Forecasts for the Korean Economy Using an Intertemporal CGE Model

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Abstract We set up an intertemporal CGE model of the Korean economy and make forecasts up to the year 2000. The basic framework used in the model is ORANI-F. The main modification made is the specification of supply functions in which domestic and export goods are differentiated. The modified specification is pursued to reflect the features of the Korean economy that has been heavily export oriented in its rapid growth path. The model is calibrated to Korean input-output (I-O) data for 1990, and the base year I-O data are updated by historical simulation in order to be utilised as a new basis in forecasting. Available information on actual changes in variables such as various sectoral price indexes and macroeconomic variables for the period 1991 to 1995 is utilised in producing updated I-O data. Results of the historical simulation highlight the major characteristics of the recent transformation of Korean industrial structure. In making forecasts, findings from the period 1991 to 1995 derived from the historical simulation are considered in setting the values of exogenous structural variables such as taste and technology changes, and other shift variables. Possible reductions in business costs as a result of expected deregulation of the economy are also considered. We contemplate several different scenarios regarding changes in the exchange rate and improvements in productivity. Not only sectoral variables but also several macroeconomic variables are endogenised. One of the findings is that, in the medium term, the depreciation of Korean Won will not help reducing the chronic trade deficit that Korea has been facing. Faster improvement in productivity will be essential for the improvement of the trade balance.

1. INTRODUCTION

ORANI [Dixon et al., 1982] has proved to be a flexible computable general equilibrium (CGE) model in its application to various national economies other than Australia such as Thailand, the Philippines, Pakistan, South Africa, and Vietnam. In this paper another version of ORANI model is applied to the Korean economy, which is among the faster growing economies in the world.[1]

The basic framework used in the model is ORANI-F [Horridge et al., 1993] and certain features of MONASH are also incorporated. The main modifications made are in the specification of supply functions in which domestic and export goods are differentiated. Industries are allowed, under varying market situations, to make a shift in its allocation of resources between domestic and export supply along a constant elasticity of transformation (CET) curve.[2] The modified specification is pursued to reflect the feature of the Korean economy that has been heavily export oriented in its rapid growth path.

The model is calibrated to Korean input-output (I-O) data for 1990, and the base year data are updated by historical simulation in order to be utilized as a new basis in forecasting for the Korean economy in year 2000. Actual observations of various price indexes for sectoral level as well as macro variables during the years 1991-1995 are utilised in the process of producing updated I-O data.

In order to make careful and flexible forecasts, we perform simulations based on several different scenarios and derive implications by comparing results. The construction of exogenous assumptions and inputs to forecasting simulation with various scenarios is based on a simple approach that takes advantage of findings from the historical trend for scalar and sectoral variables. The paper projects implications for the economy of exogenous settings and macroeconomic assumptions, and makes comparisons of results between various scenarios.

Important differences in the structure of the model from ORANI-F, and the base year data are described in Section 2. Section 3 contains explanations of data inputs to historical simulation that is necessary for the base year data to be updated and made suitable for forecasting. Presentation of exogenous assumptions for forecasting Korean economy in year 2000 is given in Section 4. In the section, we summarise results of the historical and various forecasting simulations and discuss implications for the economy's macroeconomic and structural variables. Concluding remarks are in Section 5.

2. STRUCTURE OF THE MODEL AND THE BASE YEAR DATA

2.1 Structure of the Model[3]

Basic structure of our model originates from ORANI-F. Due to the limitation of space, we only explain main difference of our model from the generic version of ORANI-F [Horridge et al., 1993].

2.1.1 Production Function

In accordance with the structure of Korean I-O data, each industry is assumed to produce only one type of product. However, transformation is allowed between versions of an industry's product that are destined to domestic and foreign markets. Inputs for production comprise domestic and imported commodities, a single type of labour, industry-specific capital and 'other costs'. Given the transformation cost, these scarce resources are allocated between two production lines in response to a change in relative prices

[1] Project of developing a CGE model of the Korean economy was initiated while Seok-Woong Moon was visiting the Centre of Policy Studies of the Monash University, Australia. We would like to thank Professor Peter Dixon, Professor Alan Powell, Dr Ken Pearson, and other members of the Centre of Policy Studies and the Impact Project for their support and advice in developing our model. We also wish to thank Professor Jang-Hee Yoo, who was the president of the Korea Institute for International Economic Policy, for his encouragement and financial support in completing the project.

[2] Similar approach was taken earlier by Peter Dixon in modeling the Korean economy with the data for 1963. (See chapter 4 of Dixon et al. [1992].)

[3] The model described here is implemented and solved using GEMPACK [Harrison et al., 1996].

at domestic and export markets. For each industry i, relevant equations with regard to supplies to domestic and export markets (q^i_{dom} and $q^i_{\exp}$) are formally given as followings in percentage change form:

$$q^i_{dom} = x^i + \sigma^i\left(p^i_{dom} - p^i\right) + f^i_{dom}, \quad (1)$$

$$q^i_{\exp} = x^i + \sigma^i\left(p^i_{\exp} - p^i\right) + f^i_{\exp}, \quad (2)$$

$$s^i_{dom} f^i_{dom} + \left(1 - s^i_{dom}\right) f^i_{\exp} = 0. \quad (3)$$

Supply to each market is proportional to industry's activity level, x^i, and to a price term which is an elasticity of transformation, σ^i, multiplied by the percentage change in a price ratio, $p^i_{dom} - p^i$ or $p^i_{\exp} - p^i$, representing the price of the good at each destination relative to the overall price level of products by the industry. f^i_{dom} and $f^i_{\exp}$ are shift variables related to supplies to domestic and export markets. Equation (3) ensures that these shifts take place along the given transformation curve. s^i_{dom} is the share of products destined to domestic market in the total value of products by industry i.

2.1.2 Capital Accumulation[4]

As for the specification of capital accumulation, we impose a different assumption from the one used in ORANI-F. Suppose that the forecasting simulation is comparing the current situation, t = 0, with that T years later. Rather than assuming that investment in the time span 0-T follows a straight-line path, we assume that capital growth rate between periods T and T+1 is equal to geometric average of capital growth rate during the time span 0-T. That is, for each industry i:

$$k^i_{T+1} - k^i_T = \frac{1}{T} k^i_T, \quad (4)$$

where k^i_{T+1} and k^i_T are percentage growth rates of capital stock during the time span 0-(T+1) and 0-T, respectively. Capital accumulation relation is:

$$K^i_{t+1} = (1-\delta)K^i_t + I^i_t, \quad (5)$$

where K^i_t is the capital stock operational at time t, I^i_t is investment at time t, and δ is the depreciation rate. If we combine the capital accumulation relation for t=T and t=0, we get

$$K^i_{T+1} - K^i_0 = (1-\delta)(K^i_T - K^i_o) + (I^i_T - I^i_0) - \delta K^i_0 + I^i_o. \quad (6)$$

Unless by coincidence $-\delta K^i_0 + I^i_o = 0$, the initial condition $K^i_0 = K^i_T$, $K^i_{T+1} = K^i_T$, and $I^i_0 = I^i_T$ will not satisfy equation (6). The problem is solved by augmenting equation (6) with a 'homotopy parameter' F whose initial value is chosen to be 0:

$$K^i_{T+1} - K^i_0 = (1-\delta)(K^i_T - K^i_0) + (I^i_T - I^i_0) + [-\delta K^i_0 + I^i_0]F. \quad (7)$$

In forecasting simulations, we shock F to 1 ($\Delta F = 1$). Then (7) is equivalent to (6) and our percentage change result are consistent with equations (4) to (6), as desired. Taking ordinary changes in F, and percentage changes in K^i_{T+1}, K^i_T and I^i_T, (7) becomes:

$$k^i_{T+1}K^i_{T+1} = (1-\delta)k^i_T K^i_T + i^i_T I^i_T + 100[-\delta K^i_0 + I^i_0]\Delta F + 100 f^i_{accum}, \quad (8)$$

where f^i_{accum} is the shift variable for capital accumulation.

2.2 Database and Parameters

The original 405-sector database is aggregated to the level of 26 commodities and industries[5]. The original database is available only in producer or purchaser prices that include indirect taxes, but the total indirect taxes for each industry are separately provided together with the tables on capital formation and margins transactions. Consequently, the basic price and indirect tax tables have to be created using data for industry's indirect tax payments and the share of each entry in total transactions.

'Other cost' item does not appear in the original Korean I-O data; only gross operating surplus (GOS) for each industry is presented. To separate costs of holding liquidity, costs of holding inventories and other miscellaneous production costs from GOS, estimates of the ratio of fixed capital in total funds employed are used. We obtain those estimates from accounting data published by the Bank of Korea (BOK).

One of the difficult jobs facing modelers applying an ORANI type model to other economies is the selection of appropriate values for various parameters. There are fourteen types of parameters required in the model. They are Armington elasticities for intermediate users, investors, and households; investment parameters; elasticities of output transformation; capital depreciation rates; total/supernumerary expenditure ratios for consumers; ratios of gross to net rate of return; investment/capital ratios; marginal budget shares for consumers; world interest rate factor; substitution elasticities of labor for capital; the debt/GDP ratio: and export demand elasticities. We use values contained in the ORANI-F database for investment parameters, total/supernumerary expenditure ratios, and the world interest rate factor. The Debt/GDP ratio for the base year is taken from Korea Statistical Yearbook. Capital depreciation rates and investment/capital ratios for 22 industries are given in annual Financial Statements Analysis (BOK).

As for other parameters, it is desirable to use results obtained from independent empirical research. As far as we know, such empirical studies for Korean economy are existent for only one parameter, i.e, substitution elasticity of capital for labor. Most of the existing studies were conducted for overall manufacturing sectors. A recent estimate of the capital-labor substitution elasticity by Nam [1990] is based on data for 1969-1988. The economy-wide estimate of substitution between capital and blue-collar

[4] We owe the specification of capital accumulation to Matthew Peter of the Center of Policy Studies and the Impact Project, Melbourne.

[5] See Table 2 for the 26 industry (commodity) classification.

labour is about 1.85 which is substantially higher than most previous studies. We opt for a uniform number of 1.45 for each industry just to be in-between the estimates from Nam's research and those from other studies.

As for Armington elasticities for investors, inelastic numbers (0.4 or 0.5) are given to industries like C5 (paper and wood products), C11 (general machinery), C12 (electronic and electric products), and C13 (precision instrument). These industries heavily depend on imports for supply of parts, production facilities and other basic materials. Many of these supplies are typically imported from Japan. ORANI-F data being taken as a source of reference, numbers for marginal budget shares are chosen so that expenditure elasticities are within economically reasonable ranges for each commodity. CET elasticities for all industries are less than 1, and industries having a greater portion of export goods such as C4 (textile and apparel), C12 (electronic and electric products) and C13 (precision instrument) are assigned the smallest CET elasticities (0.125). Changes in production structure for these industries are not sensitive to relative price changes since they have already incurred substantial sunk cost for export production lines and overseas marketing. Most industries have elastic export demand elasticities ranging from 1.125 to 9.45.

In sum, a guesstimate procedure has been guided by economic reasoning and available information on various industries. Initial numbers for various parameters have been modified several times; indeed, hundreds of experimental simulations were conducted to ensure that finally adopted parameter settings did not violate prior beliefs about the likely responses of the Korean economy to various shocks. The model has 28,649 variables and 21,038 equations. The simulation, however, was carried out in a condensed system of 5,977 variables and 4,034 equations.

3. HISTORICAL SIMULATION

Original I-O table of 1990 is no longer suited to be used as a relevant database for forecasts of economic development, or policy simulation for a rapidly growing economy such as Korea. BOK updates Korean I-O table every five years and the 1995 I-O table will be published only in 1998 while useful data on new economic developments are publicly available every month and every year.[6]

Pioneering work of Dixon and McDonald [1992] provides necessary methods of filling the gap of information. Historical simulation exercise not only serves as a device for updating old database but also is a systematic technique for improving the predictive ability of the forecasting model. The technique uses outcomes of recent economic developments as inputs to historical simulation. The model is refined in the process of historical simulation and becomes more complex system as shift variables are added to various activities in the model to allow for the impact of technology or taste changes. These shift variables capture some extra changes in output or consumption not explained by the mechanism of the economic model. Historical simulation, therefore, serves as a technique for measuring technological development and change in consumers' preferences.

Following list of variables for which we have observations for the period 1991 to 1995 are used as inputs to the updating simulation; trade deficit, real GDP, real investment, government consumption, consumer price index, aggregate wage payment, nominal wage rate by industry, aggregate employment, employment by industry, exchange rate, nominal value of imports and exports at the individual commodity level, basic prices, foreign currency import prices, export prices, and nominal investment by using industry.

For many vector variables, reliable numbers are available only at more aggregated level and we are not able to gather price information for service sectors. Information, for example, on the price indexes for domestic supply, exports and imports are available only for 16 commodities (C1-C16). We assume no change in the export and import price indexes and the nominal values of imports for service sectors. For the remaining missing pieces, we let the model work out what those numbers should be.

4. FORECASTING KOREAN ECONOMY IN YEAR 2000

Using the updated I-O table for 1995, we make forecasts for the Korean economy in the year 2000. One of the most difficult issues in making forecasts for the future is the construction of sensible assumptions concerning the future paths of exogenous variables. In order to make careful and flexible forecasts, we perform simulations based on several different scenarios (9 in total) and derive implications by comparing results. Considering the fact that we don't have enough information to be confident about year-to-year variations in exogenous variables, we only project average annual growth rates (or total changes) over our forecast period. Projections for macroeconomic variables are in Table 1 where shaded cells contain values of exogenous variables. Columns denoted by For1 to For9 represent simulation results based on 9 different scenarios. Forecasts for industry level variables are in Tables 2 and 3.[7]

For1 and For2 show the results of simulations where we force our CGE model to produce results compatible with exogenously supplied macro forecasts from the representative research institute in Korea. Two sets of forecasts from the institute are respectively based on the assumption that Korean Won will depreciate by 10% or 5% against the U.S. dollar during the entire 5-year forecast period. According to the institute, trade deficit as a percentage of GDP will fall by 1.30% with 5% depreciation and by 1.53% with 10% depreciation. Forecasts by the institute were derived by using a conventional macroeconomic model. Relationship between the exchange rate and trade balance is a hotly debated topic in Korea. Except for a few years, Korea has been experiencing chronic trade deficit. Removal of the persistent trade deficit has been one of the major macroeconomic policy issues in Korea.

The purpose of our simulations For1 and For2 is to check, in a general equilibrium perspective, whether forecasts for macroeconomic variables can be compatible with each other and to check how microeconomic and structural variables should be changed in order for these macroeconomic forecasts to be valid. Rates of changes of

[6] BOK publishes extended version of the original I-O table between the years of five-year term. The revision, however, covers only intermediate transactions. The tables on the capital formation and margin goods transaction are available only every five-years.

[7] Several tables that provide information on various aspects of Korean industrial structure are available. Due to the lack of space, we only present two of those. In order to conserve space, we only report results of For1, For2, and For3.

real GDP (row 8), private consumption (row 9), public consumption (row 10), fixed capital formation (row 11), nominal exchange rate (row 1), and consumer price index (row 14) are exogenised to the values projected by the research institute, whereas the change in trade deficit as a percentage of GDP (row 3) is endogenised. Regarding the growth rate of employment (row 5), it is assumed that the practical full employment that existed in 1995 will be maintained during the forecast period. This amounts to assuming that employment growth rate will be equal to the expected growth rate of labour force. Sectoral changes in the indexes for world price of imports and the labour productivity are selected to reflect the trends during the historical simulation period.

It should be noted that, under both scenarios, trade deficit as a percentage of GDP is expected to rise. If Won depreciates by 5% (row 1), trade deficit as a percentage of GDP will rise (row 3) by 0.86%. If Won depreciates by 10%, it is expected to rise even more. Trade deficit as a percentage of GDP will rise by 1.08%. According to our simulations, depreciation of Korean Won will increase the growth rate of GDP price deflator (row 15) and cause the real exchange rate appreciation (row 2). This reduction in competitiveness will deteriorate the trade balance. With more depreciation, growth rate of GDP price deflator and the rate of real appreciation will be higher. This result is related to the fact that Korean exports have been highly dependent on imported intermediate goods (typically crude oil and other materials), and capital goods mainly imported from Japan. Depreciation of Korean Won will make imported goods more expensive and cause higher inflation. Our result is in sharp contrast to the projections made by the institute which forecasted that the trade deficit will be reduced more with higher depreciation rate.

Due to the changing age structure of population, there will be a slowdown in the growth rate of labour force. This implies that average annual growth rate of employment (row 5) will be reduced to 2.06% from its level of 2.42% recorded during the historical simulation period. Our simulation results show that, in order to achieve forecast average annual GDP growth rate (row 8) of 6.74% (resp. 7.33%), average annual capital stock growth rate (row 7) should be increased to 5.19% (resp. 5.50%) from 3.82% and the average annual primary factor productivity growth rate (row 18) should be increased to 2.72% (resp. 3.02%) from 2.44%.

It is interesting to note that employment in manufacturing (row 6) is expected to decline under both scenarios. This implies that service sector is expected to absorb increasingly higher proportion of the labour force. This is related to the fact that Korean industrial structure is undergoing a transformation into a more advanced stage where service sector plays an increasingly important role.

For3 to For9 show our own projections based on several different scenarios. In these simulations, we make real GDP, consumption, investment, aggregate exports and imports, and GDP deflator endogenous. Our benchmark simulation is For3. In the remaining simulations, we change a few of our assumptions in the benchmark simulation and investigate how our benchmark simulation result is affected. Following is the list of assumptions that we adopt for our benchmark simulation For3.

- Growth rates of aggregate employment (row 5), public consumption (row 10), the number of households and the vector variables such as world prices of imports, and labour productivity are all exogenised to the same values used in simulations For1 and For2.
- There will be 30% exogenous increase in import demand for final consumption during the 5-year forecast period. This amounts to assuming that the past trend for consumer preference for imported good will be maintained.
- Exogenous increase in import demand for intermediate and capital goods are set at a much lower value of 15% in order to reflect Korean government's policy of fostering capital goods industry.
- There will be 4.36% average annual reduction in 'other cost' item (row 17) as a result of financial liberalisation and deregulation.
- During the 5-year period, there will be extra 10% growth in domestic demand for products of information and communication related industries (C11, C12, C20, and C22).
- Rate of depreciation of Korean Won (row 1) during the entire 5-year period and average annual CPI inflation rate (row 14) are set to 10% and 5.48%, respectively.
- Exogenous rise in foreign demand for Korean goods is set at 65% of the historical trend. This reflects our expectation of weak Japanese Yen and more fierce rivalry in export market with China and other Southeast Asian countries.
- Annual average growth rate of primary factor productivity (row 18) is set to 2.75%, which is higher than the historical trend level of 2.44% but is lower than the 3.02% implied by For2.

The result shows that average annual growth rate of real GDP (row 8) will be only 6.06%, which is much lower than the commonly regarded potential GDP growth rate of around 6.7% in Korea. In For4 where we set the average annual growth rate of primary factor productivity (row 18) at the historical level of 2.44%, real GDP (row 8) will only grow by 5.59%. These results show that Korea's potential growth rate should be adjusted to a lower level as the Korean economy advances to a more matured state.

For5 shows the result of removing the assumption of 20% reduction in 'other cost' (row 17). Average annual real GDP growth rate (row 8) will only be 5.61% instead of 6.06%. There will also be slowdown in the capital stock and investment growth rates (row 7 & 11). Slowdown in the growth rate of investment is particularly dramatic. It drops from 5.47% to 1.84%. Reduction in 'other cost', including financial cost, plays an important role in stimulating investment and growth.

In For6, exchange rate depreciation (row 1) is set to 5% instead of 10%. If we compare the result with that of For3, we see that the lower depreciation rate is associated with lower growth of GDP deflator, less real appreciation, and less deterioration of trade balance (row 3). The relationship between the rate of depreciation and the trade deficit that existed between For1 and For2 also holds here.

In For7, we check how much the primary factor productivity should be in order for the average annual GDP growth rate to be 6.7% which many economists in Korea consider to be the potential growth rate. The result shows that the average annual productivity growth rate should be at least 3.20%.

What has been manifested in the above 5 simulations (For3 to For7) is the fact that the expansion of trade deficit is inevitable for equilibrium under given assumptions. For8 is the result of our increasing values for the exogenous rise in

foreign demand for Korean goods. We set the values at 80% of historical trend instead of 65%. The result is that the trade deficit will be significantly reduced.

For9 is the result if we add the assumption that, during the 5-year forecasting period, there will be extra 5% improvement in total input factor productivity, which includes energy and input material saving technology, in manufacturing sector. Not only will there be boost in GDP growth rate but there will also be noticeable improvement in trade balance.

In all the above simulations, real wage growth rates turn out to be only slightly above half of the historical level. Since our simulations are based on the assumption that full employment will be maintained throughout the forecast period, simulation results imply that the rate of increase of real wage should be moderated in order to maintain the full employment level. If real wage does not moderate, unemployment, particularly in the manufacturing sector, will be significant.

Tables 2 shows the simulation results for industry output levels. Electronic and electric equipment (C12) registered the fastest growth during the 1991-1995 period. Transportation equipment (C14), petroleum and coal products (C7), electric, gas and water supplies (C16), general machinery and equipment (C11) followed electronic and electric equipment and enjoyed high growth rates. On the other hand, mining and quarrying (C2), textile products, apparel, and leather (C4), and agriculture, forestry, and fisheries (C1) were stagnant. In terms of forecasts up to the year 2000, electronic and electric equipment (C12), precision equipment (C13), primary metal products (C9), transportation equipment (C14) are expected to maintain their relatively faster growth. Service industries such as communications (C20), and real estate and business services (C22) are also expected to enjoy high growth. It is expected to be inevitable that textile products, apparel, and leather (C4), mining and quarrying (C2), agriculture, forestry, and fisheries (C1), and food and kindred products, and tobacco (C3) will record low growth.

Table 3 shows percentage share of each industry in economy-wide aggregate output level. It highlights the transition of Korean industrial structure. Whereas the share of light manufacturing industries (C3-C5, C15) has been falling, the share of heavy manufacturing industries (C6-C14) has been rising. Share of textile products, apparel, and leather (C4), which played a major role in Korea's export drive until the late 80s, has been falling quite rapidly. Increasing share of service industries is also apparent. Service industries now occupy more than 50% of aggregate output. The trend is expected to continue during the forecast period.

5. CONCLUSION

We have illustrated an application of a variant of ORANI-F model to the Korean economy. The model has been calibrated to Korean I-O data for 1990, and the observed data for 1991-1995 are used as inputs to historical simulation for construction of up-to-date I-O database. The updated data function as a new basis in forecasting for the period 1996 to 2000.

There have been two important developments in the economy during the historical simulation period. One is a sharp contrast between the heavy and light industries in the structural adjustments of industries, and the other is the expansion of service sectors. Heavy industries registered higher rate of growth, and took over the leading role for export drive in Korean economy that had been maintained for the past decades by labour-intensive light industries such as textiles and footwear industry.

The construction of exogenous assumptions and inputs to forecasting simulation with various scenarios is based on a simple approach that takes advantage of findings from the historical trend for scalar and sectoral variables. The projected implications for the structure of the economy of exogenous settings and macroeconomic assumptions can be summarized as followings.

1) In order to achieve the real GDP growth rate consistent with the Korea's assumed potential growth rate in the forecasting period, the economy requires an average annual improvement in primary factor input technology of about 3.2% which is higher than the estimated historical trend of 2.44%.
2) Due to the changing age structure of population, growth of labour force, and therefore growth of employment, is expected to slowdown. Faster growth of capital stock and productivity will be required to maintain a fast real GDP growth. Success in deregualation and liberalisation of financial market will play a crucial role for the future of Korean economy.
3) Depreciation of Korean Won is expected to cause higher inflation, real appreciation and worsening of the trade balance in the medium term. This result is closely related to the fact that capital goods and intermediate goods are heavily import-dependent in Korea. This suggests that no progress will be made in curing the problem of persistent trade deficit unless government and entrepreneurs succeed in bringing more rapid innovations than ever in the production process and capital goods industry so that the substantial substitution of domestic supplies for imported capital goods are possible.
4) Industrial polarisation between heavy or high-tech industries and light industries, ceteris paribus, is expected to continue up to the year 2000. Electronic and electric equipment industry is expected to top in ranking by registering high rate of growth in both domestic and foreign markets regardless of fluctuations in exchange rate.
5) According to the employment growth prospect, more portion of growth in employment will be absorbed by non-manufacturing sectors.

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	1991–1995	1996–2000								
		For1	For2	For3	For4	For5	For6	For7	For8	For9
Five Year Total (%)										
1. Nominal Exchange rate depreciation	9.0	5.0	10.0	10.0	10.0	10.0	5.0	5.0	10.0	10.0
2. Real depreciation	-16.01	-6.43	-8.53	-9.13	-9.06	-8.15	-6.54	-6.66	-10.99	-8.94
3. Change in Trade deficit as a percentage of GDP	0.58	0.86	1.08	1.28	0.84	0.26	0.64	1.30	-0.92	-0.83
Average Annual Percentage Growth Rates										
4. Real wage rate	7.09	4.41	4.99	4.37	3.87	2.60	4.20	4.94	5.30	5.96
5. Employment	2.42	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06
6. Employment in manufacturing	-1.37	-0.05	-0.24	0.26	0.24	-0.09	0.48	0.50	1.09	-0.58
7. Capital stock	3.82	5.19	5.50	5.08	4.73	3.96	4.94	5.45	5.71	5.27
8. Real GDP	7.48	6.74	7.33	6.06	5.59	5.61	6.00	6.70	6.35	7.26
9. Real private consumption	7.49	7.34	7.78	6.66	6.34	7.54	6.62	7.09	5.56	7.59
10. Real public consumption	5.20	4.65	4.65	4.60	4.60	4.60	4.60	4.60	4.60	4.60
11. Real investment	8.12	5.49	6.60	5.47	4.39	1.84	4.81	6.42	7.50	5.91
12. Export volumes	12.27	9.73	9.94	11.32	10.91	10.84	11.57	12.20	12.55	12.24
13. Import volumes	12.29	9.06	9.40	10.23	9.67	9.26	9.96	10.79	11.05	9.40
14. Consumer price index	6.20	3.96	5.48	5.48	5.48	5.48	3.96	3.96	5.48	5.48
15. GDP price deflator	6.53	3.75	5.19	5.37	5.35	5.14	3.81	3.83	5.80	5.33
16. Investment price deflator	7.28	4.52	5.96	7.02	6.90	6.58	5.36	5.54	7.26	6.94
17. Other cost tickets	0.00	0.00	0.00	4.36	4.36	0.00	4.36	4.36	4.36	4.36
18. Primary factor productivity	2.44	2.72	3.02	2.75	2.44	2.75	2.75	3.20	2.75	2.75

Table 1: Simulation Results for Key Macroeconomic Variables

	1991-1995	1996-2000		
		For1	For2	For3
C1. Agriculture, forestry, and fisheries	1.08	5.45	5.74	4.99
C2. Mining and quarrying	-3.79	5.54	6.41	2.18
C3. Food and kindred products, and tobacco	3.32	5.78	6.12	5.16
C4. Textile products, apparel, and leather	-2.65	0.79	0.85	-0.89
C5. Paper and Wood products	3.67	7.18	7.69	7.00
C6. Chemicals and allied products	8.91	7.70	7.87	7.87
C7. Petroleum and coal products	13.54	7.95	8.14	8.24
C8. Stone, clay, and glass products	5.98	6.06	6.85	5.59
C9. Primary metal products	7.73	8.71	8.90	9.56
C10. Fabricated metal products	5.14	7.18	7.90	6.60
C11. General machinery and equipment	10.36	7.02	7.40	8.45
C12. Electronic and electric equipment, except computer equipment	14.39	10.76	11.07	12.70
C13. Precision instrument	7.77	10.24	10.71	8.71
C14. Transportation equipment	14.08	8.48	8.96	7.44
C15. Miscellaneous manufacturing products	3.06	8.10	8.51	7.87
C16. Electric, gas, and water services	11.33	7.66	8.08	7.25
C17. Construction	6.69	4.91	5.83	5.02
C18. Wholesale and retail trade	6.61	6.81	7.18	6.70
C19. Transportation and warehousing	8.16	7.78	8.18	7.55
C20. Communications	6.17	7.46	7.89	8.68
C21. Finance and insurance	5.51	7.37	7.83	7.10
C22. Real estate and business services	7.88	8.20	8.70	9.24
C23. Public administration and defence	4.44	5.13	5.18	4.88
C24. Educational and health services	6.86	7.02	7.33	6.26
C25. Social and household services	7.56	8.05	8.52	7.20
C26. Dummy sector	4.92	7.15	7.57	6.98

Table 2: Simulation Results for Growth Rates in Industry Output Levels

	1990	1995	2000		
			For1	For2	For3
C1	5.41	4.41	3.45	3.40	3.28
C2	0.55	0.27	0.22	0.23	0.20
C3	6.42	5.06	4.43	4.37	4.24
C4	6.93	3.97	2.78	2.69	2.54
C5	2.01	1.84	1.98	1.96	1.92
C6	6.47	6.32	6.46	6.30	6.22
C7	2.01	2.67	2.57	2.56	2.46
C8	1.86	1.54	1.32	1.36	1.31
C9	5.33	4.84	5.30	5.20	5.24
C10	1.87	1.43	1.37	1.38	1.33
C11	3.91	3.75	3.76	3.74	4.04
C12	5.70	6.59	8.54	8.40	9.27
C13	0.42	0.38	0.46	0.46	0.44
C14	4.87	5.50	5.50	5.53	5.40
C15	1.55	1.26	1.36	1.36	1.32
C16	1.77	1.92	1.73	1.73	1.69
C17	10.32	11.59	10.69	11.05	10.91
C18	6.82	6.95	6.90	6.89	6.65
C19	3.80	4.70	5.05	5.07	4.95
C20	0.99	1.17	1.21	1.22	1.38
C21	3.21	3.36	3.56	3.61	3.55
C22	5.91	7.28	7.88	7.96	8.25
C23	3.40	3.56	3.36	3.34	3.45
C24	3.60	4.41	4.60	4.63	4.53
C25	2.50	3.06	3.32	3.35	3.25
C26	2.38	2.18	2.20	2.19	2.17
Manufacturing	49.35	45.16	45.84	45.32	45.74
Light	16.91	12.13	10.55	10.38	10.02
Heavy	32.44	33.03	35.29	34.94	35.72
Service	44.70	50.17	50.49	51.05	50.78

Table 3: Industry Shares of National Output