

11. Summary, Conclusions and Policy Implications

11.1 Introduction

The preceding chapters have defined the problem that was under investigation and presented the methodology and theoretical framework that have been used to address it. Results from several experiments through policy simulations have been discussed. The aim in this last chapter is to summarise what has been done in the study and to discuss conclusions from the analyses undertaken. Moreover, the chapter presents some of the important policy implications that emerge from these conclusions.

The chapter is organised as follows. Section 11.2 summarises the whole study. The section also highlights various conclusions that can be drawn from the analysis of external shocks and economic policies in Chapters 8, 9 and 10. Policy implications arising from the conclusions are discussed in Section 11.3. The contributions made by the study are briefly outlined in Section 11.4. The study's limitations are explained in Section 11.5. This leads to Section 11.6 where areas for further research are highlighted in an attempt to identify relevant future investigations.

11.2 Summary and Conclusions

11.2.1 The research problem and methodology

The research problem in the study was introduced in Chapter 1. In elaborating on the nature and relevance of the problem, an explanation of the role of the agricultural sector in Kenya's development strategy was discussed in Chapter 2. The chapter reviewed the roles the Kenyan policy makers expected the agricultural sector to play under various development plans that have been formulated in independent Kenya. The sector's performance over these years was discussed through an appraisal of various indicators that showed its contribution towards the defined goals. Appraisal of these indicators suggested that the sector's performance has not always met with policy makers expectations. One obvious cause for this is likely to be the ineffectiveness of agricultural sector policies. The other likely cause for this performance is the influence of the macro

environment under which these sectoral policies operate. Moreover, this macro environment may directly affect the sector's performance.

This study is an attempt to explain the sector's performance by analysing the effects of the macro environment created by external shocks facing the Kenyan economy as a whole and the various policies that the Kenyan government may have used to address these shocks. The scope of this macro environment was outlined in Chapter 3 which discussed the various external shocks that affected the Kenyan economy in the 1970s and 1980s. The discussion dealt with various policies that the government used to address these external shocks. The chapter also outlined some important policies that have been recommended to the Kenyan government by World Bank and the IMF under the structural adjustment programs being implemented in most developing countries, mainly in Sub-Saharan Africa.

In line with the research problem outlined in Chapters 1 to 3, five specific objectives were formulated to guide the study. The first objective of the study was to develop an economic model for the Kenyan economy that could be used for the evaluation of effects of external shocks and policies described in Chapter 3. To achieve this objective, a Kenyan economy general equilibrium model (KEGEM) was developed as described in Chapter 6. The model uses an ORANI-type production structure but follows the framework of World Bank type of models as described in Dervis et. al. (1982) in addressing the issues of income distribution, trade and investment. The model can be classified as being broadly in the class of neoclassical-structuralist models.

11.2.2 Effects of the terms of trade shocks in the mid-1970s

The second objective was to explain the effects of the external shocks in the 1970s on the Kenyan economy with special reference to the agricultural sector. To achieve this objective, KEGEM was implemented using the 1976 input-output tables and SAM as benchmark data. After calibrating the model for the unknown parameters, it was used to simulate the effects of two external shocks. These are the oil-price shock and the coffee boom that affected the Kenyan economy between 1973 and 1978. The oil-price shock was captured in the analysis by a simulation of an increase in the manufactured imports

price. The export boom was analysed by a simulation that increased the world price of agricultural exports.

The analyses of the terms of trade shocks that affected Kenya in the 1970s indicate that the economy was quite vulnerable to external shocks. With regard to the effects of the oil-price shock in the form of higher manufactured import prices, it can be concluded that they contributed to significant contractions in the economy. The manufacturing sector's reliance on imported capital inputs made it the most affected by the oil-crisis. In particular, its capacity to generate employment was curtailed by this external shock. This led to significant falls in employment of skilled workers. However, results of the effects of the negative terms of trade through higher manufactured import prices showed that it is not only the manufacturing sector that suffered. The linkages of the adversely affected manufacturing sector to other sectors of the economy seemed to have produced negative effects on the agricultural and services sectors.

In terms of the income distribution effects of the negative external shock, the results lead to the conclusion that all the institutions in the economy were worse off from higher manufactured import prices. However, it was urban households that suffered most in terms of larger falls in income.

The vulnerability or sensitivity of the Kenyan economy to external shocks resulting from the negative terms of trade shock was further confirmed from the effects of a positive terms of trade shock arising from the coffee boom. The conclusion here is that the export boom strongly influenced the agricultural sector at the time because it was price responsive. The export boom in the agricultural sector was quite expansionary as the economy responded positively to higher export earnings. The expansion in the agricultural sector encouraged higher production in the other sectors. However, the expansionary effects of the higher export prices are likely to have led to a shift in resources to agriculture which meant that there was a much smaller increase in total production in other sectors. Thus, there are very small increases in exports in other sectors.

Another conclusion about the effects of the positive terms of trade shock concerns its contribution to an investment boom. The additional savings resulting from higher export

earnings led to increases in investment funds resulting in an investment boom. However, instead of the highest investment expenditures being in the agricultural sector that contributed towards the higher export earnings, it was in the services sector followed by manufacturing sector where most of the investment occurred.

Another conclusion that can be drawn from the effects of the positive terms of trade shock concerns the importance of the agricultural sector in generating employment in Kenya. All labour categories enjoyed significant increases in demand for their services as a result of the coffee boom. However, in terms of sectoral employment, there was more employment generated in manufacturing than in agriculture by the boom. This leads to the conclusion that most of the higher export earnings were spent on goods and services boosting manufacturing production.

In terms of income distribution effects of the positive terms of trade shock, all households benefited positively from the export boom. However, since the manufacturing sector enjoyed higher increases in employment demand than the agricultural sector, urban households experienced higher increases in income than rural households.

The two terms of trade shocks were combined to reflect the situation that Kenyan policy makers faced in the mid-1970s. This combination as noted in Chapter 8 was because the effects of the oil-price shock in the negative terms of trade simulation were still being felt through higher manufactured imports prices when the export boom took place. Thus, the reference simulation for the policy analyses needed to combine these two external effects in order to capture the environment that the government policies were being implemented in. The first conclusion that can be drawn from combining the negative and positive terms of trade shocks in the reference simulation is that the export boom contributed in a positive way towards ameliorating the negative effects that the Kenyan economy was facing as a result of the oil-price shock. That is, the positive expansionary effects of the export boom outweighed the negative contractionary effects of the higher manufactured import prices emanating from the oil-price shock. However, the expansion effects of the export boom experienced in the individual simulation of positive terms of trade were suppressed by the negative effects of higher manufactured import prices. However, a general conclusion from the reference simulation is that in the short run,

without any government intervention, the Kenyan economy would have expanded since the export boom effects more than proportionately countered the contraction effects of the oil-crisis.

In terms of income distribution effects, the conclusion from the reference simulation corresponds to the growth in the economy. Hence, the conclusion is that positive impacts on nominal household incomes from higher world export prices outweighed the negative impacts resulting from high world import prices. This means that all households enjoyed increases in incomes, a result that would have been unlikely if there was no export boom but just the effects of the oil-price shock. However, the joint terms of trade effects still indicate that contrary to expectations, rural households involved in agricultural production did not experience significantly larger increases in nominal incomes than their urban counterparts. Hence, while urban households suffered most from the oil-price shock, the ensuing export boom in the agricultural sector meant that increases in their incomes were as good as or much better than for rural households.

11.2.3 Government responses to the terms of trade shocks

The third objective of the study was to analyse how particular government policies affected the outcome of the external shocks analysed in the second objective. This objective was important since it sought to explain whether the direction of the government's response to the terms of trade shocks had a positive or negative impact on the outcome of these shocks. Three policies were analysed under this objective. Each of them was combined with the reference joint terms of trade simulation that captured the two external shocks under investigation. The policies analysed were: an increase in import tariffs; an increase in indirect taxes; and an increase in government spending. In the simulation for government spending, the extra revenue raised from the two tax increases was used to finance the higher government expenditure.

The first conclusion that can be drawn regarding government policy effects on the outcome of the terms of trade shocks is to do with the impacts of higher import tariffs. The higher tariffs that the government favoured at the time led to a reduction in the positive impacts of the overall terms of trade in terms of real GDP and balance of trade. The gains made by the economy from the export boom over the depressing effects of the

oil-price shock were reduced by the increase in tariffs. This means that higher tariffs had the effect of discouraging production in the exporting agricultural sector. This negative effect was higher than the resulting positive effect on the import competing manufacturing sector from higher tariffs.

Remembering that the decision to increase tariffs was taken by the government before the emergence of the coffee boom, it is possible that the government would not have been able in the short run to achieve the outcome it sought over the effects of the oil-price shock. The fact that higher tariffs had the effect of lowering real GDP in general, means that if there had not been an export boom, then the economy would have contracted further from the effects of the oil-price shock. That is, higher tariffs would not have fixed the problem if the increased duty revenues were not to be used to raise government spending. The import substitution activities that resulted from higher tariffs would not have been enough to improve growth prospects for the economy. This means that such a policy undermined export producing sectors like agriculture and was not the best option.

However, the conclusion above on the effects of higher tariffs on real GDP and trade balance changes when the impacts of the tariffs on employment and income distribution are evaluated. If there was no export boom, it is obvious that the higher tariffs would have resulted in lower employment in the agricultural sector. However, this tariff policy appears to have resulted in an improvement in employment in the manufacturing and services sectors. Thus, a general conclusion from the results on the effects of increases in tariffs on the outcome of the terms of trade shocks is that, employment generation for all the labour categories apart from self-employed workers would have been better. This translates to higher nominal incomes for the households. All household incomes increased by higher margins than the ones achieved if the terms of trade changes were not accompanied by a government policy change. Therefore, the effects of the import tariffs on the export boom is that such a policy would have been acceptable if the aim of the government was to increase employment and household incomes. The existing boom meant that job losses in the agricultural sector in the short run were more than compensated by increases in jobs in manufacturing and, to a small extent in the services sector.

The other government policy instrument used at the time of the terms of trade shocks was indirect taxes. An increase in indirect taxes when external shocks occurred indicated that they had a different effect to import tariffs. The first conclusion regards the effects these taxes had on real GDP. Unlike import tariffs, the negative effect of higher indirect taxes on real GDP was slightly higher. The story is similar when looking at the effects of indirect taxes on other variables. First, unlike in the case with higher tariffs, an increase in indirect taxes meant higher production in the economy arising from the terms of trade changes was much smaller. The manufacturing and services sectors in particular experienced significantly smaller increases in output from the export boom as a result of higher indirect taxes. The conclusion that can be drawn is that indirect taxes form a major cost component for production in the economy.

The second conclusion that can be drawn from the effects of higher indirect taxes is that they contributed to a significantly small increase in employment in the economy. Unlike in the case of higher tariffs where employment demand rose above the levels attained from the joint terms of trade shock, higher indirect taxes would have resulted in a decline in demand for labour for all categories. The manufacturing sector in particular experienced a significant reduction in employment compared to what it would have achieved from the joint terms of trade shock. This means that the skilled and unskilled workers were adversely affected by increases in indirect taxes. This is evident in the income distribution effects. Higher indirect taxes led to smaller increases in nominal incomes of all households. However, it was the urban households that experienced most of the negative effect of higher indirect taxes.

The third government policy whose impact on the outcome of the external shocks was investigated was the level of government spending. Higher government spending clearly complemented the positive effects that the export boom had on the economy. The GDP growth from higher government spending overshadowed the negative effects on the same from higher tariffs and indirect taxes financing the increased expenditures. There was higher labour demand overall as a result of increased production in the three sectors emanating from the expansionary effects of higher government spending. The only negative outcome was the inflationary nature of higher government spending and that of the two tax increases to finance it which led to lower increases in the level of agricultural

and manufactured exports hence a deterioration in the trade balance. In terms of effects of higher government spending on income distribution, due to higher labour demands, there was higher increases in labour incomes of various employment groups. This meant that each of the ten household groups enjoyed significantly higher incomes than if there was no government spending increase accompanying the terms of trade changes. The urban households benefited most from increased government spending compared to gains made by rural households.

Two more conclusions can be made regarding the effects of the three government policies. The first regards the two government policies involving changes in tariffs and indirect tax rates and their effects on the outcome of the terms of trade shocks. The conclusion is that indirect taxes not only have slightly higher negative effects on overall GDP, but their impact on employment and hence income distribution make them a poorer option if the government's main concern is to improve or at least maintain the level of households' welfare. The other conclusion relates to the expansionary effects of higher government spending. That is, government spending in a small economy like Kenya is an important determinant of the level of growth and hence welfare of the various household groups.

11.2.4 Alternative policies to government's response to the external shocks

The fourth objective was to analyse how alternative economic policies to the ones pursued by the government at the time of the shocks could have affected the outcome of the shocks. As in the case of objective three, each alternative policy was combined with the reference terms of trade shock. In general, two main alternative policy regimes were analysed. The first analysis looked at how two alternate exchange rate adjustments would have influenced the terms of trade shocks. The Kenyan shilling was revalued in one simulation and then devalued in the second. The other alternative policy regime analysed in meeting this objective was an adjustment to the terms of trade shocks through a contractionary fiscal policy. Three simulations were implemented. Import tariffs, indirect taxes and government spending were reduced. The tax cuts were accompanied by equivalent reductions in the level of government spending in an attempt

to ensure that the government's fiscal balance was not adversely affected by the revenue shortfall from tax reductions.

The effects of a revalued currency on the outcome of the external shocks demonstrated a contracting effect on the economy. The economy contracts to the extent that all the gains made from the export boom are wiped out as real GDP declined rather than increased. Production in all the sectors fell as a result of the revaluation. In fact, only the agricultural sector showed some positive output growth but still the increase was lower than when there is no revaluation. The stronger currency also contributed to significant reductions in exports resulting in a deterioration in the balance of trade. Investment and employment also fall with a revalued currency. This means that if the government had revalued the currency the investment boom in the economy would not have materialised. With regard to employment, the manufacturing sector would have been the most affected by the stronger currency.

The first conclusion that can be drawn from this performance is that the effect of a stronger shilling on reducing exports is so large that the higher world agricultural export prices are no longer effective in producing growth in the economy. Another conclusion that can be drawn from the results of revalued shilling effects on the outcome of the terms of trade shocks is that the Kenyan manufacturing sector is very reliant on the agricultural sector. That is why the manufacturing sector instead of directly benefiting from a revalued currency actually lost as a result of the declines in the agricultural sector. This means that it is not enough to have an exchange rate that favours imports as is the case with overvalued currencies. In the Kenyan case, the manufacturing sector is directly affected by the performance of the agricultural sector.

The deflationary nature of the overvaluation of the shilling indicated that producer prices would have decreased if such a policy was implemented at the time the external shocks occurred. The falls in producer prices can be linked to the results showing a general contraction in the economy. The conclusion that can be made from this outcome on prices is that an overvalued currency has a tendency to have a negative effect on an agricultural economy such as Kenya's. The reduction in the competitiveness of export prices in the agricultural economy means lower producer prices and this acts as a disincentive to producers.

The other point with respect to the influence an overvaluation of the currency has on the terms of trade outcome is to do with income distribution. As pointed out, a revaluation of the currency results in a reduction in the level of employment achievable from the terms of trade gains as a result of the export boom. This means that all households receive lower incomes from the boom. The urban households that were seen to benefit substantially from the positive effects of the export boom over the depressing effects that they faced from the oil-price shock end up losing the most from an overvalued shilling. The conclusion that follows from this is that for Kenya's agricultural economy, incomes can be maintained by ensuring that the exchange rate is competitive. Any deviation from this will result in a deterioration in household incomes.

The other exchange rate adjustment issue investigated was the effect that a devaluation of the shilling would have had on the outcome of the terms of trade shocks. As opposed to the effects of an overvalued currency, a devaluation is evidently expansionary and the effect is to complement the existing export boom. Consequently, devaluation of the shilling leads to higher production in the three sectors in the economy. This is accompanied by significant growth in investment and employment. Agricultural exports increased more than that of manufactured exports. However, the manufacturing sector benefits substantially from the devaluation and it demands more labour than the agricultural sector. This strengthens the conclusion that the agricultural sector is critical to the manufacturing sector in Kenya. The better than expected performance in the manufacturing sector is attributable to the positive linkage the sector has with the agricultural sector outweighing any depressing effects a devalued currency would impose on the manufacturing sector through imported inputs.

As for income distribution effects of the devaluation, the result was that the expansion in the economy resulting from better export performance contributed to higher incomes for all labour categories. Hence, all the households gain from the positive impacts a devaluation has on the existing terms of trade effects. The urban households gain most from the effects of the devaluation through higher exports, particularly agricultural ones. The devaluation maximises the income gains from the existing favourable export prices by making Kenyan agricultural exports, mainly coffee and tea, even more competitive. Contrary to expectations, urban households gain more from the export boom in terms of

income than rural households. This is in line with the earlier conclusion that urban households in Kenya benefit significantly from good performance in the agricultural sector.

From the foregoing summary on the effects of alternative exchange rate adjustment policies that the government could have pursued at the time the two external shocks hit the Kenyan economy, one general conclusion can be made. That is if the government wanted to adjust the level of the currency, revaluation was not a good policy option. Hence it was advisable that the government did not do that. However, given the short-term nature of the export boom, if the currency was still overvalued, an opportunity may have been lost for the government to devalue further.

Besides the two exchange rate adjustments, an alternative contractionary fiscal policy regime was analysed under the fourth objective. The first of three experiments involved a fiscal adjustment that reduced import tariffs. The expected shortfall in government revenue from lower tariffs was replaced in the simulation by reducing government spending by an amount equivalent to the shortfall. The results from the simulation indicate that the economy's gains from the export boom would have been reduced through lower tariffs accompanied by less government expenditure. Thus, production growth attained with the terms of trade, *ceteris paribus*, is reduced if tariffs are lowered with concomitant reduction in government spending. Investment also declines under this scenario. This is attributable to lower government revenue which means lower total savings. Employment is lower than what would have been attained without tariff and government spending changes. However, this policy results in better export performance for both the agricultural and manufacturing sectors.

The conclusion that can be drawn is that lowering tariffs accompanied by a reduction in government spending leads to lower growth. The contraction arising from the reduction in tariffs can mainly be attributed to the accompanying government spending as lower tariffs ought to lead to better performance in exporting sectors. That is, lower tariffs could not in this case maximise gains from the export boom in the agricultural sector as their effects are undermined by a cut in government spending. Trade liberalisation could only be beneficial in the short-run if the government had sufficient resources to cover expected revenue shortfalls from lower duty collections. In other words, a policy of

trade liberalisation at the time that the terms of trade shocks took place would have been undermined by reductions in government spending. This conclusion is supported by results showing reduction in the income gains by households from the export boom when tariffs are reduced accompanied with lower government spending.

The second contractionary policy option analysed was lower indirect taxes. As in the case of tariffs, reduction of indirect taxes was supported by lower government spending to avoid creating poor fiscal balance for government. The results from this policy show that the Kenyan economy would have been worse off and an even bigger contraction from the one registered in the case of tariffs reduction would have resulted. That is, a policy of lowering indirect taxes, accompanied by a concomitant cut in the level of government spending makes the gains from the export boom smaller.

Unlike in the case of tariffs where production in the three sectors in the economy fell, the reduction in indirect taxes does lead to some positive growth in the manufacturing sector above the level when there was no policy change. This is reflected in the slightly higher labour demand in the manufacturing sector unlike the falls in the other two sectors. The conclusion that can be drawn from this is that while both lower tariffs and indirect taxes mean lower production costs, the indirect taxes are more important than tariffs to manufacturing producers. As an import competing sector, lower tariffs expose it to further foreign imports while indirect taxes basically directly lower its production costs.

It can be concluded that a contractionary fiscal policy through either indirect taxes or tariffs would have resulted in lower gains for the economy if these policies were accompanied by reduced government spending. However, both measures led to an improvement in the balance of trade through higher level of exports. The positive growth in the trade balance registered as a result of the export boom improves further in both cases of the contractionary fiscal policy through either lower tariffs or indirect taxes accompanied by the equivalent reduction in government spending. It can therefore be concluded that these two tax instruments are important policy instruments for dealing with unacceptable trade balances.

The third contractionary fiscal policy instrument analysed was a reduction in government spending without any changes in tax rates. The government expenditure increase

observed in reality was reversed in this experiment to analyse the effects such a reduction would have on the outcome of the terms of trade shocks. The rationale in the experiment was to see whether the government should have taken advantage of the boom to reduce its spending. The results of this experiment indicate that the economy would have contracted significantly, fully overshadowing the positive effects that the export boom was having on the economy in terms of real GDP growth and employment. However, the policy did improve the trade balance through an increase in agricultural and manufactured exports and a fall in imports in all the sectors accompanying lower government spending. At this point, it is important to note that the export expansion was attributed to lower costs of production that accompany the deflation in the economy associated with lower government expenditure. Thus, it can be concluded that the level of government spending influences the performance of Kenyan exports through its effect on the level of inflation.

Unlike in the previous two contractionary fiscal policies, that is the lower tariffs and indirect taxes accompanied by an equivalent reduction in government spending, this third policy gives different results with regard to investment. In the previous two experiments, investment gains from the terms of trade shocks actually declined. However, in this case of just a reduction in government spending, investment in each of the three sectors actually improves. The conclusion that can be drawn from this is that a contractionary policy through tariffs or indirect taxes has a different impact on investment from one undertaken through government expenditure alone. The contractionary policies with a direct effect on revenue lead to lower levels of investment as the government is an important source of domestic savings. The contractionary policy from the expenditure side on the other hand leads to increased government savings and hence better levels of investment.

The results obtained for labour demand from the impact of lower government spending on the effects of the terms of trade are not surprising. The government being a major provider of services, a cut in its spending leads to job losses hence the observed deterioration in employment levels from the terms of trade shocks. Consequently, incomes for various households were even worse than they would have been if the contractionary policies were to be implemented through lower tariffs and indirect taxes.

In fact, while rural households experienced positive increases in incomes, albeit lower ones, under lower indirect taxes and tariffs, some of these household incomes actually fall when government spending is reduced without tax cuts. The conclusion from these results once again strengthen the conclusion that the government is an important determinant of the level of economic activity in a small economy like that of Kenya.

11.2.5 Analyses of some policy recommendations from the World Bank and the IMF

The fifth objective of the study was to analyse the effects of some of the policies under structural adjustment programs recommended to the Kenyan government by the World Bank and the IMF since mid-1980s. To accomplish this objective, an updated database for KEGEM from 1976 to 1986 was employed. The three policy recommendations analysed were: a fiscal austerity program; a trade liberalisation policy; and a reduction in the level of foreign capital inflow in the form of foreign aid and grants to the economy. The three options of fiscal austerity included a cut in government spending, an increase in indirect taxes and an increase in direct taxes. For trade liberalisation, three options of implementing the program were analysed. The first option rationalised import tariffs of the agricultural and manufacturing sector to be at 10 per cent level. The second option supported trade liberalisation with higher indirect taxes while the third option supported the liberalisation with an increased inflow of donor support through higher foreign capital inflow.

The experiment on reduction in the level of foreign borrowing was also analysed through three simulations. The first simulation reduced the foreign capital inflow without any measure to remedy the shortfalls in investment funds such a move would create. The other two simulations sought to fix the problem of a shortfall in investment funds due to reduced total savings through two options. The first option was to lower government spending to a level concomitant with the fall in foreign capital inflow. The rationale being that most of Kenya's borrowing is public hence the need to reduce government expenditure. The second option attempted to adjust for the external shock from lower foreign capital inflow through a stabilisation response that involved devaluing the shilling. This option aimed to make Kenyan exports more competitive and, in the

process, increase foreign exchange earnings to cover the shortfall in foreign capital inflow.

Before delving into the findings on the effects some of the policy recommendations made to the government by World Bank and the IMF might have had on the Kenyan economy, the outcome of the terms of trade shocks in the mid-1980s is first summarised. The analysis of the impacts of the terms of trade shocks was undertaken in the light of the very sensitive nature the Kenyan economy was found to have towards such shocks in the 1970s. There was a favourable shift in terms of trade facing Kenya in the mid-1980s when there was a mini-coffee boom and a decline in the world oil prices at the same time.

The interesting result obtained regarding this favourable terms of trade shift is that while there was an expansion in the economy, it was the manufacturing sector that benefited most from the external shocks. The mini-coffee boom and lower manufactured import prices resulting from lower oil prices significantly boosted manufacturing production. There was a very small expansion in the agricultural sector from the mini-coffee boom. This is a surprising result but can be explained through the structural change that may have taken place in the sector over the ten years since the previous coffee boom. While coffee was still the most important export in the economy, it formed a much smaller proportion of Kenya's total exports unlike in the 1970s when this proportion was high. Moreover, the magnitude of the coffee boom in the 1980s was only a small proportion of the major coffee boom in the 1970s. One conclusion that can be drawn from these findings is that the structural change in the agricultural sector shielded the economy from imbalances created by the terms of trade shocks.

The other positive effect that the favourable terms of trade in the 1980s had on the economy was improvement in the level of investment. Investment grew in the three sectors and the conclusion that can be drawn here is that the terms of trade is an important determinant of investment in Kenya. However, the way savings from the favourable terms of trade are allocated does raise an important issue as results in the 1980s, just like in the 1970s, indicated that it was the services sector that benefited most. That is, allocation of total savings was skewed towards this sector even though it is the agricultural and manufacturing sectors that contribute mainly to savings.

The other result from the terms of trade effects was that the manufacturing and agricultural sectors had better employment demands than the services sector where most of the investment took place. The favourable terms of trade had direct positive effects on the labour markets of the two sectors experiencing the shocks. The conclusion that can be drawn regarding employment points to the importance of manufacturing in providing jobs for Kenya's growing labour force in addition to the agricultural sector. Hence, given the right conditions, the manufacturing sector can contribute significantly to lowering unemployment levels. That the agricultural sector's labour demand increased by a smaller amount compared to growth in manufacturing labour demand supports the notion that Kenya's manufacturing should be further strengthened as an important source of jobs.

The implication for incomes from the terms of trade shocks is that all households gained. Urban households gained most compared to the income growth in the rural households. Once again, as in the case of the boom of the 1970s, urban households register much better income growth than rural households.

Continuing now to the effects of some of the policies recommended to the Kenya government by the World Bank and the IMF, several important conclusions can be drawn. The first policy recommendation was to do with government fiscal management. As outlined previously, three options for dealing with the existing fiscal imbalance were investigated. One of the options dealt with the expenditure side of the government's budget and cuts its spending. The other two options address the problem from the revenue side by raising two different taxes, indirect and direct taxes.

The first important conclusion from the effects of these three fiscal measures is that dealing with the fiscal deficit from the expenditure side has a significant contractionary effect. This measure is costly in terms of losses in real GDP growth, investment and employment. However, the option does have a positive impact on the trade balance as exports from the agricultural and manufacturing sector increase while imports decline. As for the other two options, the economy does not change much in GDP terms from the increase in indirect taxes. This is different to the direct taxes measure which leads to a contraction which is only one third of the contraction resulting from reduced government spending.

On the effects of the three measures on trade, higher direct taxes, like reduced government spending, resulted in an improvement in the trade balance. However, indirect taxes cause a deterioration in existing trade balance. This leads to an important conclusion with regard to trade. That is, through lower costs of production due to its deflationary nature, the lower government spending option can improve the trade balance. Direct taxes can also improve the trade balance through a direct effect that lowers consumption of imports and an indirect effect of lower cost of production as the measure is also deflationary, though to a smaller extent than with government spending. Unlike the other two options, indirect taxes worsen the trade balance as they increase the cost of production, reducing the capacity for exports to increase.

The results regarding employment indicate that the three fiscal measures contribute to depressed performance in the labour market. Each of them leads to a decline in labour demand. The declines are proportionate to the level of production changes. Thus, a fiscal austerity measure through lower government spending leads to the worst outcome on employment followed by the option of increasing direct taxes. The conclusion that can be drawn regarding employment is that a fiscal austerity measure through indirect taxes is much better than one through either a government spending cut or higher direct taxes. Indirect tax increases have the least negative effect on labour demand.

The outcome on labour demand as a result of the three fiscal measures is replayed in their effects on income. All the households register declines in their incomes. In all three cases, urban household incomes suffer larger decreases than those for rural households. In general though, the magnitudes of the declines suggest that the best option to deal with a fiscal deficit is through indirect taxes rather than through either lower government spending or higher direct taxes.

Trade policy reform is the other important policy the Kenyan government was impressed upon to address under structural adjustment programs. This issue was addressed through three options of implementing trade liberalisation available to the Kenya government. The first option was a liberalisation measure that rationalised agricultural and manufacturing sector import tariffs to 10 per cent from their pre-simulation levels. The other two options supported the liberalisation measures as they recognised that trade liberalisation has fiscal implications for the government. The first supporting measure

increased indirect taxes while the second option relied on foreign capital inflow in the form of aid or grants.

The results indicate that in real GDP terms, Kenya stood to gain in the short-run from trade liberalisation in the 1980s whichever path it chose. The third option would have been the best path to take if donor countries were willing to support Kenya's reform program. In terms of production, the manufacturing sector stood to lose from trade liberalisation irrespective of the option implemented. This can be explained by its import competing nature.

The three liberalisation measures indicate that in the short run, Kenya would have gained from better trade performance. Each trade liberalisation option resulted in an improvement in the trade balance. The option with the highest improvement is that of trade liberalisation without any support, followed by the one where the fiscal shortfall is supported by higher indirect taxes. The surprising result is that manufactured exports increased in each case given that output fell for this sector. The likely explanation is that the production mix in the manufacturing sector is such that some of the sub-sectors are import competing while others are export producing. The conclusion that can be drawn here is the possibility of success in the shift towards an export-led growth development strategy in most developing countries, Kenya included, in the early 1980s from one driven by import-substitution production.

The significance of supporting measures for trade reform are clearer when results for employment and investment are considered. The conclusion is that undertaking trade liberalisation without paying attention to the fiscal consequences would have led to investment declines in the three sectors. The two supporting measures for the reforms would have improved investment outcomes in the three sectors. Supporting trade reform through higher capital inflows led to the best investment results.

In employment terms, trade liberalisation alone led to job losses through lower labour demand mainly in the manufacturing sector. The agricultural sector actually showed some improvements in employment from trade reform. One conclusion that can be drawn regarding employment is that raising indirect taxes to support trade reform results in the worst employment outcome. The other conclusion is that foreign capital support

for trade liberalisation is important and this is most visible when labour demand is distributed amongst the various categories.

The results of the three options on income distribution indicate why the Kenyan government may have been hesitant to undertake trade reforms. In all three cases, nominal incomes fall from trade liberalisation. That is, all households would have experienced declines in nominal incomes regardless of the path the government took to implement the trade liberalisation. In each option, urban households experience larger falls in nominal incomes than rural households. An attempt to reduce government revenue losses from the trade liberalisation through raising indirect taxes resulted in the poorest results for household incomes. Supporting trade liberalisation through higher foreign capital inflow on the other hand causes the least declines in household nominal incomes.

Another point is that government suffers from trade liberalisation as revenue falls. The government's fiscal position is worst if trade liberalisation is carried out without any support. The options at the government's disposal for supporting the reform indicate that the fiscal deterioration would be curtailed to some extent in both instances but the best option would be higher indirect taxes. However, since higher indirect taxes result in much poorer results other than government's revenue, the best option for the government in undertaking trade reform is with donor support if this is possible.

The last issue addressed under policies recommended to the Kenya government by the World Bank and the IMF looks at the effects of a policy that tries to deal with Kenya's foreign debt. This policy was investigated through a reduction in the level of foreign capital inflow. It needs to be qualified once again that most of the foreign capital inflow is direct government external borrowing or state guaranteed borrowing by parastatal firms. The reduction in foreign capital inflow is implemented through three options. The first option simply cuts the inflow. The other two options try to implement a stabilisation measure for the external shock from the reduction in foreign capital inflow. The first stabilisation measure is quite obvious. That is, reducing government spending as most of the foreign aid and grants are part of the government's budgetary appropriations. The other stabilisation measure is through an exchange rate adjustment that aims to increase export earnings to cover the foreign capital shortfall.

The results regarding effects of reduced foreign capital inflows indicate that foreign savings are an important factor in Kenya's economic development. Reducing foreign borrowing alone leads to a fall in the economy's performance. Since government spending has already been seen to be an important determinant of the level of economic activity, it is not surprising that trying to meet the shortfall from foreign capital by cutting expenditure makes the economy perform even more poorly. However, the results of the third policy option show that it is possible to counter the foreign capital inflow shortfall through a currency devaluation. Adjustment through a devaluation is accompanied by increases on investment and employment.

In the options where the economy contracts, investment and employment also performed poorly, falling for each of the sectors. The importance of foreign savings as an invaluable source of investment funds for Kenya explains the deterioration in investment levels. The services sector is worst affected by a fall in foreign capital inflow and, as mentioned previously, this can be attributable to it receiving the lion's share of total savings. As such, it is the first sector to suffer from an investment funds shortfall. In terms of employment, reduced foreign funds cause labour demand to contract. However, the agricultural sector does not face a big contraction as with the other two sectors under the first two policy options.

Income distribution results show that foreign capital is an important determinant of household incomes. All the households had falls in income as a result of reduced foreign capital inflow. However, an adjustment to this external shock effect through a currency devaluation results in positive growth in households' nominal incomes. The conclusion that can be drawn on foreign savings impact is that they are an indispensable component of development efforts in Kenya. They contribute towards the well being of Kenyan households.

11.3 Policy Implications

The first important policy implication is that the Kenyan economy is very sensitive to terms of trade shocks. The study has confirmed the vulnerability of the economy to

either negative or positive terms of trade shocks. The extent of this sensitivity depends on the length of time that the economy is experiencing the external shocks.

Before considering the effects of the government's response to the shocks two important policy implications need to be noted. First, it has been concluded that the services sector in Kenya takes a disproportionately large percentage of total savings. This was seen to be the case even where the agricultural sector generated most of the savings through higher export earnings. The policy implication arising from this conclusion is that it may be worth considering implementing a policy that seeks to improve the allocation of savings to agricultural and manufacturing sectors. The heavy investment in the services sector for a low income economy may not be the best path for the envisioned economic growth and development. Then again, it may be best. Further analysis is needed here.

Secondly, urban households were seen to be the ones benefiting most from the export boom at the expense of rural households involved in agricultural production. This means that government should consider policies that ensure redistribution of wealth created by higher export earnings towards the rural households. Unlike in most developed countries, Kenyan rural households form the biggest component of the poor population. It is therefore important that a mechanism exists so that rural households benefit appropriately from agricultural production through a fair share of export earnings.

Turning now to economic policy effects on the external shocks, there is a need for appropriate policies to be always available to stabilise the economy from internal and external imbalances that result from terms of trade shocks. The policies implemented when an external shock occurs affect its outcome.

Looking more closely at the policy options the government used in dealing with the external shocks that faced the Kenyan economy in the 1970s there are several policy implications. The first is that the instrument used for contractionary fiscal policy need to be chosen depending on the outcome sought in terms of employment and income distribution in addition to other macro variables. If the government wanted higher employment and household incomes, then, given the prevailing export boom, the contractionary fiscal policy through higher tariffs was appropriate since it aimed at helping the manufacturing sector. Use of higher indirect taxes may not have been the best policy

in this case. The policy of increasing indirect taxes worsened the already precarious situation in the manufacturing sector. Therefore, if the government wanted to assist the manufacturing sector then it was correct to take advantage of the existing boom to raise tariffs. The short run job losses in the agricultural sector from that policy appear to have been more than compensated for by increases in jobs in the manufacturing and services sectors.

The other conclusion that was made regarding government policy response to the external shocks was that government spending in a small economy like Kenya is a critical determinant of the level of economic activity. The policy implication that can be drawn from this is that an expenditure enhancing policy was good for the economy at the time of the boom. The condition that needed to be met for the policy to succeed was the existence of a budget surplus or some leeway for government to raise revenue through taxes without hurting the economy. This seems to have been the case at the time Kenya experienced the export boom. It was possible to raise government spending financed through higher tariffs and indirect taxes. The gains made from higher spending more than compensated the effects of the tax measures. In any case, the positive effects of the export boom supported the tax measures. However, this kind of policy is unsustainable in the medium to long term, implying that the gains from the export boom should have been used to support an adjustment program that reduced government spending.

Results from analysing the effects of a contractionary policy on the outcome of the terms of trade shocks indicated that a contractionary fiscal policy through either lower indirect taxes or lower tariffs would have resulted in lower gains for the economy from the export boom if accompanied by reduced government spending. The two contractionary fiscal policy measures did however lead to improved trade balances and also, lower indirect taxes resulted in a slight growth in labour demand for the manufacturing sector. Unlike contractionary fiscal policies through tax measures, reducing government spending alone showed that most of the gains from the export boom would have been wiped out. However, given the short term nature of the export boom and the fluctuating nature of commodity prices, probably the government could have pursued a contractionary fiscal policy. The argument against such a policy is usually that it would hurt household incomes. The results indicate that income gains from the export boom in

the face of a contractionary policy would have been lower but still positive. Hence, an opportunity existed for government to implement a demand management policy without having too much concern about incomes. The policy implication is that positive terms of trades should be taken advantage of in a situation where fiscal or current account deficits exist as the government may not need to be too concerned about income distribution aspects.

The other comment that needs to be made about the external shocks of the 1970s is that the exchange rate was an important policy that the government ignored. It was appropriate that the government did not take advantage of the boom to revert back to the pre-boom exchange rate level. Such a move would have undermined income earnings for households from the export boom and also reduced improvements in the economy from the boom. However, the alternative option of a devaluation indicated that the economy would have gained significantly from that kind of exchange rate adjustment. The policy implication from this is that it is possible to take advantage of favourable terms of trade to devalue an overvalued currency without much concern about increased costs resulting from the policy.

Turning to the findings for the issues in the 1980s, the first conclusion regarding the sensitivity of the economy to external shocks was that there was a possibility that structural change had occurred in the economy between 1976 to 1986 which made the external shocks less likely to produce huge changes as in the 1970s. The results, while giving smaller changes in the economy in general, replicated one of the findings regarding savings allocation for investment in the 1970s. That is, the services sector still took a larger share of savings than the other two sectors. This strengthens the need for a policy that promotes allocation of savings between sectors producing real goods. The other significant conclusion was that the terms of trade changes in the 1980s indicated that the manufacturing sector gained more in terms of employment than the agricultural sector. The implication from these results for modern Kenya is that the possibility of emphasising policies that are favourable to the manufacturing sector is acceptable which would lead to employment generation. This would ease the pressure on the agricultural sector to meet employment demand.

One important issue in policy debate since the early 1980s is the appropriateness and relevance of recommendations made under structural adjustment programs by the World Bank and the IMF. The policy recommendations arose to deal with unsustainable budget and current account deficits. Three options for implementing a fiscal austerity measure were investigated. The implication from the findings is that the government should have its objectives properly identified as there were gains and losses from each of the measures, and these tended to impact on different aspects of the economy. For instance, where an unacceptable balance of payments situation exists, the most appropriate fiscal austerity measure is through either lower government spending or direct taxes rather than one through indirect taxes. The two measures result in a slight improvement in the trade balance while indirect taxes actually worsen the trade balance. However, the two austerity measures give the worst result in terms of household incomes as labour demands fall significantly under them. Thus, if the government must implement a fiscal austerity measure, then a trade-off must be made between an improvement in the balance of payments and the welfare of urban and rural households.

Economic reform through trade liberalisation in the 1980s was the other policy recommendation investigated in this study. The results indicated that the economy would have gained in the short run from the program in terms of real GDP growth and an overall better trade performance whichever path was taken for the three options analysed. However, trade liberalisation affect employment in the short run. Trade liberalisation alone or with support through higher indirect taxes would have resulted in substantial reductions in demand for labour. This is reflected in income losses for all households. However, the outcome on employment and hence incomes was not so severe when foreign capital was available to support reform.

The policy implication from these findings is that trade liberalisation is not as bad as governments in developing countries, Kenya included, make it out to be. It is possible to remove the protectionist barriers without severely affecting economic performance as the trade liberalisation results indicated. There seems to be some gains in the short run. However, the costs that trade liberalisation impose on the economy through falls in short term employment and hence reductions in nominal incomes support the case for tariffs to be lowered gradually and where possible with a safety net in place. This would reduce

the negative impacts on household incomes. The safety net could be through expenditures by government from an existing budget surplus or from donor countries taking the initiative to support the programs they advocate. Advocating that the trade reforms be supported by shifting the burden from tariffs to higher indirect taxes is unacceptable as the economic costs are even higher with this option. Such an option is only helpful to the government in terms of maintaining its fiscal balance but its negative effects on the manufacturing sector cannot be overlooked due to its linkages to the rest of the economy.

The fiscal austerity and trade liberalisation measures analysed under the policy recommendations to the Kenyan government were initiatives seen by World Bank and the IMF as critical to achieving future sustainable growth in Kenya. The last issue addressed regarding foreign capital inflows was an indirect recommendation requiring the Kenyan government to control the rate of growth of its foreign borrowing. The conclusions reached from an analysis of effects of foreign capital inflow is that it is an important component of the Kenyan economy. A reduction in foreign capital inflow seriously reduced economic growth. The situation worsens when an attempt is made to stabilise the external shock that the reduction of foreign capital inflow creates by a demand management policy that lowers government spending. Both urban and rural households had falling incomes from these two policy options. The third option comprising a devaluation as the adjustment measure for lower foreign capital inflow led to significant improvements in the economy. Even households experienced some positive growth in their incomes.

The first policy implication that can be drawn from these findings is that the Kenyan government needs to create an enabling macroeconomic environment that is conducive to foreign investors in the current liberalised framework. The Kenyan economy will continue to rely on foreign savings to meet the shortfall between domestic savings and investment requirements. The other implication has to do with the role of bilateral and multilateral donors that contribute towards Kenya's budgetary appropriations. These findings indicate that failure to support government programs through withholding of loans, aid and grants negatively affect the economy. This means that using foreign aid as a conditionality for economic and political reforms as has been the case, has meant

significant losses. In particular, urban and rural poor have been affected by the failure to disburse foreign funds. However, these results do imply that the Kenya government must take any hard decisions that may be set as aid-conditionality if it wishes to prevent the vulnerable in the society (that is the rural and urban poor) from suffering the effects that withholding of aid for failure to meet the conditions have on the economy.

11.4 Contributions of the Study

The first contribution is to do with the structure of the model employed. Several CGE models have been developed for the Kenyan economy. These models have either followed a very rigid production structure or where this has been taken care of, they have failed to include a detailed framework for addressing income distribution issues. KEGEM has attempted to include a detailed production structure and, at the same time, employed a detailed framework to capture the various households in the economy. Therefore, KEGEM can be regarded as an original contribution towards models for development policy analysis for the Kenyan economy and similar economies in developing countries.

The other contribution is to do with the empirical analysis. Other CGE models for Kenya, apart from Tyler and Akinboade (1992a, 1992b), have been employed to address only one or two issues. Where the models have been used to look at the external shocks in the 1970s, the policy environment operating in the economy at the time the external shocks occurred have been ignored. This study has looked not only at the impact of the policies that the government used at the time on the outcome of the external shocks but has also considered what might have been the outcome if alternative policies had been pursued. With the analyses of these various policies, this study is also the first one to comprehensively apply multiple shocks in explaining the effects of external shocks. Other studies looking at this issue have not recognised the importance of combining different policy instruments in an experiment.

The other contribution is that while there has been debate on the appropriateness and effects of policies under structural adjustment programs, no CGE model application for Kenya has looked at this issue. This study is the first to apply recent data to address the

important issue of the likely effects of the structural adjustment policies on the modern Kenyan economy.

11.5 Limitations of the Study

The first limitation of this study is similar to that faced by other studies using CGE models. That is, the elasticity parameters used have not been econometrically estimated using Kenyan data but have been ‘borrowed’ from other studies. The shortcoming with these ‘borrowed’ values of elasticity parameters is that the conclusions and policy implications are likely to change with different values of the same parameters. But as sensitivity analysis involving three of the key parameters used in KEGEM carried out in Chapter 9 illustrated, a reasonable level of confidence can be attached to the conclusions and policy implications as the results were robust with different parameter values.

The short term nature of the results can also be seen as a limitation to the extent that decisions beyond two years usually need to be made in economic planning. Consequently, the fact that the results are short run imposes a limitation on using the conclusions to prescribe policies whose medium and long term effects are not known. Tied with this limitation on length of analysis is the real nature of the model. The study has not incorporated financial aspects of the Kenyan economy. This means that conclusions and policy implications from this study may be different if a financial sub-model was to be added to the framework. Mechanisms to control the inflationary nature of some of the policies analysed may lead to different conclusions regarding these policies. Moreover, financial aspects of the macroeconomic stabilisation and structural adjustment programs recommended by World Bank and the IMF cannot be completely analysed in a model that considers the real component of the Kenya economy alone.

Another limitation of the study is the exogenous nature of the institutional income transfers. This has meant that while in the benchmark year households derive income from labour and net transfers, the exogenous nature of net transfers have meant that profits are not distributed to different households. Consequently, it is possible that household incomes may be underestimated. However, the direction these incomes took

from the different simulations is not likely to change even with endogenous net transfers and this can be a source of reassurance.

Another important limitation is the data from the 1986 input-output tables and social accounting matrix. The data in these two sources for this year was taken from a Kenyan government sanctioned project under the Ministry of Economic Planning that tried to develop a CGE model for the Kenyan economy. The project updated the 1976 input-output tables using the RAS technique to 1986 and from there constructed the 1986 SAM. This new input-output table and SAM did not include the previous ten household groups in the 1976 database. Hence in the present model (KEGEM application to issues of the 1980s), the proportions from the 1976 data were used to disaggregate the single household component of the 1986 data. Similarly, the labour component of the 1986 data was disaggregated to the five labour categories using the shares of these same categories for 1976. The limitation that arises from doing this is that there were no significant changes in the structure of the labour market and household income groups between 1976 and 1986.

11.6 Areas for Further Research

The areas for further research emerging from this study are directly or indirectly linked to some of the limitations of the study discussed above. Consequently, the following areas are recommended for further investigation. First, it would be appropriate to devote some resources for research that econometrically estimates the elasticity parameters in the model using Kenyan economic data. This will ensure that conclusions and policy implications are not dependent on chosen elasticities or guesses about the same and would also save time from undertaking sensitivity analysis of these parameters.

Second, the addition of dynamic equations to update capital and labour in the economy is another area for further investigation. This would enable policy simulations that are medium or long term in nature. This would assist policy making processes such as preparation of development plans. Simulations showing effects of particular policies beyond one or two years would enable planners to establish likely impacts of policies envisioned in such development plans.

Third, the issue of availability of data, especially for the model's application in the 1980s, has arisen as an important limitation of the study. It is therefore recommended that if this model is to be of value to Kenya's public policy debate, then more recent data are needed. This calls first for the updating of the original 1976 input-output data and SAM to 1986 with a clear distinction in the different types of labour and households. Thereafter, the data can be updated to more recent years which would allow the model to address more contemporary economic policy issues in the country.

Fourth, the analysis undertaken in this study has used only three sectors. The next immediate area of research would be to disaggregate the three sectors to more sectors. The advantage of doing so is that it would be possible to trace changes in the economy to the actual sub-sectors of the current three sectors. While this may call for more investment in the computer facilities that can be used to implement such a model, it is the logical next step to take if the model is to be applied to look at economic policy impacts on many sectors in the economy.

Appendix A TABLO Input File for KEGEM

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=====
! TABLO Input file for a real Kenya's Economy General Equilibrium      !
! Model (KEGEM), following the description of the model developed to    !
! undertake an economic analysis of the effects of macroeconomic        !
! stabilisation and structural adjustment policies on the Kenyan        !
! agricultural sector                                                  !
=====

! SETTING DEFAULTS FOR THE MODEL                                     !
=====

EQUATION (DEFAULT = LEVELS) ;
VARIABLE (DEFAULT = LEVELS) ;
FORMULA (DEFAULT = INITIAL) ;
COEFFICIENT (DEFAULT = PARAMETER) ;

=====
! SETS INCLUDED IN THE MODEL                                         !
=====

SET SECT # Sectors #
  (agric, manuf, servic) ;
SET CLAB # Labour categories #
  (unskill, skilled, semipro, pro, selfemp) ;
SET HHOLD # Household categories #
  (uhh1, uhh2, uhh3, rhh1, rhh2, rhh3, rhh4, rhh5, rhh6, rhh7) ;

=====
! LEVELS VARIABLES                                                  !
=====

VARIABLE RGDP
  # Real GDP # ;
VARIABLE (all,i,SECT) X(i)
  # Gross sectoral supply of resources # ;
VARIABLE (all,j,SECT) E(j)
  # Export supply # ;
VARIABLE (all,i,SECT) M(i)
  # Import demand # ;
VARIABLE (all,i,SECT) INV(i)
  # Investment by sector of destination # ;
VARIABLE (all,i,SECT) LAB(i)
  # Composite labour demand # ;
VARIABLE (all,l,CLAB) TCLAB(l)
  # Total demand for labour by category # ;
VARIABLE (all,i,SECT) W(i)
  # Nominal wage rate of composite labour # ;
VARIABLE (all,i,SECT) RW(i)
  # Real wage rate # ;
VARIABLE CPI
  # Consumer price index # ;
VARIABLE PPI
  # Producer price index # ;
VARIABLE (all,i,SECT) PX(i)
  # Producer price # ;
VARIABLE (CHANGE) BOT
  # Balance of trade # ;
VARIABLE (all,l,CLAB) RWL(l)
  # Real labour income by category # ;

```

```

VARIABLE (all,h,HHOLD) RYH(h)
# Total real incomes for given household group # ;
VARIABLE (all,i,SECT) RYF(i)
# Real sectoral profits from production # ;
VARIABLE RYG
# Real government revenue # ;
VARIABLE TGDG
# Total gross domestic product # ;
VARIABLE (all,i,SECT) VA(i)
# Composite primary input (total value added) # ;
VARIABLE TLAB
# Total demand for composite labour # ;
VARIABLE TINV
# Total investment # ;
VARIABLE TEXPQ
# Total export quantities # ;
VARIABLE TEXP
# Total exports in domestic currency values # ;
VARIABLE TIMPQ
# Total import quantities # ;
VARIABLE TIMP
# Total imports in domestic currency values # ;
VARIABLE (all,l,CLAB) WL(l)
# Labour income by category # ;
VARIABLE (all,h,HHOLD) YH(h)
# Total income for a given household group # ;
VARIABLE (all,i,SECT) YF(i)
# Sectoral profits from production # ;
VARIABLE TYF
# Total sectoral profits # ;
VARIABLE YG
# Government revenue # ;
VARIABLE (all,j,SECT) (all,i,SECT) N(j,i)
# Composite intermediate input # ;
VARIABLE (all,j,SECT) (all,i,SECT) ID(j,i)
# Domestic intermediate input # ;
VARIABLE (all,j,SECT) (all,i,SECT) IM(j,i)
# Imported intermediate input # ;
VARIABLE (all,i,SECT) K(i)
# Consumption of fixed capital and working capital # ;
VARIABLE (all,i,SECT) TCAP(i)
# Available capital # ;
VARIABLE (all,l,CLAB) (all,i,SECT) CL(l,i)
# Labour usage by category # ;
VARIABLE (all,j,SECT) D(j)
# Domestically used commodity # ;
VARIABLE (all,j,SECT) DUR(j)
# Domestic use ratio # ;
VARIABLE (all,j,SECT) (all,h,HHOLD) CH(j,h)
# Consumer demands by household type # ;
VARIABLE (all,j,SECT) CG(j)
# Government demand # ;
VARIABLE (all,j,SECT) Z(j)
# Investment demand by sector of origin # ;
VARIABLE (all,j,SECT) (all,i,SECT) PN(j,i)
# Price of composite intermediate # ;
VARIABLE (all,i,SECT) PVA(i)
# Price of value added # ;
VARIABLE (all,j,SECT) (all,i,SECT) PID(j,i)
# Price of domestic intermediate input # ;
VARIABLE (all,j,SECT) (all,i,SECT) PIM(j,i)
# Price of imported intermediate input # ;
VARIABLE (all,i,SECT) PK(i)
# Price of capital # ;

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```

VARIABLE (all,i,SECT) PA(i)
# Price of capital assets # ;
VARIABLE (all,i,CLAB) (all,i,SECT) CW(l,i)
# Wage rate by labour category # ;
VARIABLE (all,i,SECT) PM(i)
# Price of imports in domestic currency # ;
VARIABLE (all,j,SECT) PE(j)
# Price of exports in domestic currency # ;
VARIABLE (all,i,SECT) PMW(i)
# World price of imports in foreign currency # ;
VARIABLE (all,j,SECT) PEW(j)
# World price of exports in foreign currency # ;
VARIABLE (all,j,SECT) CPQ(j)
# Consumer price # ;
VARIABLE (all,i,SECT) PD(i)
# Unit price of domestic commodity # ;
VARIABLE ER
# Exchange rate # ;

```

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!=====!
! OTHER VARIABLES USED IN KEGEM !
!=====!

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```

VARIABLE (all,h,HHOLD) NTH(h)
# Net households transfers # ;
VARIABLE NTG
# Net government transfers # ;
VARIABLE (all,i,SECT) NTF(i)
# Net firms transfers # ;
VARIABLE (all,h,HHOLD) HTAX(h)
# Direct taxes paid to the government by each household type # ;
VARIABLE (all,h,HHOLD) SVH(h)
# Savings by each household group # ;
VARIABLE (all,i,SECT) INT(i)
# Sectoral interest payments # ;
VARIABLE (all,i,SECT) ITAX(i)
# Sectoral indirect taxes excluding duty # ;
VARIABLE (all,i,SECT) SUBS(i)
# Sectoral subsidy received # ;
VARIABLE (all,i,SECT) CTAX(i)
# Sectoral direct taxes payments # ;
VARIABLE (all,i,SECT) DUTY(i)
# Sectoral duty payments # ;
VARIABLE (all,i,SECT) SVF(i)
# Sectoral savings # ;
VARIABLE (all,h,HHOLD) TH(h)
# Households' direct tax rate # ;
VARIABLE (all,i,SECT) TF(i)
# Sectoral direct tax rate # ;
VARIABLE (all,i,SECT) TD(i)
# Sectoral indirect tax rate # ;
VARIABLE (all,i,SECT) TM(i)
# Import duty rate # ;
VARIABLE SVG
# Government savings # ;
VARIABLE TGC
# Total government consumption # ;
VARIABLE SVR
# Inflow of foreign capital # ;
VARIABLE TSAV
# Total savings # ;
VARIABLE (all,i,SECT) DEP(i)
# Depreciation or consumption of fixed capital # ;
VARIABLE (all,i,SECT) DEPR(i)

```



```

# Rate of depreciation # ;
VARIABLE (all,i,SECT) INTR(i)
# Interest rate # ;
VARIABLE (all,j,SECT) Q(j)
# Composite commodity # ;
VARIABLE (all,l,CLAB) WSHIFT(l)
# Exogenous shifts in category wages # ;
VARIABLE (all,j,SECT) (all,i,SECT) SVID(j,i)
# Shilling value of domestic intermediate input # ;
VARIABLE (all,j,SECT) (all,i,SECT) SVIM(j,i)
# Shilling value of imported intermediate input # ;
VARIABLE (all,l,CLAB) (all,i,SECT) SVCL(l,i)
# Shilling value of labour by category # ;
VARIABLE (all,i,SECT) SVK(i)
# Shilling value of capital stock # ;
VARIABLE (all,j,SECT) (all,h,HHOLD) SVCH(j,h)
# Shilling value of household demands # ;
VARIABLE (all,j,SECT) SVCG(j)
# Shilling value of government demand # ;
VARIABLE (all,j,SECT) SVZ(j)
# Shilling value of investment demand # ;
VARIABLE (all,i,SECT) SVM(i)
# Shilling value of import demand # ;
VARIABLE (all,j,SECT) SVE(j)
# Shilling value of export supply # ;
VARIABLE (all,j,SECT) (all,i,SECT) SVN(j,i)
# Shilling value of the composite intermediate # ;
VARIABLE (all,i,SECT) SVLAB(i)
# Shilling value of composite labour # ;
VARIABLE (all,i,SECT) SVVA(i)
# Shilling value added composite of primary factors # ;

!=====
! PARAMETERS IN THE MODEL                                     !
!=====

COEFFICIENT (all,i,SECT) AX(i)
# Exogenous shift parameter in production # ;
COEFFICIENT (all,i,SECT) AVA(i)
# Exogenous shift parameter in formation of composite value-added # ;
COEFFICIENT (all,i,SECT) AL(i)
# Exogenous shift parameter in formation of composite labour # ;
COEFFICIENT (all,j,SECT) (all,i,SECT) AN(j,i)
# Exogenous shift parameter in the formation of composite intermediate # ;
COEFFICIENT (all,i,SECT) AQ(i)
# Exogenous shift parameter in the formation of composite commodity # ;
COEFFICIENT (all,i,SECT) BX(i)
# Exogenous shift parameter in the transformation of gross output # ;
COEFFICIENT HWAGE
# Wage indexation parameter # ;
COEFFICIENT (all,j,SECT) (all,h,HHOLD) THETA(j,h)
# Fixed level subsistence consumption # ;
COEFFICIENT (all,j,SECT) (all,h,HHOLD) BETA(j,h)
# Marginal budget shares # ;
COEFFICIENT (all,i,SECT) KAPPA(i)
# Exogenous sectoral investment shares in total investment # ;
COEFFICIENT (all,h,HHOLD) (all,l,CLAB) BETAH(h,l)
# Proportion of household h ownership of labour of category l # ;
COEFFICIENT (all,j,SECT) (all,i,SECT) OMEGABAR(j,i)
# Share of commodity j in the capital good of sector i # ;
COEFFICIENT (all,j,SECT) BETAG(j)
# Proportion of commodity j in government's total consumption # ;
COEFFICIENT (all,i,SECT) ALPHAVA(i)
# Distribution parameter for composite value-added in production # ;

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COEFFICIENT (all,j,SECT) (all,i,SECT) ALPHAN(j,i)
# Distribution parameter for composite intermediate in production # ;
COEFFICIENT (all,j,SECT) (all,i,SECT) ALPHAID(j,i)
# Distribution parameter for intermediate domestic input # ;
COEFFICIENT (all,j,SECT) (all,i,SECT) ALPHAIM(j,i)
# Distribution parameter for intermediate imported input # ;
COEFFICIENT (all,i,SECT) ALPHAK(i)
# Distribution parameter for capital # ;
COEFFICIENT (all,i,SECT) ALPHAL(i)
# Distribution parameter for composite labour # ;
COEFFICIENT (all,l,CLAB) (all,i,SECT) ALPHACL(l,i)
# Distribution parameter for labour by category # ;
COEFFICIENT (all,j,SECT) ALPHAD(j)
# Distribution parameter for domestic commodity # ;
COEFFICIENT (all,j,SECT) ALPHAM(j)
# Distribution parameter for imported commodity # ;
COEFFICIENT (all,j,SECT) GAMMAD(j)
# Distribution parameter for domestic commodity supply # ;
COEFFICIENT (all,j,SECT) GAMMAE(j)
# Distribution parameter for exported commodity supply # ;
COEFFICIENT (all,i,SECT) MU(i)
# Share of each sector in total GDP # ;
COEFFICIENT (all,h,HHOLD) SVRATE(h)
# Savings rate by household # ;

```

```

!=====!
! ELASTICITY PARAMETERS WHOSE VALUES ARE NEEDED IN      !
! THE MODEL                                              !
!=====!

```

```

COEFFICIENT (all,i,SECT) SIGMAN(i)
# Elasticity of substitution between intermediate inputs # ;
COEFFICIENT (all,i,SECT) SIGMAVA(i)
# Elasticity of substitution between primary inputs # ;
COEFFICIENT (all,i,SECT) SIGMAL(i)
# Elasticity of substitution between different labour categories # ;
COEFFICIENT (all,j,SECT) SIGMAQ(j)
# Elasticity of substitution between imported and domestic good # ;
COEFFICIENT (all,j,SECT) PSIX(j)
# Elasticity of transformation between domestic and export supplies # ;
COEFFICIENT (all,j,SECT) (all,h,HHOLD) ETA(j,h)
# Income elasticity of commodity j for household h # ;
COEFFICIENT (all,h,HHOLD) OMEGA(h)
# Frisch parameter for household groups # ;

```

```

!=====!
! FILE                                                  !
!=====!

```

FILE samdataa # social accounting matrix data for KEGEM # ;

```

!=====!
! READS FROM THE SAM AND INPUT-OUTPUT DATA BASE      !
!=====!

```

```

READ SVN from FILE samdataa HEADER "CIMI" ;
READ SVID from FILE samdataa HEADER "DIIN" ;
READ SVIM from FILE samdataa HEADER "IIIN" ;
READ SVVA from FILE samdataa HEADER "CVAI" ;
READ SVK from FILE samdataa HEADER "PIOC" ;
READ SVLAB from FILE samdataa HEADER "CLIN" ;
READ SVCL from FILE samdataa HEADER "LIBC" ;
READ SVM from FILE samdataa HEADER "DDFI" ;
READ SVE from FILE samdataa HEADER "DSFE" ;

```

```

READ SVCH from FILE samdataa HEADER "CDBH" ;
READ SVCG from FILE samdataa HEADER "CDBG" ;
READ SVZ from FILE samdataa HEADER "IDBS" ;
READ TCAP from FILE samdataa HEADER "CAPS" ;
READ TCLAB from FILE samdataa HEADER "ALBC" ;
READ D from FILE samdataa HEADER "DCSD" ;
READ X from FILE samdataa HEADER "TOUT" ;

```

```

=====
! READS OF OTHER VARIABLES USED IN KEGEM !
=====

```

```

READ NTH from FILE samdataa HEADER "NTTH" ;
READ NTG from FILE samdataa HEADER "NTTG" ;
READ NTF from FILE samdataa HEADER "NTTF" ;
READ DEPR from FILE samdataa HEADER "ROSD" ;
READ INTR from FILE samdataa HEADER "ROIN" ;
READ TH from FILE samdataa HEADER "HDTP" ;
READ TF from FILE samdataa HEADER "SDTP" ;
READ TD from FILE samdataa HEADER "SITP" ;
READ TM from FILE samdataa HEADER "POID" ;
READ TGC from FILE samdataa HEADER "GCON" ;
READ SVR from FILE samdataa HEADER "FSAV" ;
READ WL from FILE samdataa HEADER "WINC" ;
READ YH from FILE samdataa HEADER "HINC" ;
READ HTAX from FILE samdataa HEADER "HTPA" ;
READ SVH from FILE samdataa HEADER "HHSA" ;
READ YF from FILE samdataa HEADER "FPRO" ;
READ DEP from FILE samdataa HEADER "COFC" ;
READ INT from FILE samdataa HEADER "IPBF" ;
READ ITAX from FILE samdataa HEADER "ITPB" ;
READ SUBS from FILE samdataa HEADER "SRBF" ;
READ CTAX from FILE samdataa HEADER "CTFF" ;
READ SVF from FILE samdataa HEADER "SSAV" ;
READ DUTY from FILE samdataa HEADER "TARR" ;
READ YG from FILE samdataa HEADER "GREV" ;
READ SVG from FILE samdataa HEADER "GSAV" ;
READ INV from FILE samdataa HEADER "IBSD" ;
READ TSAV from FILE samdataa HEADER "SAVI" ;
READ BOT from FILE samdataa HEADER "BOTR" ;

```

```

=====
! READS FOR KNOWN COEFFICIENTS !
=====

```

```

READ BETAH from FILE samdataa HEADER "PHLC" ;
READ BETAG from FILE samdataa HEADER "PGCC" ;
READ OMEGABAR from FILE samdataa HEADER "CJCI" ;
READ KAPPA from FILE samdataa HEADER "SISH" ;
READ MU from FILE samdataa HEADER "SWPI" ;
READ SVRATE from FILE samdataa HEADER "SVRA" ;

```

```

=====
! FORMULAS TO CALCULATE THE INITIAL SOLUTION !
=====

```

```

=====
! 1. FORMULAS FOR INITIAL PRICES IN INITIAL SOLUTION !
=====

```

```

FORMULA (all,j,SECT) PD(j) = 1 ;
FORMULA (all,j,SECT) PM(j) = 1 ;

```

```

FORMULA (all,j,SECT) CPQ(j) = 1 ;
FORMULA (all,j,SECT) (all,i,SECT) PN(j,i) = 1 ;
FORMULA (all,i,SECT) PVA(i) = 1 ;
FORMULA (all,j,SECT) PE(j) = 1 ;
FORMULA (all,i,SECT) PX(i) = 1 ;
FORMULA (all,j,SECT) (all,i,SECT) PID(j,i) = 1 ;
FORMULA (all,j,SECT) (all,i,SECT) PIM(j,i) = 1 ;
FORMULA (all,i,SECT) PK(i) = 1 ;
FORMULA (all,i,SECT) PA(i) = 1 ;
FORMULA (all,j,SECT) PMW(j) = 1 ;
FORMULA (all,j,SECT) PEW(j) = 1 ;
FORMULA ER = 1 ;

```

```

=====
! 2. FORMULAS FOR INITIAL WAGES IN INITIAL SOLUTION      !
=====

```

```

FORMULA HWAGE = 0.3 ;
FORMULA (all,l,CLAB) WSHIFT(l) = 1 ;
FORMULA (all,i,SECT) W(i) = 1 ;
FORMULA (all,l,CLAB) (all,i,SECT) CW(l,i) = 1 ;

```

```

=====
! 3. ELASTICITY OF SUBSTITUTION BETWEEN INTERMEDIATE    !
!   INPUTS                                              !
=====

```

```

FORMULA SIGMAN("agric") = 0.8 ;
FORMULA SIGMAN("manuf") = 0.6 ;
FORMULA SIGMAN("servic") = 0.4 ;

```

```

=====
! 4. ELASTICITY OF SUBSTITUTION BETWEEN PRIMARY          !
!   INPUTS                                              !
=====
FORMULA SIGMAVA("agric") = 0.5 ;
FORMULA SIGMAVA("manuf") = 0.7 ;
FORMULA SIGMAVA("servic") = 0.6 ;

```

```

=====
! 5. ELASTICITY OF SUBSTITUTION BETWEEN LABOUR           !
!   CATEGORIES                                          !
=====

```

```

FORMULA SIGMAL("agric") = 0.5 ;
FORMULA SIGMAL("manuf") = 0.3 ;
FORMULA SIGMAL("servic") = 0.4 ;

```

```

=====
! 6. ELASTICITY OF SUBSTITUTION BETWEEN IMPORTED        !
!   AND DOMESTIC GOOD                                  !
=====

```

```

FORMULA SIGMAQ("agric") = 0.8 ;
FORMULA SIGMAQ("manuf") = 0.6 ;
FORMULA SIGMAQ("servic") = 0.4 ;

```

```

=====
! 7. ELASTICITY OF TRANSFORMATION BETWEEN EXPORTED      !
!   AND DOMESTIC GOOD                                  !
=====

```

```

FORMULA PSIX("agric") = 1.3 ;
FORMULA PSIX("manuf") = 0.8 ;

```

FORMULA PSIX("servic") = 0.3 ;

```

=====
! 8. INCOME ELASTICITIES OF DIFFERENT HOUSEHOLDS FOR      !
!   DIFFERENT COMMODITIES                                  !
=====

```

```

FORMULA ETA("agric","uhh1") = 0.9 ;
FORMULA ETA("agric","uhh2") = 0.7 ;
FORMULA ETA("agric","uhh3") = 0.5 ;
FORMULA ETA("agric","rhh1") = 0.9 ;
FORMULA ETA("agric","rhh2") = 0.8 ;
FORMULA ETA("agric","rhh3") = 0.7 ;
FORMULA ETA("agric","rhh4") = 0.6 ;
FORMULA ETA("agric","rhh5") = 0.5 ;
FORMULA ETA("agric","rhh6") = 0.5 ;
FORMULA ETA("agric","rhh7") = 0.7 ;
FORMULA ETA("manuf","uhh1") = 1.1 ;
FORMULA ETA("manuf","uhh2") = 1.3 ;
FORMULA ETA("manuf","uhh3") = 1.4 ;
FORMULA ETA("manuf","rhh1") = 1.1 ;
FORMULA ETA("manuf","rhh2") = 1.2 ;
FORMULA ETA("manuf","rhh3") = 1.3 ;
FORMULA ETA("manuf","rhh4") = 1.4 ;
FORMULA ETA("manuf","rhh5") = 1.5 ;
FORMULA ETA("manuf","rhh6") = 1.6 ;
FORMULA ETA("manuf","rhh7") = 1.3 ;
FORMULA ETA("servic","uhh1") = 0.7 ;
FORMULA ETA("servic","uhh2") = 0.8 ;
FORMULA ETA("servic","uhh3") = 1.1 ;
FORMULA ETA("servic","rhh1") = 0.7 ;
FORMULA ETA("servic","rhh2") = 0.8 ;
FORMULA ETA("servic","rhh3") = 0.9 ;
FORMULA ETA("servic","rhh4") = 1.0 ;
FORMULA ETA("servic","rhh5") = 1.1 ;
FORMULA ETA("servic","rhh6") = 1.2 ;
FORMULA ETA("servic","rhh7") = 0.8 ;

```

```

=====
! 9. ASSUMED FRISCH PARAMETERS                               !
=====

```

```

FORMULA OMEGA("uhh1") = -4.0 ;
FORMULA OMEGA("uhh2") = -3.0 ;
FORMULA OMEGA("uhh3") = -2.0 ;
FORMULA OMEGA("rhh1") = -4.5 ;
FORMULA OMEGA("rhh2") = -4.0 ;
FORMULA OMEGA("rhh3") = -3.5 ;
FORMULA OMEGA("rhh4") = -3.0 ;
FORMULA OMEGA("rhh5") = -2.5 ;
FORMULA OMEGA("rhh6") = -2.0 ;
FORMULA OMEGA("rhh7") = -3.5 ;

```

```

=====
! 10. COMPUTATION OF INITIAL SOLUTION                         !
=====

```

```

FORMULA & EQUATION Domintermed
# Domestic intermediate input #
(a,l,j,SECT) (all,i,SECT)
ID(j,i) = SVID(j,i) / PID(j,i) ;
DISPLAY (all,j,SECT) (all,i,SECT) ID(j,i) ;
FORMULA & EQUATION Impintermed
# Imported intermediate input #

```

```

(all,j,SECT) (all,i,SECT)
IM(j,i) = SVIM(j,i) / PIM(j,i) ;
DISPLAY (all,j,SECT) (all,i,SECT) IM(j,i) ;
FORMULA & EQUATION Catlabour
# Labour input by category #
(all,l,CLAB) (all,i,SECT)
CL(l,i) = SVCL(l,i) / CW(l,i) ;
DISPLAY (all,l,CLAB) (all,i,SECT) CL(l,i) ;
FORMULA & EQUATION Pricapital
# Primary capital input #
(all,i,SECT)
K(i) = SVK(i) / PK(i) ;
DISPLAY (all,i,SECT) K(i) ;
FORMULA & EQUATION Comp_intermed
# Composite intermediate input #
(all,j,SECT) (all,i,SECT)
N(j,i) = SVN(j,i) / PN(j,i) ;
DISPLAY (all,j,SECT) (all,i,SECT) N(j,i) ;
FORMULA & EQUATION Comp_labour
# Composite labour input #
(all,i,SECT)
LAB(i) = SVLAB(i) / W(i) ;
DISPLAY (all,i,SECT) LAB(i) ;
FORMULA & EQUATION Comp_value_added
# Composite value added #
(all,i,SECT)
VA(i) = SVVA(i) / PVA(i) ;
DISPLAY (all,i,SECT) VA(i) ;
FORMULA & EQUATION Importsdemand
# Demand for imports #
(all,i,SECT)
M(i) = SVM(i) / PM(i) ;
DISPLAY (all,i,SECT) M(i) ;
FORMULA & EQUATION Exportsupply
# Export supply #
(all,j,SECT)
E(j) = SVE(j) / PE(j) ;
DISPLAY (all,j,SECT) E(j) ;
FORMULA & EQUATION Consumerdem
# Consumer demands #
(all,j,SECT) (all,h,HHOLD)
CH(j,h) = SVCH(j,h) / CPQ(j) ;
DISPLAY (all,j,SECT) (all,h,HHOLD) CH(j,h) ;
FORMULA & EQUATION Governmentdem
# Government consumption #
(all,j,SECT)
CG(j) = SVCG(j) / CPQ(j) ;
DISPLAY (all,j,SECT) CG(j) ;
FORMULA & EQUATION Investmentdem
# Investment demand #
(all,j,SECT)
Z(j) = SVZ(j) / CPQ(j) ;
DISPLAY (all,j,SECT) Z(j) ;
FORMULA & EQUATION Total_investment
# Total investment by sector #
TINV = SUM(i,SECT,INV(i)) ;
FORMULA & EQUATION Total_imports
# Total imports #
TIMP=SUM(j,SECT,SVM(j)) ;
DISPLAY TIMP ;
FORMULA & EQUATION Tot_imports_quant
# Total import quantity #
TIMPQ=SUM(j,SECT,M(j)) ;
DISPLAY TIMPQ ;

```

```

FORMULA & EQUATION Total_exports
# Total exports #
TEXP=SUM(j,SECT,SVE(j)) ;
DISPLAY TEXP ;
FORMULA & EQUATION Tot_exports_quant
# Total export quantity #
TEXPQ=SUM(j,SECT,E(j)) ;
DISPLAY TEXPQ ;
FORMULA & EQUATION Total_GDP
# Total gross domestic product #
TGDP=SUM(j,SECT,SUM(h,HHOLD,SVCH(j,h)))+SUM(j,SECT,SVCG(j))+
SUM(j,SECT,SVZ(j))+SUM(j,SECT,SVE(j))-SUM(j,SECT,SVM(j)) ;
FORMULA & EQUATION Mclear_comp_labor
# Market clear for composite labour #
TLAB=SUM(i,SECT,LAB(i)) ;
DISPLAY TLAB ;
FORMULA & EQUATION Dom_use_ratio
# Domestic use ratio #
(all,j,SECT)
DUR(j)=D(j)/(D(j)+M(j)) ;
FORMULA & EQUATION Comp_commodity
# Composite commodity #
(all,i,SECT)
Q(i) = SUM(j,SECT,N(j,i))+SUM(h,HHOLD,CH(i,h))+CG(i)+Z(i) ;
FORMULA & EQUATION Cons_price_index
# Consumer price index #
CPI=SUM(j,SECT,MU(j)*CPQ(j)) ;
FORMULA & EQUATION Prod_price_index
# Producer price index #
PPI=SUM(j,SECT,MU(j)*PX(j)) ;
FORMULA & EQUATION Total_sec_profits
# Total firm profits #
TYF = SUM(i,SECT,YF(i)) ;
FORMULA & EQUATION Real_GDP
# Real GDP #
RGDP=TGDP/CPI ;
FORMULA & EQUATION Real_wage
# Real wage rate #
(all,i,SECT)
RW(i) = W(i)/CPI ;
FORMULA & EQUATION Real_house_inc
# Real household incomes #
(all,h,HHOLD)
RYH(h) = YH(h)/CPI ;
FORMULA & EQUATION Real_profits
# Real sectoral profits #
(all,i,SECT)
RYF(i) = YF(i)/CPI ;
FORMULA & EQUATION Real_gov_income
# Real government revenue #
RYG = YG/CPI ;
FORMULA & EQUATION Real_labour_inc
# Real labour income #
(all,l,CLAB)
RWL(l) = WL(l)/CPI ;

!=====!
! CALIBRATION FORMULAS FOR UNKNOWN !
! PARAMETERS !
!=====!

FORMULA (all,i,SECT)
ALPHA K(i)=K(i)^(1/SIGMAVA(i))/(K(i)^(1/SIGMAVA(i))+
LAB(i)^(1/SIGMAVA(i))) ;

```

```

DISPLAY (all,i,SECT) ALPHAK(i)
# Share of capital in value added # ;
FORMULA (all,i,SECT)
  ALPHAL(i)=LAB(i)^(1/SIGMAVA(i))/(K(i)^(1/SIGMAVA(i))+
  LAB(i)^(1/SIGMAVA(i))) ;
DISPLAY (all,i,SECT) ALPHAL(i)
# Share of composite labour in value added # ;
FORMULA (all,i,SECT)
  ALPHAN("agric",i)=N("agric",i)/(SUM(j,SECT,N(j,i))+VA(i)) ;
FORMULA (all,i,SECT)
  ALPHAN("manuf",i)=N("manuf",i)/(SUM(j,SECT,N(j,i))+VA(i)) ;
FORMULA (all,i,SECT)
  ALPHAN("servic",i)=N("servic",i)/(SUM(j,SECT,N(j,i))+VA(i)) ;
DISPLAY (all,j,SECT) (all,i,SECT) ALPHAN(j,i)
# Shares of composite intermediate in total output # ;
FORMULA (all,i,SECT)
  ALPHAVA(i)=VA(i)/(SUM(j,SECT,N(j,i))+VA(i)) ;
DISPLAY (all,i,SECT) ALPHAVA(i)
# Share of composite value added in total output # ;
FORMULA (all,i,SECT)
  ALPHACL("unskill",i)=CL("unskill",i)^(1/SIGMAL(i))/(SUM(l,CLAB,CL(l,i)^(
  1/SIGMAL(i)))) ;
FORMULA (all,i,SECT)
  ALPHACL("skilled",i)=CL("skilled",i)^(1/SIGMAL(i))/(SUM(l,CLAB,CL(l,i)^(
  1/SIGMAL(i)))) ;
FORMULA (all,i,SECT)
  ALPHACL("semipro",i)=CL("semipro",i)^(1/SIGMAL(i))/(SUM(l,CLAB,CL(l,i)^(
  1/SIGMAL(i)))) ;
FORMULA (all,i,SECT)
  ALPHACL("pro",i)=CL("pro",i)^(1/SIGMAL(i))/(SUM(l,CLAB,CL(l,i)^(
  1/SIGMAL(i)))) ;
FORMULA (all,i,SECT)
  ALPHACL("selfemp",i)=CL("selfemp",i)^(1/SIGMAL(i))/(SUM(l,CLAB,CL(l,i)^(
  1/SIGMAL(i)))) ;
DISPLAY (all,l,CLAB) (all,i,SECT) ALPHACL(l,i)
# Shares of labour categories # ;
FORMULA (all,j,SECT) (all,i,SECT)
  ALPHAID(j,i)=ID(j,i)^(1/SIGMAN(i))/(ID(j,i)^(1/SIGMAN(i))+
  IM(j,i)^(1/SIGMAN(i))) ;
DISPLAY (all,j,SECT) (all,i,SECT) ALPHAID(j,i)
# Shares of domestic intermediates in total intermediate # ;
FORMULA (all,j,SECT) (all,i,SECT)
  ALPHAIM(j,i)=IM(j,i)^(1/SIGMAN(i))/(ID(j,i)^(1/SIGMAN(i))+
  IM(j,i)^(1/SIGMAN(i))) ;
DISPLAY (all,j,SECT) (all,i,SECT) ALPHAIM(j,i)
# Shares of imported intermediates in total intermediate # ;
FORMULA (all,j,SECT)
  ALPHAD(j)=D(j)^(1/SIGMAQ(j))/(D(j)^(1/SIGMAQ(j))+M(j)^(1/SIGMAQ(j))) ;
DISPLAY (all,j,SECT) ALPHAD(j)
# Share of domestic commodity in domestic composite # ;
FORMULA (all,j,SECT)
  ALPHAM(j)=M(j)^(1/SIGMAQ(j))/(D(j)^(1/SIGMAQ(j))+M(j)^(1/SIGMAQ(j))) ;
DISPLAY (all,j,SECT) ALPHAM(j)
# Share of imported commodity in domestic composite # ;
FORMULA (all,j,SECT)
  GAMMAD(j)=D(j)^(1/PSIX(j))/(D(j)^(1/PSIX(j))+E(j)^(1/PSIX(j))) ;
DISPLAY (all,j,SECT) GAMMAD(j)
# Share of domestic commodity in total output # ;
FORMULA (all,j,SECT)
  GAMMAE(j)=E(j)^(1/PSIX(j))/(D(j)^(1/PSIX(j))+E(j)^(1/PSIX(j))) ;
DISPLAY (all,j,SECT) GAMMAE(j)
# Share of exports in total output # ;
FORMULA (all,j,SECT) (all,h,HHOLD)
  THETA(j,h)=CH(j,h)*(1+(ETA(j,h)/OMEGA(h))) ;

```



```

DISPLAY (all,j,SECT) (all,h,HHOLD) THETA(j,h)
# Subsistence levels in household consumption #
FORMULA (all,h,HHOLD)
BETA("agric",h)=(CPQ("agric")*CH("agric",h))/(YH(h)-HTAX(h)-SVH(h)) ;
FORMULA (all,h,HHOLD)
BETA("manuf",h)=(CPQ("manuf")*CH("manuf",h))/(YH(h)-HTAX(h)-SVH(h)) ;
FORMULA (all,h,HHOLD)
BETA("servic",h)=(CPQ("servic")*CH("servic",h))/(YH(h)-HTAX(h)-SVH(h)) ;
DISPLAY (all,j,SECT) (all,h,HHOLD) BETA(j,h)
# Marginal budget shares # ;

```

```

=====
! EXOGENOUS EFFICIENCY PARAMETERS IN PRODUCTION AND      !
! TRADE                                                    !
=====

```

```

FORMULA (all,i,SECT)
AX(i)=X(i)/(SUM(j,SECT,ALPHAN(j,i)*N(j,i))+ALPHA VA(i)*VA(i)) ;
DISPLAY (all,i,SECT) AX(i) ;
FORMULA (all,j,SECT) (all,i,SECT)
AN(j,i)=N(j,i)/(ALPHAID(j,i)*ID(j,i)^-((1-SIGMAN(i))/SIGMAN(i))+
ALPHAIM(j,i)*IM(j,i)^-((1-SIGMAN(i))/SIGMAN(i)))^
-(SIGMAN(i)/(1-SIGMAN(i))) ;
DISPLAY (all,j,SECT) (all,i,SECT) AN(j,i) ;
FORMULA (all,i,SECT)
AVA(i)=VA(i)/(ALPHA K(i)*K(i)^-((1-SIGMA VA(i))/SIGMA VA(i))+
ALPHA L(i)*LAB(i)^-((1-SIGMA VA(i))/SIGMA VA(i)))^
-(SIGMA VA(i)/(1-SIGMA VA(i))) ;
DISPLAY (all,i,SECT) AVA(i) ;
FORMULA (all,i,SECT)
AL(i)=LAB(i)/(SUM(l,CLAB,ALPHA CL(l,i)*CL(l,i)^
-((1-SIGMAL(i))/SIGMAL(i))))^-(SIGMAL(i)/(1-SIGMAL(i))) ;
DISPLAY (all,i,SECT) AL(i) ;
FORMULA (all,j,SECT)
AQ(j)=Q(j)/(ALPHA D(j)*D(j)^-((1-SIGMA Q(j))/SIGMA Q(j))+
ALPHA M(j)*M(j)^-((1-SIGMA Q(j))/SIGMA Q(j)))^
-(SIGMA Q(j)/(1-SIGMA Q(j))) ;
DISPLAY (all,j,SECT) AQ(j) ;
FORMULA (all,j,SECT)
BX(j)=X(j)/(GAMMA D(j)*D(j)^((1+PSIX(j))/PSIX(j))+
GAMMA E(j)*E(j)^((1+PSIX(j))/PSIX(j)))^(PSIX(j)/(1+PSIX(j))) ;
DISPLAY (all,j,SECT) BX(j) ;

```

```

=====
! DEMAND FOR COMPOSITE INPUTS AT THE TOP (LEONTIEF)      !
! NEST                                                    !
=====

```

```

EQUATION Comp_inter_dem
# Composite intermediate input demand #
(all,j,SECT) (all,i,SECT)
N(j,i)=ALPHAN(j,i)*(X(i)/AX(i)) ;
EQUATION Value_added_demand
# Composite value added demanded #
(all,i,SECT)
VA(i)=ALPHA VA(i)*(X(i)/AX(i)) ;

```

```

=====
! DEMANDS FOR INTERMEDIATE INPUTS AT THE SECOND (CES)    !
! NEST                                                    !
=====

```

```

EQUATION Dom_intermed
# Intermediate domestic commodity demand #

```

```

(all,j,SECT) (all,i,SECT)
ID(j,i)=(N(j,i)/AN(j,i))*(ALPHAID(j,i)^SIGMAN(i)*PIM(j,i)^(1-SIGMAN(i))
+ALPHAID(j,i)^SIGMAN(i)*PID(j,i)^(1-SIGMAN(i)))^
(SIGMAN(i)/(1-SIGMAN(i)))*ALPHAID(j,i)^SIGMAN(i)*PID(j,i)^-SIGMAN(i) ;
EQUATION Imp_intermed
# Intermediate imported commodity demand #
(all,j,SECT) (all,i,SECT)
IM(j,i)=(N(j,i)/AN(j,i))*(ALPHAID(j,i)^SIGMAN(i)*PIM(j,i)^(1-SIGMAN(i))
+ALPHAID(j,i)^SIGMAN(i)*PID(j,i)^(1-SIGMAN(i)))^
(SIGMAN(i)/(1-SIGMAN(i)))*ALPHAID(j,i)^SIGMAN(i)*PIM(j,i)^-SIGMAN(i) ;

!=====!
! DEMANDS FOR PRIMARY FACTORS AT THE SECOND (CES)           !
! NEST                                                         !
!=====!

EQUATION Capital_demand
# Demand for capital #
(all,i,SECT)
K(i)=(VA(i)/AVA(i))*(ALPHA(i)^SIGMAVA(i)*PK(i)^(1-SIGMAVA(i))+
ALPHA(i)^SIGMAVA(i)*W(i)^(1-SIGMAVA(i)))^
(SIGMAVA(i)/(1-SIGMAVA(i)))*
ALPHA(i)^SIGMAVA(i)*PK(i)^-SIGMAVA(i) ;
EQUATION Labour_demand
# Demand for labour #
(all,i,SECT)
LAB(i)=(VA(i)/AVA(i))*(ALPHA(i)^SIGMAVA(i)*PK(i)^(1-SIGMAVA(i))+
ALPHA(i)^SIGMAVA(i)*W(i)^(1-SIGMAVA(i)))^
(SIGMAVA(i)/(1-SIGMAVA(i)))*
ALPHA(i)^SIGMAVA(i)*W(i)^-SIGMAVA(i) ;

!=====!
! DEMANDS FOR CATEGORIES OF LABOUR AT THE THIRD (CES)        !
! NEST                                                         !
!=====!

EQUATION Dem_cat_lab
# Demand for unskilled labour #
(all,l,CLAB) (all,i,SECT)
CL(l,i)=(LAB(i)/AL(i))*(ALPHA(l,i)^SIGMAL(i)*CW(l,i)^
(1-SIGMAL(i))^(SIGMAL(i)/(1-SIGMAL(i)))*ALPHA(l,i)^SIGMAL(i)*
CW(l,i)^-SIGMAL(i) ;

!=====!
! PRICE FORMATION EQUATIONS ON PRODUCTION                     !
!=====!

EQUATION Dom_basic_price
# Zero profit condition for domestic production #
(all,i,SECT)
PD(i)*X(i)= PK(i)*K(i)+SUM(j,SECT,PIM(j,i)*IM(j,i))+
SUM(l,CLAB,CW(l,i)*CL(l,i))+SUM(j,SECT,PID(j,i)*ID(j,i)) ;
EQUATION Comp_inter_price
# Composite intermediate input price formation #
(all,j,SECT) (all,i,SECT)
PN(j,i)*N(j,i)=PIM(j,i)*IM(j,i)+PID(j,i)*ID(j,i) ;
EQUATION Comp_valueadd_pri
# Composite value added price formation #
(all,i,SECT)
PVA(i)*VA(i)=PK(i)*K(i)+W(i)*LAB(i) ;
EQUATION Sectoral_wage
# Composite wage formation #
(all,i,SECT)

```

W(i)*LAB(i) = SUM(l,CLAB,CW(l,i)*CL(l,i)) ;

```

=====
! THE PRODUCER AND CONSUMER PRICES EQUATIONS      !
! FORMED THROUGH COMPOSITES                        !
=====

```

EQUATION Producer_price
 # Composite producer price #
 (all,j,SECT)
 $PX(j)*X(j) = (PD(j)*(1+TD(j)))*D(j) + PE(j)*E(j)$;
 EQUATION Consumer_price
 # Composite consumer price #
 (all,j,SECT)
 $CPQ(j)*Q(j) = PM(j)*M(j) + (PD(j)*(1+TD(j)))*D(j)$;

```

=====
! OTHER PRICE FORMATION EQUATIONS                  !
=====

```

EQUATION(LINEAR) Wage_indexation
 # Wage by sector and category #
 (all,l,CLAB) (all,i,SECT)
 $p_CW(l,i) = \{HWAGE*p_CPI + p_WSHIFT(l)\}$;
 EQUATION(LINEAR) Assets_price
 # Price of capital assets #
 (all,i,SECT)
 $PA(i)*p_PA(i) = \text{SUM}(j,SECT,OMEGABAR(j,i)*CPQ(i)*p_CPQ(i))$;
 EQUATION Price_dom_intermed
 # Purchaser's price of domestic intermediate input #
 (all,j,SECT) (all,i,SECT)
 $PID(j,i) = PD(j)*(1+TD(j))$;
 EQUATION Import_price
 # Import price in Kenya shillings #
 (all,j,SECT)
 $PM(j) = PMW(j)*(1+TM(j))*ER$;
 EQUATION Export_price
 # Export price in Kenya shillings #
 (all,j,SECT)
 $PE(j) = PEW(j)*ER$;
 EQUATION Price_imp_intermed
 # Purchaser's price for imported intermediates #
 (all,j,SECT) (all,i,SECT)
 $PIM(j,i) = PMW(j)*(1+TM(j)+TD(j))*ER$;

```

=====
! HOUSEHOLDS CONSUMPTION                          !
=====

```

EQUATION Household_dem
 # Household consumption demand #
 (all,j,SECT) (all,h,HHOLD)
 $CH(j,h) = THETA(j,h) + (BETA(j,h)*(YH(h)-HTAX(h)-SVH(h)-$
 $(THETA(j,h)*CPQ(j))))/CPQ(j)$;

```

=====
! GOVERNMENT CONSUMPTION                          !
=====

```

EQUATION(LINEAR) Government_dem
 # Government consumption #
 (all,j,SECT)
 $p_CG(j) = \{BETAG(j)*p_TGC\}$;

```

=====
! INTERNATIONAL TRADE COMPONENT EQUATIONS
=====

```

```

EQUATION Import_demand
# Import demand #
(all,j,SECT)
M(j)=(ALPHAM(j)/ALPHAD(j))^SIGMAQ(j)*
((PD(j)*(1+TD(j)))/PM(j))^SIGMAQ(j)*D(j) ;
EQUATION Export_supply
# Export supply #
(all,j,SECT)
E(j)=(GAMMAD(j)/GAMMAE(j))^PSIX(j)*(PE(j)/(PD(j)*(1+TD(j))))^
PSIX(j)*D(j) ;

```

```

=====
! INVESTMENT DEMAND
=====

```

```

EQUATION(LINEAR) Investment_demand
# Investment demands by sector of origin #
(all,j,SECT)
Z(j)*p_Z(j)=SUM(i,SECT,OMEGABAR(j,i)*INV(i)*p_INV(i)) ;

```

```

=====
! OTHER EQUATIONS
=====

```

```

EQUATION Labour_income
# Labour earnings by category #
(all,l,CLAB)
WL(l) = SUM(i,SECT,CW(l,i)*CL(l,i)) ;
EQUATION house_income
# Households income #
(all,h,HHOLD)
YH(h) = SUM(l,CLAB,SUM(i,SECT,BETAH(h,l)*CW(l,i)*CL(l,i)))+
NTH(h) ;
EQUATION House_tax
# Household payment of direct taxes #
(all,h,HHOLD)
HTAX(h) = TH(h)*YH(h) ;
EQUATION(LINEAR) House_savings
# Household savings #
(all,h,HHOLD)
p_SVH(h)=SVRATE(h)*p_YH(h) ;
EQUATION Sectoral_profits
# Sectoral profits from production #
(all,i,SECT)
YF(i)=PX(i)*X(i)-SUM(j,SECT,PID(j,i)*ID(j,i))-SUM(j,SECT,PIM(j,i)*IM(j,i))-
DEP(i)-INT(i)-ITAX(i)+SUBS(i)-SUM(l,CLAB,CW(l,i)*CL(l,i)) ;
EQUATION Depreciation
# Consumption of fixed capital (depreciation) #
(all,i,SECT)
DEP(i)=DEPR(i)*PA(i)*K(i) ;
EQUATION Interest
# Interest payments #
(all,i,SECT)
INT(i)=INTR(i)*PK(i)*K(i) ;
EQUATION Indirect_tax
# Sectoral indirect taxes excluding duty #
(all,i,SECT)
ITAX(i)=TD(i)*PX(i)*X(i) ;
EQUATION Corporate_tax
# Corporate tax #

```

```

(all,i,SECT)
CTAX(i)=TF(i)*YF(i) ;
EQUATION Sectoral_savings
# Sectoral savings #
(all,i,SECT)
SVF(i)=YF(i)-CTAX(i)-NTF(i) ;
EQUATION Import_tariff
# Duty paid for sectoral imports #
(all,i,SECT)
DUTY(i)=TM(i)*PM(i)*M(i) ;
EQUATION Government_income
# Government revenue #
YG=SUM(h,HHOLD,HTAX(h))+SUM(i,SECT,CTAX(i))+SUM(i,SECT,ITAX(i))+
SUM(i,SECT,DUTY(i))-SUM(i,SECT,SUBS(i))+NTG ;
EQUATION Government_saving
# Government saving #
SVG=YG-TGC ;
EQUATION(LINEAR) Sectoral_inv
# Investment by sector of destination #
(all,i,SECT)
p_INV(i)=KAPPA(i)*p_TSAV ;
EQUATION Total_sav
# Total savings #
TSAV = SUM(h,HHOLD,SVH(h))+SUM(i,SECT,SVF(i))+
SVG+(SVR*ER) ;
EQUATION Balance_of_trade
# Balance of trade #
BOT =TEXP-TIMP ;
EQUATION Domestic_use
# Domestic absorption of a given commodity #
(all,j,SECT)
D(j)=SUM(i,SECT,ID(j,i))+(DUR(j)*(SUM(h,HHOLD,CH(j,h))+CG(j)+Z(j))) ;
EQUATION Mclear_commodity
# Gross sectoral commodity output #
(all,j,SECT)
X(j)=SUM(i,SECT,ID(j,i))+(DUR(j)*(SUM(h,HHOLD,CH(j,h))+CG(j)+Z(j)))+E(j) ;
EQUATION Mclear_capital
# Market clear capital #
(all,i,SECT)
K(i) = TCAP(i) ;
EQUATION Mclear_cat_labor
# Market clear for labour by category #
(all,l,CLAB)
SUM(i,SECT,CL(l,i))=TCLAB(l) ;

```

Appendix B Text Data File Used with MODHAR

```

=====!
! Text data file called KEGEMADT.TXT which can be used with MODHAR via the !
! 'at' option to create a Header Array file called KEGEMA.DAT to be the !
! file with logical name 'samdataa' referred to in the TABLO Input file !
! called KEGEMA.TAB for Kenya's General Equilibrium Model. !
=====!

!
! SVN - Shilling value of composite intermediate
!
3 3 header "CIMI"
longname
"Composite intermediate input" ;
425700 2322380 49060
631260 11553380 3686500
269420 2333400 4537620
!
! SVLAB - Shilling value of composite labour input
!
3 header "CLIN"
longname
"Composite labour input" ;
6248000 2570000 9204000
!
! SVVA - Shilling value of composite value added
!
3 header "CVAI"
longname
"Composite value added input" ;
9504100 6443320 12168060
!
! X - Sectoral output
!
3 header "TOUT"
longname
"Gross output by sector" ;
10830480 22652480 20441240
!
! SVID - Shilling value of domestic intermediate input
!
3 3 header "DIIN"
longname
"Domestic intermediate input - thousands of shillings" ;
397200 2173600 46800
390900 6486100 3332280
252340 2256820 4058380
!
! SVIM - Shilling value of imported intermediate input
!
3 3 header "IIIN"
longname
"Imported intermediate input - thousands of shillings" ;
28500 148780 2260
240360 5067280 354220
17080 76580 479240
!
! SVK - Shilling value of consumed fixed capital and working capital
!
3 header "PIOC"
longname

```

```

"Consumed fixed capital in production" ;
3256100 3873320 2964060
!
! TCAP - Available capital
!
3 header "CAPS"
longname
"Fixed capital stock" ;
3256100 3873320 2964060
!
! SVCL - Shilling value of labour used by category
!
5 3 header "LIBC"
longname
"Shilling value of labour categories used in production" ;
1000000 730000 1606000
46000 810000 984000
62000 424000 1864000
44000 406000 2514000
5096000 200000 2236000
!
! SVM - Shilling value of imports
!
3 header "DDFI"
longname
"Imports demanded by each sector - thousands of shillings" ;
227940 8690060 1164520
!
! SVE - Shilling value of sectoral exports
!
3 header "DSFE"
longname
"Export supply to the rest of the world - thousands of shillings" ;
2833560 2856440 3353140
!
! SVCH - Shilling value of household demands
!
3 10 header "CDBH"
longname
"Households demand for commodities consumption" ;
276214 271964 78765 184186 168180 352326 233641 2894710 179886 682828
787603 1634086 546866 149056 178721 232117 242504 2124020 138679 1538646
846342 1192254 804243 113490 80138 152814 109024 1085738 73682 917716
!
! SVCG - Shilling value of government demand
!
3 header "CDBG"
longname
"Government demand for commodities produced - thousands of shillings" ;
0.0000000001 0.0000000001 5075820
!
! SVZ - Shilling value of investment demand by sector of origin
!
3 header "IDBS"
longname
"Investment demand by sector of origin in thousands of shillings" ;
105020 5042660 660920
!
! NTH - Net households transfers
!
10 header "NTTH"
longname
"Net households transfers" ;
127731.63 -22555.91 -520838.72 85647.888 150339.40 176512.01 206805.85

```

```

1278940.6 148666.23 889190
!
! NTF - Net firms transfers
!
3 header "NTTF"
longname
"Net firms transfers" ;
782225.6 329512.55 371241.85
!
! NTG - Net government transfers
!
1 header "NTTG"
longname
"Net government transfers" ;
1148060
!
! DEPR - Depreciation rate by sector
!
3 header "ROSD"
longname
"Rate of sectoral depreciation" ;
0.1695279 0.1636838 0.1896048
!
! INTR - Proportion of interest payments in total capital
!
3 header "ROIN"
longname
"Proportion of interest payments" ;
0.0541506 0.0927421 0.3132122
!
! TH - Rate of household direct tax
!
10 header "HDTP"
longname
"Direct tax rate for households" ;
0.0394502 0.0453965 0.0788772 0.00648825 0.0058690543 0.0063122293
0.0055036575 0.0064538844 0.0053681093 0.0773685
!
! TF - Corporate tax rate
!
3 header "SDTP"
longname
"Rate of direct taxes paid by sectors" ;
0.2705818 0.2705818 0.2705818
!
! TD - Rate of indirect taxes excluding duty
!
3 header "SITP"
longname
"Indirect tax rate" ;
0.0051133468 0.0810401 0.0149129
!
! TM - Import tariff rates for different sectors
!
3 header "POID"
longname
"Rate of import duties" ;
0.037115 0.1497112 0.004911895
!
! SVR - Foreign capital
!
1 header "FSAV"
longname
"Foreign capital flows in shillings" ;

```



```

962970
!
! TGC - Governments total consumption demand
!
1 header "GCON"
longname
"Govenrment's total consumption demand" ;
5075820
!
! BETAH - Share of household h in labour of category l
!
10 5 header "PHLC"
longname
"Household h share of labour of category l" ;
0.3147482 0.2413043 0.1307627 0.035346 0.0050451407
0.2026378 0.4304347 0.4635373 0.2724595 0.0167286
0.0155875 0.0826086 0.1953059 0.3254786 0.0905469
0.0059952038 0.002173913 0.0016764459 0.0022091311 0.043813
0.0323741 0.0086956522 0.0067057837 0.0095729013 0.0326606
0.0035971223 0.0010869565 0.00083822297 0.0014727541 0.0844397
0.0323741 0.0086956522 0.0067057837 0.0095729013 0.0382368
0.1930455 0.0532608 0.0427493 0.0537555 0.5724907
0.0065947242 0.002173913 0.0016764459 0.0014727541 0.0355815
0.1930455 0.1695652 0.1500419 0.2886597 0.0804567
!
! BETAG
!
3 header "PGCC"
longname
"Proportion of commodity j consumed by government" ;
0 0 1
!
! OMEGABAR - Capital coefficients matrix
!
3 3 header "CJCI"
longname
"Capital coefficient matrix" ;
0.01808 0.01808 0.01808
0.8681369 0.8681369 0.8681369
0.113783 0.113783 0.113783
!
! KAPPA - Exogenous sectoral investment shares
!
3 header "SISH"
longname
"Exogenous sectoral investment shares" ;
0.0867678 0.3060978 0.6071342
!
! MU - Sectoral shares of total output
!
3 header "SWPI"
longname
"Sectoral shares of total output" ;
0.2857265 0.2411959 0.4730774
!
! SVRATE - Households savings rate
!
10 header "SVRA"
longname
"Houeholds savings rate" ;
0.0367552 0.047989 0.0874553 0 0.2347336 0.1081065 0.1089578 0.065948
0.1242604 0.0489815
!
! WL - Wage incomes

```

```

!
5 header "WINC"
longname
"Labour earnings" ;
3336000 1840000 2350000 2964000 7532000
!
! YH - Households income
!
10 header "HINC"
longname
"Households incomes" ;
2067731.6 3417444.1 1715161.3 449647.89 562339.4 832512.01 660805.85
6580940.6 450666.23 3593190
!
! HTAX - Households tax
!
10 header "HTPA"
longname
"Households tax payments" ;
81572.627 155140.09 135287.28 2915.8879 3300.4005 5255.0067 3636.8491
42472.63 2419.2256 278000
!
! SVH - Households savings
!
10 header "HHSA"
longname
"Households savings" ;
76000 164000 150000 0.0000000001 132000 90000 72000 434000 56000 176000
!
! YF - Sectoral profits
!
3 header "FPRO"
longname
"Sectoral profits" ;
2479620 1044540 1176820
!
! DEP - Depreciation
!
3 header "COFC"
longname
"Depreciation" ;
552000 634000 562000
!
! INT - Interest
!
3 header "IPBF"
longname
"Interest payments" ;
176320 359220 928380
!
! ITAX - Indirect taxes
!
3 header "ITPB"
longname
"Indirect taxes" ;
55380 1835760 304840
!
! SUBS - Subsidy received
!
3 header "SRBF"
longname
"Subsidy payments" ;
7220 200 7980
!

```

```

! CTAX - Corporate taxes
!
3 header "CTFF"
longname
"Corporate taxes from firms" ;
670940.24 282633.6 318426.17
!
! SVF - Sectoral savings
!
3 header "SSAV"
longname
"Sectoral savings" ;
1026454.2 432393.85 487151.98
!
! DUTY - Tariff paid
!
3 header "TARR"
longname
"Tariff payments" ;
8460 1301000 5720
!
! YG - Government income
!
1 header "GREV"
longname
"Government revenue" ;
6625820
!
! SVG - Government savings
!
1 header "GSAV"
longname
"Government savings" ;
1550000
!
! INV - Investment by sector of destination
!
3 header "IBSD"
longname
"Investment by sector of destination" ;
503999 1778000 3526600
!
! TSAV - Total savings
!
1 header "SAVI"
longname
"Total savings" ;
5808600
!
! BOT - Balance of trade
!
1 header "BOTR"
longname
"Balance of trade" ;
-1039380
!
! GDP - Sectoral GDP
!
3 header "SGDP"
longname
"Sectoral GDP" ;
8033340 6781340 13300800
!
! TCLAB -Total labour by category

```

```

!
5 header "ALBC"
longname
"Aggregate labour by category" ;
3336000 1840000 2350000 2964000 7532000
!
! Q - Composite commodity for domestic use
!
3 header "CCDU"
longname
"Composite commodity for domestic use" ;
8224860 28486100 18252620
!
! D - Domestic supply(demand) of commodity
!
3 header "DCSD"
longname
"Domestic demand(supply) for commodity" ;
7996920 19796040 17088100
!
! TYF - Total sectoral ptofits
!
1 header "ASPR"
longname
"Total sectoral profits" ;
4700980
!
! TGDP - Total GDP
1 header "AGDP"
longname
"Aggregate GDP" ;
28115480

```

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