The purchase cost of local Thai and Indonesian cement companies to European and Mexican capitalists is said to be between 30% and 70% lower than the cost of establishing equivalent production facilities anew, when calculated on a per ton production capability basis, and there are also huge savings on fixed costs to be made. As a result of the buying up of Asian cement manufacturers by European and Mexican concerns after the onset of the Asian currency crisis, regional rivals to Vietnamese cement producers gained both in size and cost competitiveness, making it even harder for Viet Nam to open up its cement market to free competition.

Domestic demand for cement in Viet Nam entered a period of oversupply from 1997, after enjoying a run of strong growth. Growth in demand was 29% in 1994, 16% in 1995, 15% in 1996, 12% in 1997, 8% in 1998, and 7% in 1999. There has been a progressive fall off in growth from year to year, and annual growth for the past two years has been at single figure levels. The Vietnamese government predicts that domestic demand for cement will continue to grow at the 10-13%/year level in the future.[14] However, there is little hope of a markedly high growth rate being achieved in the near future.

Local Vietnamese cement companies fall into the three categories of VNCC, foreign joint ventures ("JVs"), and small-scale producers run by regional governments or the military ("Locals"). The combined production capacity of local cement companies is 11.12 Mt, not including the 2.14 Mt production capacity of Nghi Son Cement (of which 0.50 Mt is destined for exports), which came on line in July 2000; this already satisfies local demand. There are also additional 10 facilities that have applied to expand production capacity in 2001 or later,[15] and assuming that all these are approved, an additional 13 Mt or so of production capacity will be generated. Given the current domestic and international market context, any approval of additional production expansion could harm the market further.

As a result of excessive international supply and a very weak international market in Asia, removal of the import ban into Viet Nam could realistically lead to cheap imports from countries such as Thailand flooding the market, and domestic companies being forced out of business. The widespread use of inefficient old-style kilns and high prices of coal and electricity, are pushing up production costs over those in other countries.

In the years 1997 to 1999, the Vietnamese government fashioned the following policies in an attempt to protect domestic producers. ① ban on imports, ② freezing of new investment, and ③ price control. These stipulations are considered to have been necessary as a stop-gap measure, but will be difficult to maintain over the medium or long term due to Viet Nam's affiliation with AFTA and the WTO. In reality, the Vietnamese government plans to lift the ban on clinker imports in 2001, and does not expect to be able to maintain cement import restrictions beyond 2003.[16] In addition, Viet Nam is obliged to reduce duties on cement imports to

[14] Based on an interview with the Ministry of Construction (September 2000)

[15] Check as to how things are at present.

[16] Check as to how things are at present.

below 5% by 2006, as part of AFTA requirements. This leaves the issue of exactly what should be done about currently regulated cement prices at that time.

VNCC has a lot of outdated, inefficient equipment that requires modernization, but reserves of retained earnings that should have been set aside for capital investment are thin on the ground, making capital investment difficult. In addition, it has a large staff of non-production workers. Of the 6.70 Mt annual production capacity of VNCC (predicted for 2000), 2.00 Mt is produced with production- and energy-inefficient pre-second generation wet kilns. In stark comparison, JVs employ the latest-type dry kilns, with an annual production capacity of 5.50 Mt (estimated for 2000). VNCC's market share has been undermined by heightened international competition, and the company is starting to lose corporate vitality.

The most effective response to the requirements of AFTA/WTO is for the domestic cement industry to be made more competitive. In order for Viet Nam to promote its cement industry without turning its back on free trade, measures such as those outlined below must be adopted:

① *Restructuring of VNCC*: Non-production operations should be scaled down, as well as modernizing and streamlining the production process through assistance via policy-based finance, or tax breaks, for example. Devising an integrated production, distribution, and sales system could also enhance the profitability of thecompany.

② *Modernization of equipment used by small-scale producers managed by regional governments or the military (Locals)*: Modernization of equipment used by small-scale producers is believed to be necessary in order to enhance competitiveness and protect the environment, and policy-based finance or tax breaks would provide the source to do this. Vertical kiln facilities, commonly found in inland regions, should be aggregated or integrated into modern coastal plants, due to their greater competitiveness in production and sales distribution terms. The mass of small-scale producers must be thinned out for the cement industry to survive in the future, and the government must embark on the immediate stimulus of the labor market, to buffer the resultant social impact.

③ *Reduction of energy costs*

④ *Government-facilitated infrastructure development for cement plants (port facilities, roads, fuel, communications, etc.)*

⑤ *Production capacity expansion in line with growth in demand*

⑥ *Active use of foreign capital: At present, foreign joint venture companies have difficulty in* procuring foreign currency necessary for paying off debts, and they are obliged to export a fixed amount of cement at a loss.

By way of the above policies, the Viet Nam government should do its utmost to foster international competitiveness in the local cement industry by 2006. There are of course hurdles such as unemployment problem, and the restructuring of the industry will not be achievable at that fast a pace. Having said this, time is limited, and Viet Nam may find that the duration of tariff-based industry protection needs extending.[17]

Generally speaking, however, the cement industry is considered to be in need of deregulation, and protective measures should be used only as a temporary response in an emergency. If protective measures are to be adopted, the long-term heading of the cement industry should be clearly laid out, a distinct protective period set, and rationalization forced upon the industry in the duration thereof. In this instance, Viet Nam should apply to AFTA for temporary exemption from free trade requirements, or an extension of the protective period. As to the WTO, Viet Nam should apply to be able to maintain inflated import duties (say, 50%) over the short term as will give domestic cement a clear price advantage over imports, in return for agreeing to remove all non-tariff trade barriers. However, there is no guarantee that such demands would be officially allowed, in addition to which, import duties can only be used for a limited time to protect the domestic product. The pace of industrial reform must therefore be maintained at a high level. There will always, however, be room to enforce anti-dumping regulations in a globally acceptable form, depending on the state of themarket.

Automobiles and automobile parts

The automobile and automobile parts industries call for a large scale of economy. Thus, in order to generate industry competitiveness, latecomer nations with a limited domestic market must rely on some form of policy-based support over at least a limited period, in order to get the local automobile industry off the ground. Reasons that countries accept this overhead and give the automobile industry special treatment via protective/ furtherance policy at relatively early stages of industrialization, relate to the following features of the industry:

(1) It is highly value added, and can lead to large-scale savings in trade revenue through locally producing rather than importing cars;

(2) backward linkage effect is great, and extends over peripheral and base material industries;

(3) as it is a high-technology industry, there is a high level of technology transfer to other industries; and

(4) it has considerable potential for job creation. To be more specific, the following effects can be expected.

The skills and business know-how accumulated through working in the automobile industry are easily transferable across to other industries, having a positive external effect on local technological and business practices. As a result, furtherance of the automobile and automobile parts industries drives up overall technological levels of a country. At the same time, however, it makes furtherance of the automobile industry that much more difficult than other industries.

Demand for automobiles in Viet Nam is still extremely low, and far from the level of scale merit for either assembled cars or car parts. It would certainly be possible for Viet Nam to opt against protecting its car industry, and simply leave things to fate. However, if we are to take a long-term view of the industry over 20

[17] In determining whether to continue protecting the local cement industry, debate is required as to its relative importance in comparison to other industries.

or 30 years, it is hard to see a heavily populated country such as Viet Nam continuing to import finished cars in the future when its economy has grown and motorization has taken place. In essence, the motor vehicle industry requires long-term step-by-step protection and furtherance lasting around 30 years for it to reach fruition, as has been seen in countries such as Thailand and Indonesia. In Viet Nam's case, however, global conditions rule out such long-term development. Viet Nam must nurture its car industry at between 3 to 10 times the speed of other countries, which is by no means an easy task given the comprehensive technologically nature of the industry, where a single car is made up of 20,000-30,000 components.

Sales of new cars in the ASEAN 4 (Thailand, Malaysia, Indonesia, and the Philippines) leapt up in each country in the latter half of the 1980's, peaking at 590,000 (1996), 400,000 (1997), 400,000 (1997), and 140,000 (1997) units, respectively. Under the effects of the Asian crisis from July 1997, however, sales of new cars tumbled in 1997 and 1998, before rebounding in 1999, with sales in Thailand recovering to 220,000 units (1999). If recovery in the ASEAN forum is to continue unabated and the Japanese, U.S., and European economies are to remain at their current levels, then sales are expected to overtake former peak levels (1.45 million car sales in 1996, for the ASEAN 4) by around 2003-2006.

The production capacity in Asia (ASEAN 4, Viet Nam and Taiwan) of the 11 main car manufacturers[18] was 2,950,000 units at the end of January 2000 (2,210,000 units in the ASEAN region alone). All companies intend on expanding operations by 2005, with the production capacity expected to reach 3,320,000 units in Asia, and 2,580,000 units in the ASEAN region. On the other hand, the current demand for new cars in Asia is only 1,100,000 units as of the end of 1999. As such, Asia is currently in a state of relatively high overproduction. Assuming that forecasts for new car sales in Asia to reach 3,000,000 units by 2010 are correct, only then will the market reach a size commensurate with current production capacity, given that all cars are to be sold within Asia.[19]

Japanese car makers have a strong presence in most ASEAN countries, and generally have a long history of involvement in the ASEAN forum, dating back to the original moves by ASEAN countries toward a local car industry in the 1960's and encompassing technology transfer into the area, the establishment of local automobile parts operations and construction of a number of local production facilities. Over the years, Japanese car manufacturers have worked toward developing automobile parts complementation schemes in the ASEAN region. As each individual ASEAN country has only a small market, it makes economic sense to view all ASEAN nations as a single market and achieve economy of scale through reductions in production costs. All Japanese car firms are making active use of the AICO scheme, by which import duties are kept down below 5% as a precursor to AFTA. Car and car parts companies have worked toward integrating the ASEAN countries into a single market by using intensive production and parts complementation to generate

[18] Toyota, Daihatsu, Hino, GM, Isuzu, Suzuki, Ford, Mazda, Honda, Mitsubishi and Nissan

[19] Note that some companies have targeted their operations at a component of exports outside the ASEAN region.

economy of scale. This is becoming a trend that is expected to escalate in the future and that has been accelerated by the shrinking of the Asian market subsequent to the economic crisis. The tendency for car manufacturers to procure parts from the optimal location, is expected to intensify as trade in the ASEAN forum is freed up and local content requirements are removed according to the WTO agreements.

If market deregulation in the ASEAN forum is to gain momentum, then as things stand, Thailand will be in the strongest position of all the ASEAN nations, for reasons of the size of the local market and the breadth of peripheral industries. If the degree of peripheral industry proliferation is taken as an indicator of the number of car parts manufacturers, then Thailand has by far the largest market representation of all ASEAN nations. Thailand with around 1,500 companies, followed by Malaysia with 350, Indonesia with 300, the Philippines with 170, right on down to Viet Nam with almost zero. Even Thailand, however, has its weak points, in that no local production of base materials such as steel and petrochemicals exists, and it is incapable of producing the latest electronic components.

As Viet Nam lacks peripheral industries, it imports CKD parts and assembles them into cars, a small scale operation which results in relatively high car prices. The new CKD car sales in Viet Nam have remained in the range 6,000-7,000 units for the past few years. In 2000, however, domestic demand has started showing signs of growth, and sales of new cars for the year reached a record high of around 14,000 units. While continued growth is predicted, the new car market in Viet Nam in 10 years time is expected to be no higher than about 60,000 units per year, which must be shared between 11 car companies, such that no company is expected to be able to achieve economy of scale.[20] The various plants of the 11 car companies are currently operating at between a few per cent and a paltry 20% of capacity. The top companies have recently moved into the black for the first time with their domestic car production operations, although they are said to still be in the red as a consolidated group, and far from keeping their own as a business.

For the 5 years up until 2003, the Vietnamese government is offering a 95% reduction in the 100% special consumption tax on locally-produced cars, which when coupled with the car import duty of 55%, means that the local product is protected by an effective import duty of 200%. Note that despite imports of CBU[21] (completely assembled cars) having been banned since July 1, 1997, there is no regulation of secondhand car imports, causing a headache for local CKD production firms. Around 18,000 of such cars are expected to be imported in 2000, accounting for a hefty 60% of domestic demand.

Viet Nam has applied to the ASEAN administrative authorities for passenger cars of size 16 passengers and less, to be included on its GE (general exception list). However, based on the definition of the GE as being "items related to natural security, life-threatening items, and the like", cars clearly have no place on Viet Nam's GE. Other ASEAN countries are expected to put pressure on Viet Nam to free up trade of automobiles

[20] In order to achieve international price competitiveness, a plant is said to need to produce around 100-200,000 units annually.

[21] CBU ("completely built up") refers to completely assembled cars

in the future. In Viet Nam's case, even corporate giants such as Toyota would not be able to survive were import duties lowered to 5% or below in time for the 2006 deadline. In terms of car assembly, the chances of the Vietnamese industry attaining international competitiveness within the next 10-15 years are slim. In order to firmly establish the car assembly industry, protection via high-level import duties must be made, for which purpose, cars must be included on Viet Nam's GE. With respect to the WTO, Viet Nam should make the most of its current position of negotiations not being very advanced, to urgently raise the level of tariffs on automobile imports as high as is required to protect the local industry, and resubmit its application for membership to the WTO. The only way of protecting the local product in Viet Nam from imports is to set the tariff level so high that it is uneconomical to import CBU cars. One could of course take the stance that this sort of protection will not be tenable in the future, but this is equivalent to stating that Viet Nam has no need for full car production in the future (a position which is of course quite plausible).

In relation to the WTO, developing countries are required to have removed all non-tariff trade barriers, including local content restrictions, by 2000, after a 5-year period of grace. There are, however, countries that have failed to achieve this, and the Philippines is currently applying for a 5-year extension to the period of grace, and Malaysia a 2-year extension. With regard to AFTA also, at the May 2000 ASEAN economic ministers' conference (held in Myanmar), Malaysia applied for an extension in the timing of the reduction in import duties to 5% or under to January 2005, for automobile-related items only. Reasons cited for this extension included the ASEAN economic crisis. This partial postponement in the implementation of CEPT has essentially been agreed upon. Thailand and Indonesia kept their promise to the WTO in removing local content requirements by 2000. These two countries have made clever use of import duties to protect domestic parts production, making up for the loss of local content requirements. The Indonesian duty system is stepped as follows: CBU (passenger car) imports from outside the ASEAN region are subject to a duty of 65-80%, CKD imports a duty of 35-50%, IKD[22] imports a duty of 10-15%, and other minor parts a maximum duty of 15%. CEPT rules require that intra-ASEAN distribution be subject to a uniform duty of no more than 20%. Thailand has also raised import duties to a level such that domestic parts manufacturers can compete with imports. In this manner, it is possible to promote a country's local car industry in a manner acceptable to the WTO and AFTA, as demonstrated by leading ASEAN nations. Important factors in car industry furtherance are the ability to objectively judge the long-term position of one's own country and rival countries, and the ability to lay out policy which conforms with international demands.

In the long-term process of integration, aggregation, and specialization of full car production operations according to model type in the ASEAN region, the Vietnamese government must provide assistance for the production of a car model targeted at the overall ASEAN market and development of a local mother plant therefor. In the future, it will be highly beneficial for Viet Nam to host a mother plant for a promising car

[22] IKD refers to partly localized CKD

model. Strategic policy-based assistance must be provided to support the transition of Viet Nam's assembly plants into mother plants for a car of the future.

In terms of parts production, a viable tariff structure (with progressively lower tariffs for completely assembled cars, KD parts, and KD parts components) must be maintained in order to promote local car production. If the degree of value added generated domestically is to be progressively increased over the years, then the only option open to the government is to incrementally move toward full domestic production, starting with parts production destined for intra-ASEAN exports. The government must devise some way of realizing a system to support this (a tariff structure, etc.) posthaste. Key components that are not currently produced in large volumes in the ASEAN region should be identified, and the car parts industry strategically targeted at the production of those parts. That is, Viet Nam should put itself in a position of exporting sought-after parts within the ASEAN region, and use this place of privilege to attract parts makers from advanced parts manufacturing countries. Viet Nam both has a miniscule market, and lags well behind other countries in technological levels in the automobile parts industry. As a result, it will be extremely difficult to attract FDI purely through tariffs. Consequently, Viet Nam must prepare a set of attractive measures to entice FDI, as are unrivalled by other countries, and work hard to attract FDI from car parts makers. It is imperative that FDI be attracted to Viet Nam as soon as possible, and that all assistance possible is provided to generate competitiveness between now and 2006. The Vietnamese workforce has a good reputation, but a skilled workforce does not have much impact on company accounts. What do impinge on profits are power, communications and distribution costs, in all of which respects Viet Nam is at a disadvantage over other countries. In the case of electricity, power supplies are unreliable and power failures are not an uncommon occurrence. Viet Nam is on a par with other countries in terms of investment incentives, but then again there is little to set it apart from the crowd. Viet Nam needs to find some obvious sales point that translates into corporate profits, to win FDI off other countries.

A further problem associated with Viet Nam is the lack of systematic protection for technological transfer. Car and car parts production technologies must generally be transferred from developed to developing countries on a constant basis, but Viet Nam currently allows only one-off technical transfers as a rule, and the maximum duration of technical transfer contracts is only 7 years. Additionally, the ceiling on royalty payments in Viet Nam is low. Commensurate remuneration must be made for technical transfer, and the intellectual integrity of transferred technologies properly upheld. Only when such a system is in place will technical transfer from developed nations take place.

All car companies are obliged to meet a 30% local content requirement within 10 years, and some form of dispensation through tariffs or otherwise could be made for companies that achieve this target. It is vital that some form of incentive be maintained that will be of direct benefit to companies, to encourage increases in local production rates.

Details of an intra-ASEAN parts complementation scheme have nearly been finalized by the ASEAN 4,

leaving little room for Viet Nam to maneuver in. Even if Viet Nam is to attempt to attract car parts companies to produce parts that have not yet been incorporated into the industry scheme, it will have to compete with other countries. This is the most important issue currently facing the Vietnamese automobile industry, and Viet Nam must bite the bullet and lure strategic FDI to its shores. Policies which should be adopted immediately by the Vietnamese government, to this end include: divesting details of long-term car and car parts furtherance policy to the private sector in order for car companies to be able to invest in Viet Nam with confidence; providing legal provision for smooth technical transfer; enhancing investment conditions (developing infrastructure, generating highly attractive investment conditions, etc); and providing assistance with local company link-ups.

Issues which must be tackled in the medium term, prior to 2006, include the maintenance of exemption from general application of AFTA conditions/maintenance of industry protection based on import duties and similar, stimulation of demand for cars, enticement of prominent parts manufacturers to Viet Nam, and promotion of exports.

In the lead-up to the initiation of AFTA, the intra-ASEAN import duty on all products will be reduced to 5% or under, although it will be quite possible to offer subsidies after the free trade zone is initiated. Even organizations such as the WTO are relatively lax on subsidization schemes in developing countries. One way of promoting capital and technical transfer investment would be to increase the domestic consumption tax at the same time as decreasing import duties, and redirect the extra revenue resulting therefrom into subsidies of a form which would not be considered export subsidies. In order to ensure that subsidies do not turn into profits in a vested interest, the implementation must be kept unambiguous.

The Viet Nam car assembly industry is expected to reach a modest 60,000 units of annual production by 2010, the limited spoils of which must be shared between 11 companies. International competitiveness is thus not a realistic prospect for a time to come. There is a real chance that the Vietnamese car assembly industry will vanish the moment protection is revoked. This must be avoided by leaving car assembly on the GE as long as possible, and progressively building up competitiveness over about 20 years through incremental increases in local content, under the guidance of long-term industry policy conformant with domestic and international trends.