

Guyana:

Impacts of Structural Reform in Bauxite and Sugar on Economic Prospects and Poverty Reduction: Analysis with the T21-Guyana Model

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Millennium Institute

1117 N. 19th Street, suite 900

Arlington, VA 22209

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Executive Summary

Guyana is facing difficult choices at this point. Its growth rate has fallen substantially from the highly satisfactory rates achieved in the early part of the 1990s. Those growth rates were augmented by recovery from a weather-induced slow-down in agricultural production and the positive impacts of devaluation. The slow-down since 1997 has been partly the result of declining prices to Guyana's major exports, sugar and bauxite, but also partly due to the cumulative effects of poor management and relative inefficiency in those sectors. Without any change in policy, it is likely that these negative trends will continue, further slowing growth and increasing poverty.

The government has recognized these challenges and has developed a National Development Strategy and PRSP to implement a program of structural reform supported by Guyana's friends and donors. A key element of this reform program is structural adjustment in the sugar and bauxite sectors. These adjustments pose a difficult dilemma for the government: significant layoffs will be required in both sectors, which will be politically unpopular. To examine the potential impacts of these reforms and possible alternatives for mitigating these impacts, the World Bank commissioned this analysis by the Millennium Institute to examine the results of the reform over a 20 year horizon.

The Millennium Institute's T21 model is used to look at alternative scenarios. First, base case scenarios are run to see what would happen if no reforms were made over the next 20 years. Growth would continue to slow, as would employment creation. Even without the reforms, the government would still be faced with at least one very difficult choice. It could continue subsidies in the sugar and bauxite sectors, and face ever growing budget deficits -- reducing its ability to fund other public services and eventually running an unsustainable budget deficit, which would derail the rest of the adjustment program and threaten foreign assistance. Or it could eventually reduce the subsidies, and then face large layoffs, particularly in the sugar industry. At the point where the cross-subsidies in the sugar sector from the profitable areas to the unprofitable areas are no longer possible, it is assumed most likely that the government will not be able to institute new subsidies directly from the government budget, and layoffs will be inevitable. Poverty would continue to decline, if the subsidies continue, and level off at about 19% by 2020. If the subsidies in sugar cannot be continued, then poverty would rise a bit before declining slowly to about 21% of the population by 2020. Neither option is desirable.

A series of reform scenarios is then examined to estimate the impacts of adjustment in these two industries. The proposed reforms would increase productivity in both, raise output in bauxite, and adjust output in sugar to take optimum advantage of preferential trade agreements and avoid producing at a loss. These reforms result in layoffs in both sectors, but save money on the subsidies, which are used on other expenditures. The results of pure adjustment show higher growth, more employment, and lower poverty in the medium term, but at a cost of somewhat lower employment and slightly higher poverty over about a 7-year horizon. Poverty eventually falls to under 16% by 2020. Although better for the country in the long term, this is probably not acceptable in the short term.

In order to ease the transition during the adjustment period, several mitigating measures are tested. Severance payments of about two years' wages are made to the laid-off workers, mostly out of saved subsidies. These payments improve the poverty situation, at little cost in growth compared to the pure adjustment scenario. Poverty levels stay below the base cases from the beginning and eventually fall to just above 16% in 2020. If, in addition, the remaining subsidy savings are directed toward highly productive infrastructure investments, growth increases significantly and poverty is reduced further below the base case, falling to under 11% by 2020. GDP growth is more than double that achieved in the base case. Increasing the efficiency of investment will always help.

With the adjustment program in place, additional resources are freed up from subsidies to go into new programs of high return investment, or additional training for laid-off workers. Both severance payments and judicious use of saved subsidies play a critical role in making the adjustment process successful.

These results strongly suggest that the adjustment program in bauxite and sugar can be implemented in a satisfactory manner with substantial medium term gains for the economy, employment, and poverty reduction. Mitigating measures will need to be implemented to reduce the short-term impacts to acceptable levels. Several such measures are analyzed in this study. Other measures could be implemented to further reduce the short-term negative impacts. Overall, the proposed reform program is a highly desirable option.

Note: Since this exercise was undertaken, the government has begun the reforms in the bauxite sector. It has privatized both the Linmine and the Bermine (amalgamated with Aroima). Severance payments were agreed approximately equal to two years wages, paid in a lump sum. A net of 1060 workers were laid off. This is similar to the assumptions contained in this study for the reform of the bauxite sector. The scenarios shown here could become markers to monitor further results of the reform.

Introduction

In February of 2002 the World Bank approached Millennium Institute to customize the Threshold 21 (T21) template model to Guyana and perform some analyses to support the World Bank's proposals for structural adjustment in the preparation of the PRSP proposal. Desk analysis and data entry was completed in March and April and a country visit to Guyana undertaken in April. Information provided by the World Bank, the Government of Guyana, and other sources on the proposed structural adjustments has been used in preparing this report.

This document consists of five sections. The first section provides a statement of the issues Guyana is facing. The next three sections present the T21 model framework for analyzing policy changes; the challenges requiring structural reform in the bauxite and sugar sectors; and the specific reform options considered, along with the results of the reform scenarios tested. The fifth section contains the conclusions and recommendations. An expanded description of the structure of T21-Guyana is provided in Appendix A.

Issues facing Guyana

There is significant poverty in Guyana; over 36 percent of Guyana's 770,000 citizens lived below the poverty line of US\$1.40 per day in 1999. Guyana was able to raise its rate of growth to 7-8% p.a. from 1992 to 1997, ran into rough times, and the rate fell to an average of less than 2% p.a. since. This decline is due to a combination of external factors, such as declining terms of trade, and internal problems, such as declining productivity and competitiveness in several major industries.

Actual population growth is expected to continue growing very slowly, if at all, because of a high migration rate, although total fertility rates are estimated to remain around 2.3. According to experts, the population may now be on the verge of serious decline if the high migration rate continues. While the migration reduces pressures on domestic resources, it involves the loss of people from the labor force during the most productive period of their lives, which reduces productivity and deprives the economy of a vital resource to restore growth. Remittances partly compensate for this loss.

If the economy is going to restore growth, it will have to undertake reforms to improve governance, productivity, and its attractiveness to foreign investment. The broad framework for this program of reforms has been described in detail in the National Development Strategy (2001-2010) A Policy Framework. This program is reflected in the PRSP currently being prepared for the World Bank and in several specific reform projects.

The National Development Strategy and the PRSP cover the full range of issues faced by the country, and the reader is directed to them for a more complete picture of the situation in Guyana, the broad reform program envisioned, and the elements featured in the PRSP that will be supported by the World Bank. In this exercise, we look in more detail at the impacts of two major elements of the structural adjustment program being considered by

the government with the support of the World Bank: a major privatization in the bauxite industry and a major restructuring of the sugar industry.

Together these two sectors account for one fifth of GDP and over two fifths of Guyana's exports. They are critical to the long-term viability of the economy and should provide a basis for further development and growth. They were major factors in the country's growth in the 1990's. Poor management, loss of competitiveness, and declining prices have taken their toll. Investment in these sectors has lagged as profits have fallen and uncertainty over policy direction has increased. Subsidies have grown, depriving the government of resources for other activities; and employment in these two sectors stands well above efficient levels. World prices for these goods have declined and are expected to decline further. In sugar, this is in part due to the decline of quotas in preferential markets and falling prices within the preferential agreements.

One of the most important challenges facing Guyana is to turn these industries around – making them more efficient and competitive in global markets. This would eliminate large government subsidies, enabling those resources to be used more productively supporting social services and critical infrastructure. Going forward, it is important to reduce the country's dependence on these industries, while increasing their positive contribution to the economy. Guyana needs to be able to diversify its production and provide better income growth for its people, both to reduce poverty and to slow emigration of the skilled workforce. Those issues are addressed in the National Strategy.

Structural Reform: Adapting the model to address the challenges of change

The proposed structural reforms for the bauxite and sugar sectors are described below. They pose a typical dilemma for the government. There is an initial cost in terms of loss of jobs and increased poverty. But there are substantial benefits in terms of greater GDP growth, and over time more employment growth and reduction in poverty. To analyze the time frame of the adjustment, the extent of the costs and benefits, and the potential for satisfactory mitigating actions, the World Bank commissioned this analysis using the T21 Model developed by the Millennium Institute.¹

Overview of the T21 Model

The T21 model is well suited for this kind of analysis. It is a fully integrated model that includes

- ❖ a core economic component of three sectors with Cobb-Douglas production functions, consumption, savings, investment, relative prices, government revenues and expenditures, trade, debt, etc.
- ❖ a social sector with full population dynamics, health (including HIV/AIDS spread), education, literacy, a labor market, etc.
- ❖ an environmental sector with resource uses, depletion, pollution, etc.²

¹ See the MI website, www.millenniuminstitute.net, and the model website www.threshold21.com for more details,

² See Appendix A for a fuller description of the model. Or look at the MI website (see footnote 1) for a run only version of a typical model.

The model generates future scenarios based on a systems dynamics methodology that contains full feedback links across sectors and variables. For example, increased government spending on education results in higher literacy, which leads to higher labor productivity with appropriate lags, and conversely. The model can examine the effects of different policies affecting income growth on population growth rates, employment, and poverty. The full integration of the different sectors and the ability to track impacts of different policy choices make the model an ideal tool to examine the implications of the policy choices facing the government with the proposed structural adjustment program.

The model has been calibrated with Guyana data and fitted to the trends over the past ten years (limited only by the availability of data, which was marginal in some areas).³ This exercise provides the basic parameters for running scenarios to look at the impacts of the proposed structural reform. The model typically runs scenarios for 20 years, but can go longer. In this case, one of the advantages of this model is its capacity to compare the short and longer-term implications of different policy choices.

Additional sectors have been integrated into the model for the bauxite and sugar sectors, including their impacts on the overall employment activities, in order to examine the key direct and indirect effects of the structural adjustment program. The detailed relations are shown in Appendices B and C. These special sub-sectors were designed to reflect the specific structure of the two industries facing structural adjustment. The model incorporates their production functions, demand for labor, generation of surpluses, and use of subsidies, permitting a broader analysis of the impacts of the structural adjustment.

Due to time and resource constraints, detailed adaptation of the model concentrated on the structural reform issues. A full data loading and calibration was done to assure viable results. However, detailed modifications were not made for the other sectors to look at policy options there. With the data entry and calibration complete, extending the model to others issues and sectoral analysis would require only modest additional effort. Before looking at the alternative scenarios of the adjustment program, let us examine the two affected industries more closely.

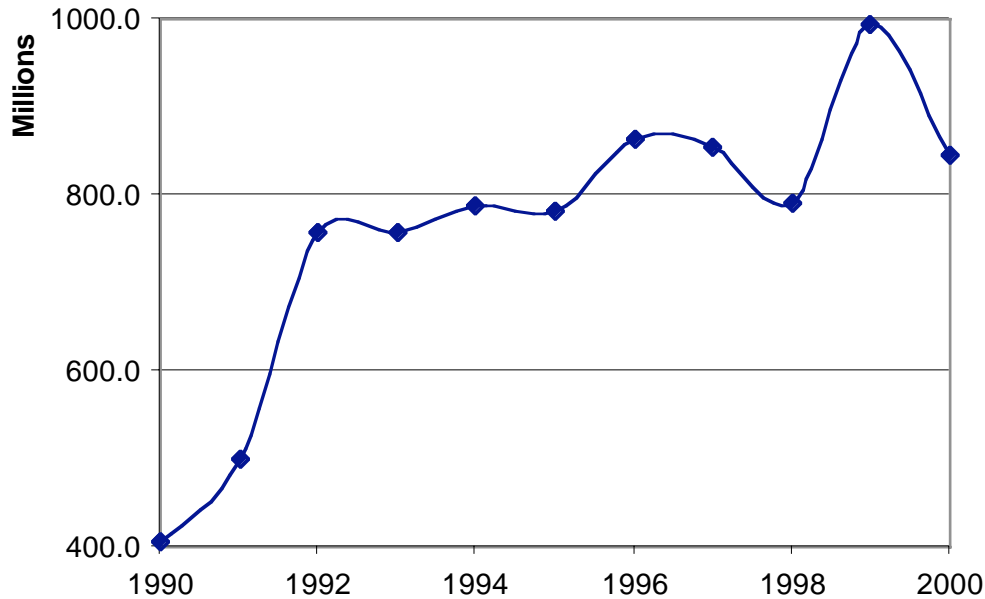
Structural Reform: The Challenges Facing the Sugar and Bauxite Industries

Sugar sector

Nearly 20 percent of GDP is sugar production. Sugar's production value-added has grown during the 1990s from 500 to 950 GYD million dollars with an average annual growth rate of about 4 percent. Figure 1 shows sugar production from 1990 to 2000.

³ Any such exercise is constrained by the quantity and quality of data available. The model actually provides the tools to extract maximum information from data that is available and to assure that it is as consistent as possible. While data problems exist, they are less constraining in this framework than in comparing alternatives based on partial sector models or on mental models.

Figure 1: Value-added (GYD) in sugar sector from 1990 to 2000



Source: Caroline's spreadsheet: Table set 1

Most of the increase in the value of sugar production is attributed to recovery from a low point around 1990 due to weather factors (El Nino) and to impacts of the devaluations in 1992 and 1994, which improved competitiveness. The levels achieved in the rest of the decade are simply a return to levels achieved in the 1980s. There has been no significant underlying growth trend. Yields have returned to the levels attained in the 1970s and 1980s, but remain below those achieved in the 1960s. Sugar prices have been decreasing in the past several years at about 1.5 percent per year. This decline is expected to continue as the prices offered in protected markets in the EU and elsewhere are projected to decline in the coming years in response to pressure to reduce subsidies.⁴

GUYSUCO⁵ operates the major sugar plantations and mills in two regions: Berbice and Demerara.⁶ The operations in the Berbice area are more efficient and, with additional investment, could remain profitable within the evolving world sugar market by producing the sugar that Guyana can sell under preferential agreements. Those in Demerara are not profitable (primarily due to low productivity in the mills) and unlikely to become so. Currently, surpluses from the Berbice area, representing about 2.5 percent of GDP, are used to compensate for the lower productivity of (and therefore, higher average cost) in

⁴ Guyana has benefited from special agreements primarily with the EU for about 150,000 tons of its exports (check). This has allowed it to continue production even though its costs are significantly above the world's low cost producers. As these preferences decline, it will have to increase its productivity to stay in its current markets. See the Analysis of the Guyana Sugar Industry Strategic Plan. Prepared for the World Bank by LMC International Ltd. September 2000.

⁵ A publicly owned company managed by a private firm under contract.

⁶ A relatively small amount of sugar grown in Guyana is produced by small-holders and sold to the plantation mills.

the Demerara region. This leaves too few resources to finance adequate investment and improvement of efficiency in Berbice production. If the current trends in both production areas continue, and preferential agreement prices decline as expected, surpluses will disappear by 2015, and none of the sugar exported will generate a surplus.

The sugar industry currently employs about 18,000 people. About 8,000 produce 40 percent of the sugar production in the Demerara region with an average cost of about 18-19 US cents/lb. The remaining 10,000 laborers produce 60 percent of the sugar production in the Berbice region with an average cost of approximately 14 US cents/lb. The most favorable quota agreements pay 22 cents/lb, which will fall to about 15 1/2 cents/lb by 2015. With the current cost structure, the industry generates a surplus of about US\$20 million on the first roughly 150,000 tons of sugar sold up to the quotas for Guyana under the most preferential agreements. Sales of an additional roughly 100,000 tons are made under less favorable preferential agreements or on the open market. These result in a loss of more than UD\$10 million per year.⁷

When the subsidies required to maintain production in the Demerara area exceed the surpluses generated in the Berbice area, about 2005, the government will face a difficult decision. It can close down the Demerara area and retain the (declining) profitable Berbice. Closing Demerara would result in laying off about 8000 workers. Or the government can maintain production in the Demerara area by providing additional direct subsidies. These payments will come directly out of government revenues and reduce funds available for expenditures on other important activities, including health and education. It will no longer be possible to hide these subsidies within the GUYSUOCO accounts.

The marginal cost of producing sugar in Guyana is above many major producers and almost twice the price of sugar traded in 'free' markets outside of trading agreements (10-11 cents/lb). Studies to date indicate that production costs cannot be brought down far enough to be competitive under some of the lower priced preferential agreements of the open market. The Berbice region can produce nearly all the sugar that can be sold under favorable agreements and make a profit. In effect, the production from Demerara is sold in the free or unprotected market at a loss, hence the effective cross-subsidy within GUYSUOCO. This is not sustainable.

Guyana would gain substantially if it could undertake a major restructuring and investment program to raise the productivity of the Berbice region and control its production to sell only into markets where it receives a preferred price above its production costs and clears a surplus. Without such a structural adjustment, not only the 8000 people working in Demerara, but also many of the people working in the Berbice region will risk losing their jobs as less and less Guyanese sugar remains competitive.

⁷ Imagine a supply curve rising as a step function with the rising costs of different mills and a demand curve declining as Guyana uses its quotas under increasingly less favorable trade agreements. The curves intersect at about 150,000 tons at this time. The area between the curves up to their intersection represents the surplus, and the area between the curves to the right of their intersection (the supply curve is above the demand curve) up to the point of total sales represents a loss.

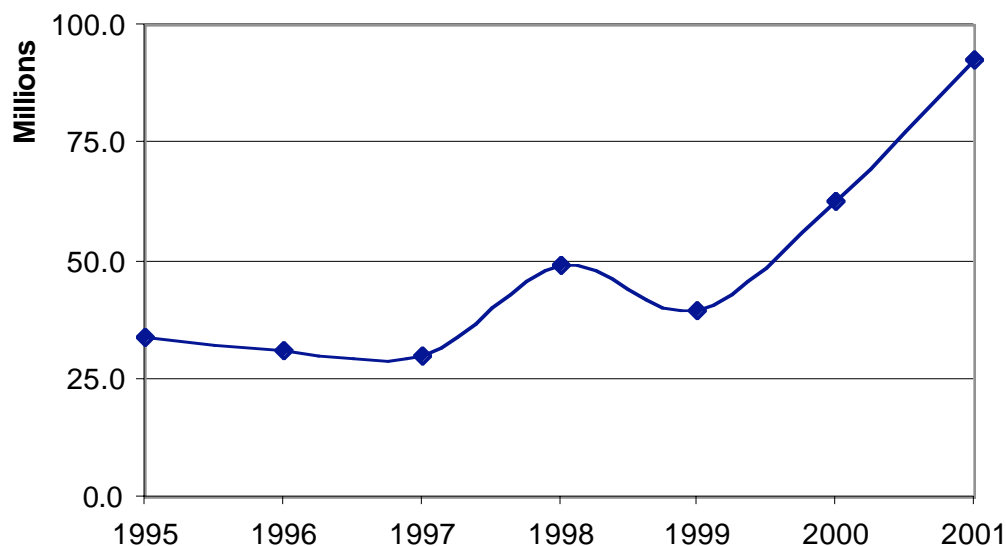
The combination of relatively low productivity in Guyana's sugar industry, fixed quota limits, and falling sugar prices calls for serious thinking about the future of the industry.

Bauxite sector

Mining in general comprises about ten percent of GDP in Guyana. Bauxite represents half of that, or about five percent of GDP. Guyana's deposits are of high quality and have a ready market internationally. The value-added in this sector started to decline after 1978, when the government nationalized the industry. In 1992, the operations were declared technically bankrupt but continued operating with a government subsidy. The bauxite sector employs about 2000 people, after going through several down-sizings of employment since 1991. Poor management of the operations, inadequate investment, and thus low productivity are factors in the declining profitability of the industry.⁸

The reform program concerns the privatization of Linmine, the largest of three bauxite mines in Guyana.⁹ The government has subsidized operating costs at Linmine for some time. Subsidies amounted to about 0.7% of GDP in 1995, but it has grown to 1.7 percent of GDP in 2001, or GYD 93 million. See Figure 2. Linmine currently employs about 1250 people. The subsidy covers the costs of an estimated 800 surplus workers plus a share of operating costs.

Figure 2: Government subsidies to Linmine (GYD)



From: Mr. Horace James, CEO of Linmine

The future of bauxite depends on reforms that increase productivity. At this time, the government has the option to sell the mine to a competent operator who will undertake

⁸ Dr. David A. Phillips, Environmental, Social, and Economic Studies of Linmine/Bermine Operations, Privatization Unit, Kingston, Georgetown, September 1999

⁹ One of the others is government owned, but relatively small (check). And the third is privately owned.

the required investment to increase production and return to profitability. Without such a transfer, it is unlikely that the industry can remain in business for long. It currently costs the government 1.7% of GDP to assure a contribution of 5% of GDP, and the level of the subsidy is growing. This is not sustainable, and at some point, the subsidies to Linmine will become too costly. They will have to be cut off and all the workers laid off.

Structural Reform: The reform program, policy options, and scenarios

The proposed structural reform programs

The sugar and bauxite sectors comprise about 20 percent of GDP and employ about 20,000 people (slightly less than ten percent of the labor force). Both the bauxite and sugar industries are facing falling external prices and have to increase their productivity. This requires additional investment and cost reductions, including reducing labor use significantly. As major employers, this poses severe problems for the adjustment period.

Reform in the bauxite and sugar sectors will contribute to the recovery, over the medium term. Their recovery depends on the results of increasing investment and improving management. The reforms in these industries will eliminate subsidies that the government is currently paying, and may also attract some additional foreign funding. Resources saved from the subsidies could be applied to ease the transition, shorten the period of employment and income losses, and eventually fund more important expenditures elsewhere. The reform programs will be different in each industry.

In bauxite, it was proposed that the government privatize the Linmine, which is potentially profitable, but making losses due to excess labor and lagging investment in new equipment. The new owners would be responsible for the additional investment needed to make the mine more competitive and expand production. They are expected to permanently lay off about 800 workers. However, the government would save the money that is currently being used to subsidize the mine operation.

Last month, the government implemented its reform program in the bauxite sector, which went further than that discussed above. The Bermine was combined with the Aroima mine and privatized in addition to Linmine. As a result, total layoffs were 1060 rather than the 800 assumed above. In addition, the government agreed to severance payments of 4 weeks' pay per year worked in Aroima and 6 weeks per year worked in Linmine, both up to 104 weeks. These are to be paid in a lump sum. This works out to two years of severance in most cases. In addition, the government offered some training and rights to land for home in some cases. Both mining enterprises look profitable.

In sugar, we base our adjustment on the 4-year Modified Reform Strategy described in the Analysis of the Guyana Sugar Industry Strategic Plan.¹⁰ This program is somewhat less expensive than the full reform analyzed in that document, but it can be funded entirely out of the surpluses generated in the Berbice area if it does not have to cross subsidize Demerara, and it raises a portion of the funds needed for investment from

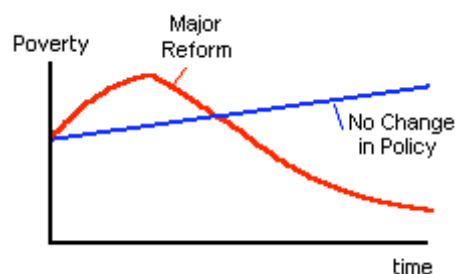
¹⁰ See the Analysis of the Guyana Sugar Industry Strategic Plan. Prepared for the World Bank by LMC International Ltd. September 2000.

selling others assets. The reform program would close operations in Demerara, laying off 8000 workers, and expand operations in Berbice, which would add 1700 workers, so the net loss in jobs would be 6300.

After the four-year program is completed, GUYSUCO generates substantial surplus. We assume that 2/3 of the surplus accrue to the government either through taxes or payments for the right to operate the industry. It is also possible that once the government establishes that it is committed to the reform program, it will be able to borrow some additional funds, either to pay for part of the investment costs (and thus liberating some surplus to pay severance payments) or to cover some of the costs of the transition. These loans would be repaid out of the future revenues of the company or government. In these scenarios, we assume that the government funds the initial costs of the severance payments in sugar from non-disruptive domestic borrowing, which it repays out of the increased revenues after the transition is complete.

As a result of these adjustments, unemployment will increase in the short run, but the improved efficiency of the economy should lead to higher growth, and over time more employment. Whether poverty decreases faster or slower than in the base case depends on the other actions taken by the government during the transition. It is important that the specter of economic and political costs in the short term not prevent the reform from being undertaken, thus condemning the economy to longer-term stagnation and decline. The key issues to be addressed by the model are how long would the adjustment period be and what measures could be undertaken to shorten the difficult adjustment period to an acceptable length. Figure 3 shows graphically the nature of the choices faced. The major questions to be addressed in the scenario analysis are: How large is the area between the reform and no change curves before reform reduces poverty below the level with no change? How long until Guyana reaches that point? And what can be done to reduce that time frame?

Figure 3: An image of poverty pattern in the next two decades under no change policy and major reform scenario



Policy options and scenarios

The T21 model provides a powerful tool to examine what is likely to happen if there is no policy change, and then look at the implications of the structural reforms summarized above for each sector. Several scenarios are run to compare the results of different options for adjustment with the base case of no change and with each other. The reader should note that this analysis looks only at the impacts of the proposed reforms in these

two sectors. Guyana is currently planning and undertaking a number of reforms outlined in the National Strategy and in the PRSP. These reforms are also likely to have significant beneficial effects on the economy.

This analysis assumes that other policies remain constant in the comparisons among the adjustment scenarios and the base case. The comparisons among the scenarios would be about the same regardless of whether the other policies in place were the pre-reform or included other reforms, so long as it is the same set of “background” policies across the scenarios considered here. Obviously, reforms that improve economic governance, infrastructure, and other conditions would improve the results of the adjustments analyzed. Indeed, the positive effects of the other reforms could offset most of the negative impacts of the structural reforms reviewed here, enabling Guyana to benefit more rapidly from their positive results.¹¹

Base Case

In the base case, it is assumed that the government does not make the structural changes in the sugar and bauxite industries. More than 15 percent of GDP is in serious jeopardy when sugar industry begins to decline, and 5 percent of GDP in bauxite. About 18,000 people risk becoming unemployed in sugar and 1250 in bauxite if the industries are forced to close due to lack of competitiveness. Until that occurs, the government would have to pay increasing subsidies, reducing funds available for other uses. Growth would slow. Poverty and unemployment would rise. These statements concern only the direct impacts. Declining output and exports from these industries will also reduce their demand for inputs from other sectors; lower production will reduce government revenues; and lower exports will reduce the foreign exchange available for imports.¹²

What happens without structural reform can evolve in several ways, depending on the government’s reaction to the declines in these industries. For this analysis, we have identified two alternative base cases:

Base Case with Subsidies:

- ❖ *Bauxite*: The level of production would decline slightly continuing past trends, but the employment would remain constant. The subsidy would increase as a function of the loss in productivity. The increase in subsidy would not affect any other expenditure. (BB1)
- ❖ *Sugar*: The government would not allow region Demerara to be closed, but would pay an additional subsidy to the internal cross subsidy to maintain employment at current levels. However, the increased subsidies from the government would lead to a reduction in government expenditure equal to the amount of the subsidy the government has to add to the cross subsidy within GUYSUCO. (SB1)

¹¹ As noted above, with modest refinements, this T21 model could run scenarios to illustrate the impacts of a wider range of policies.

¹² Due to the lack of sufficient data, some of the indirect impacts of the decline in these industries cannot be included in the model, to the base case, if anything, understates the extent of the threat.

Likely Base Case without Direct Sugar Subsidies:

- ❖ *Bauxite*: The level of production would decline slightly continuing past trends, but the employment would remain constant. The subsidy would increase as a function of the loss in productivity. The increase in subsidy would not affect any other expenditure. (BB1)
- ❖ *Sugar*: The level of production would increase slightly until 2005, but revenues would remain constant as prices are expected to fall. In about 2005, the costs of cross subsidies to the Demerara areas would exceed the surpluses available from Berbice sales. Demerara production would be closed as the funds for subsidies are not sustainable and 8000 workers would be laid off. Cross subsidies from Berbice would stop after payment of severance equal to one year's wages for each Demerara worker. Remaining surpluses would go into investment in Berbice, however, without the reform, production would decline there as well.¹³ (SB2)

Base Case Results:

For simplicity, we have reduced the number of variables reported and shown them in graphic form. We will show the implications of the base cases for production and employment in the Sugar and Bauxite sectors, on GDP, the incidence of poverty, and total employment. We will then compare these results with what happens when the structural adjustment reforms are implemented by themselves and then with mitigating measures. More graphs and tabular results can also be produced for all variables of interest.

In the Base cases, production in bauxite declines, but employment remains constant as subsidies continue. This remains the same for both sugar base cases. In sugar, production and employment will decline sharply after 2005 if the government allows the Demerara area to close once there is no more surplus in the sugar industry to carry the inefficient sector, Sugar Base 1. However, if the government decides to continue operating sugar mills in the Demerara area, overall production and employment will decline more slowly, but at a growing cost to the government and reduction in resources available to the government for other investment, Sugar Base 2. The results are shown in Figure 4. The impact on employment in these sectors is shown in Figure 5.

¹³ The actual point of loss of profitability occurs between 2005 and 2010 depending on prices, weather, and production levels. Alternative scenarios could be tested.

Figure 4: Base Case Production in Bauxite and Sugar

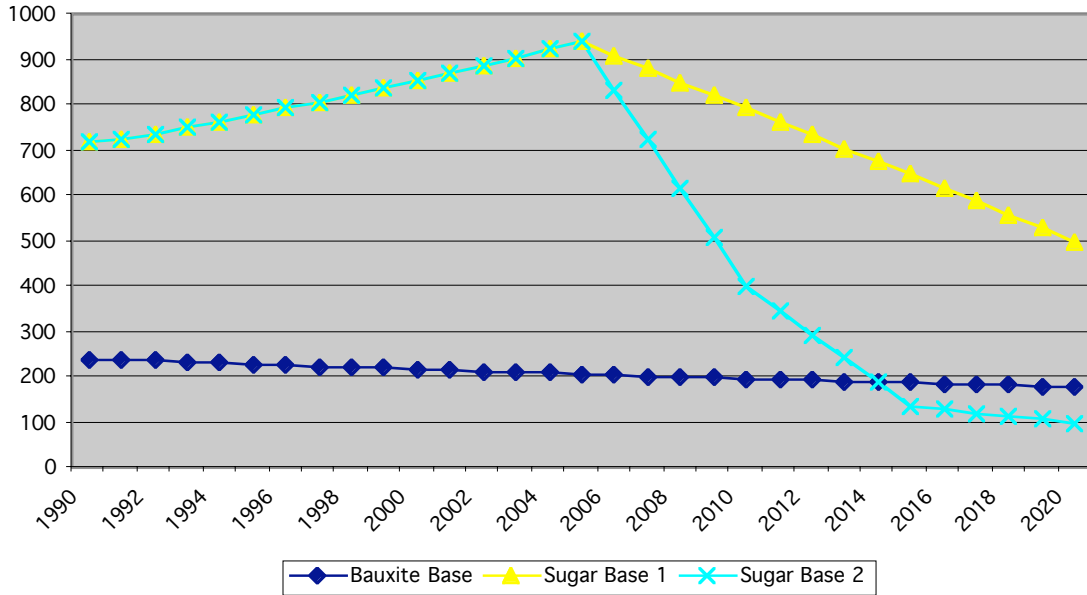
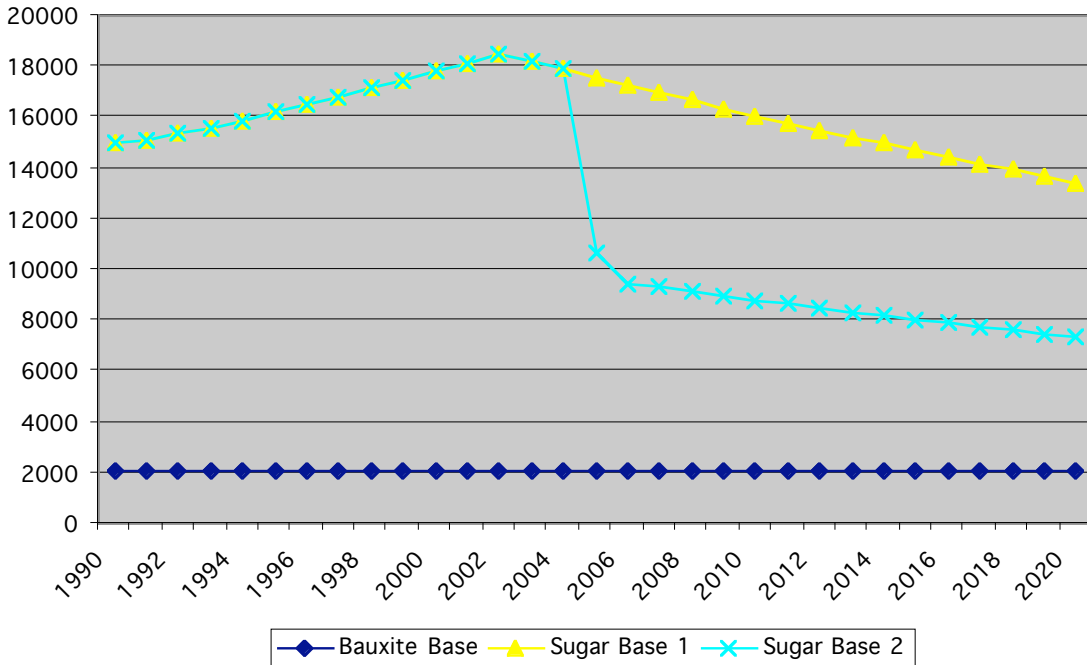


Figure 5: Base Case Employment in Bauxite and Sugar



GDP growth in the base cases continues to decline from a current level of over 3.5% p.a. to about 1% p.a. by 2020 (Figure 6). It is slightly lower in the case where the government continues to subsidize the sugar sector. Employment growth dips when the

sugar sector has to begin closing part of its production when subsidies do not cover the losses in that sector. The growth recovers, but grows at about half the rate of GDP (Figure 7). Of course, employment would be higher with continued government subsidies in sugar, but at a cost in terms of growth and other government expenditures. For simplicity, the graphs of GDP and employment with the subsidies are not shown.¹⁴

Figure 6. GDP Trend for Base Case

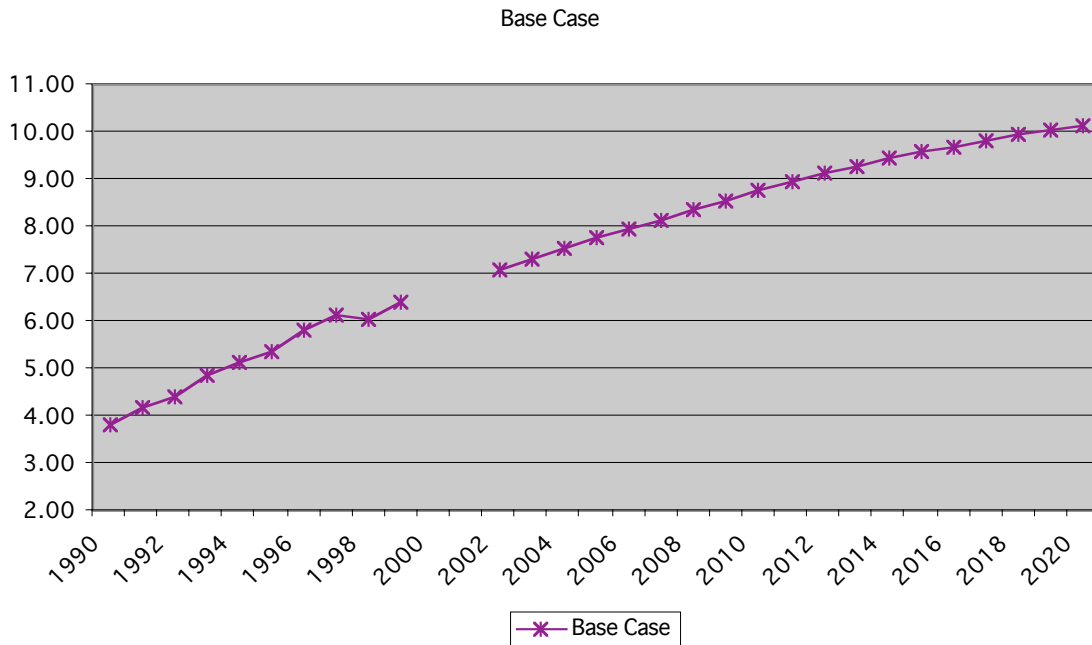
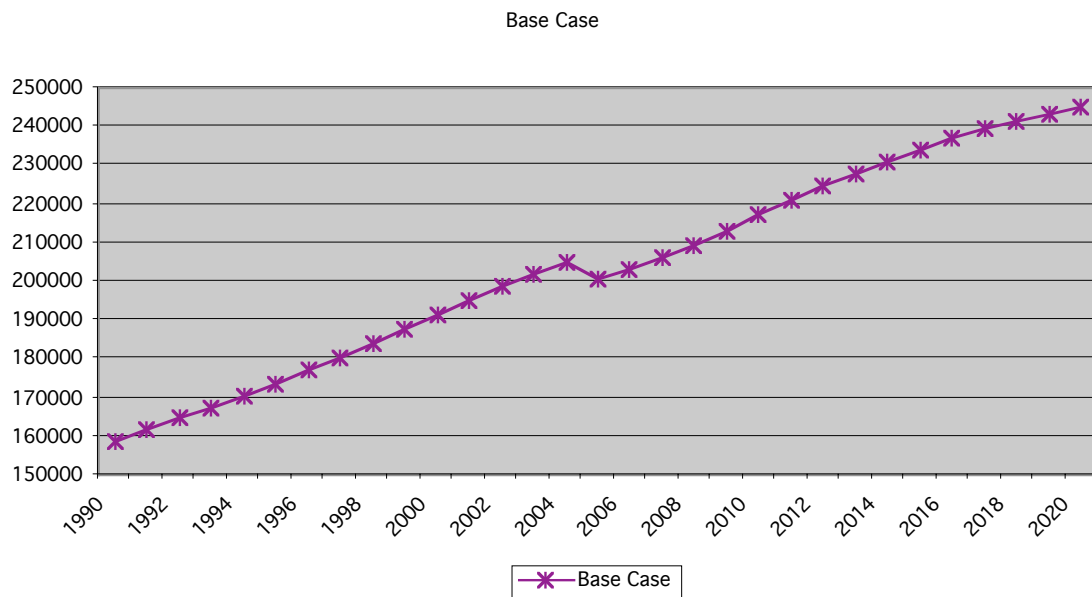


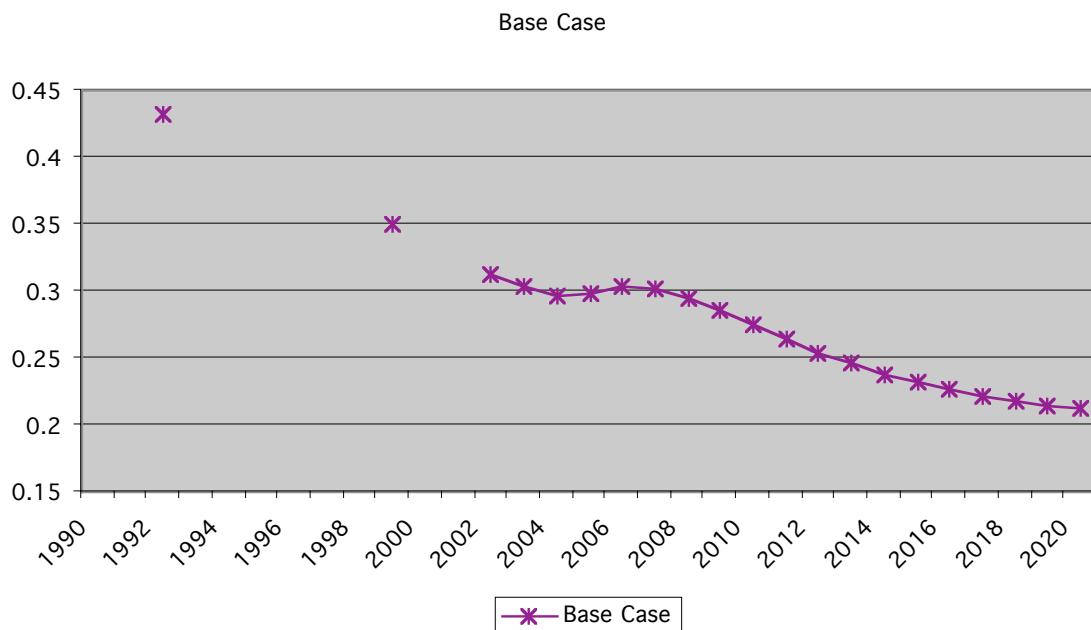
Figure 7: Employment Trend for Base Case



¹⁴ The break indicates data that was not available at the time the model was built.

In the case where the government is not able to make explicit subsidies and has to shut down production in the Demerara area, the poverty incidence would increase after 2005 before resuming its declining trend, which is based on the two observations shown from recent history. This movement is due to continuing increase in per capita income, albeit slowly. Poverty rates would decline slowly in the case where the government continues subsidies in sugar. The government faces difficult choices in not undertaking reform as well.¹⁵ The temptation is to continue subsidies that prevent an increase in poverty in the short term, even though there is a threat of lower growth, fiscal collapse, and poverty reduction in the longer term.

Figure 8: Poverty Incidence Trend for Base Case



Overall, the base cases of avoiding reform do not offer a very optimistic picture. Two of Guyana’s major industries go into decline, dragging down overall GDP growth. Employment does not grow enough to reduce the poverty rate very rapidly. Subsidies may increase to over 6% of government revenues (depending on how much the government chooses to pay), which could increase the budget deficit over a longer term by 2-3% of GDP. That would lead to inflation, probably a decline in support from Guyana’s friends abroad, and then even worse overall results.

¹⁵ The changes in poverty levels are to be treated with care. There are no good ways to estimate changes in poverty levels from aggregate changes in GDP, employment, and sector output. The T21 model has adapted a relationship based on the Gini coefficient and log normal distributions of income. The levels are very sensitive to the parameters used. However, the direction is correct. Thus the shape of the curves and point of intersection should be interpreted with care. The comparative results are what are important, not the actual levels.

Reform options

The structural adjustments described above are derived from detailed studies of the two sectors, and extensive discussions with the World Bank and others. From this information, we have constructed three scenarios for each industry to examine the potential impacts of these reforms and some possible mitigation actions. The first reform scenario in each sector contains the adjustment program, but no mitigating measures. This shows the impacts of the adjustments by themselves. The second scenario includes mitigation measures to provide a safety net and then to use any additional funds saved after severance payments to increase government expenditures.¹⁶

The third scenario uses the money saved after severance payments in a more focused manner, investing in infrastructure, which has been identified as a major constraint to further growth and to attracting more foreign investment. This program of more directed investment could be undertaken independent of the other reforms. The impact would be a similar increment in the variables examined. However, without the basic adjustment that reduces subsidies, the government would have fewer resources for these improved investment activities. The increased expenditures on infrastructure also absorb workers laid off from sugar and bauxite. If the government or the sugar sector were able to attract more foreign funds from donors on the strength of the adjustment program, this would enhance the results of the reforms.

Reform Options Results:

The actual reforms can take many forms. For this exercise, we have made reasonable assumptions based on the documents available describing possible reform programs and concerns.¹⁷ The specific assumptions for each stage of reform by industry are

Pure Adjustment:

- ❖ *Bauxite:* The government privatizes the mine.¹⁸ Production continues to increase. 800 workers are laid off and move into the labor pool. There is no severance payment. The savings from the subsidy are used to increase all other government expenditures.
- ❖ *Sugar:* The Demerara area is closed and 8000 workers are laid off. The Modified Expansion Plan for Berbice is implemented. It uses the money saved from the cross subsidy to undertake necessary investment over four years. It hires 1700 additional workers, so the net impact on employment is 6300 jobs lost. Production occurs in Berbice area, and grows to

¹⁶ Additional scenarios have been run looking at the impacts of specialized training for those laid off and diverting more of the saved subsidies into productive investment rather than severance payments. These have positive impacts, which simply reemphasize the importance of carefully managing the whole adjustment process and investing the savings strategically.

¹⁷ Alternative versions of the reforms and of their timing can easily be run.

¹⁸ It is assumed that the government does not receive a positive net payment. The private firm instead agrees to invest in expanded production and take over several services provided locally by the government owned mine. If there were a positive net payment, it could be used to cover the severance payments and other public investments on the same terms as assumed in the adjustment cases.

'optimum' level. After four years, 2/3 of the surplus then generated transfers to the government to increase other expenditures proportionately.

The impacts of these reforms on production and employment in each sector are shown in Figures 9 and 10. Bauxite loses about 800 jobs permanently, but enjoys a return to output growth as efficiency increases. Production is higher than the base case throughout. Sugar loses a net of 6300 jobs. However, output declines modestly to a level consistent with Guyana's access to preferential trade quotas. The actual reform in the bauxite sector results in slightly larger job loss on net, but essentially the same overall impact. Sugar production with reform exceeds the likely base case in 2008. Even if the government were to continue the subsidies in sugar, its production would fall below the level in the adjustment case by 2012. Employment in sugar falls with adjustment compared to the likely base case without subsidies, but is higher after 2006. These production and employment profiles are the same for all adjustment scenarios.

Figure 9: Impacts of Adjustment on Production in Sugar and Bauxite

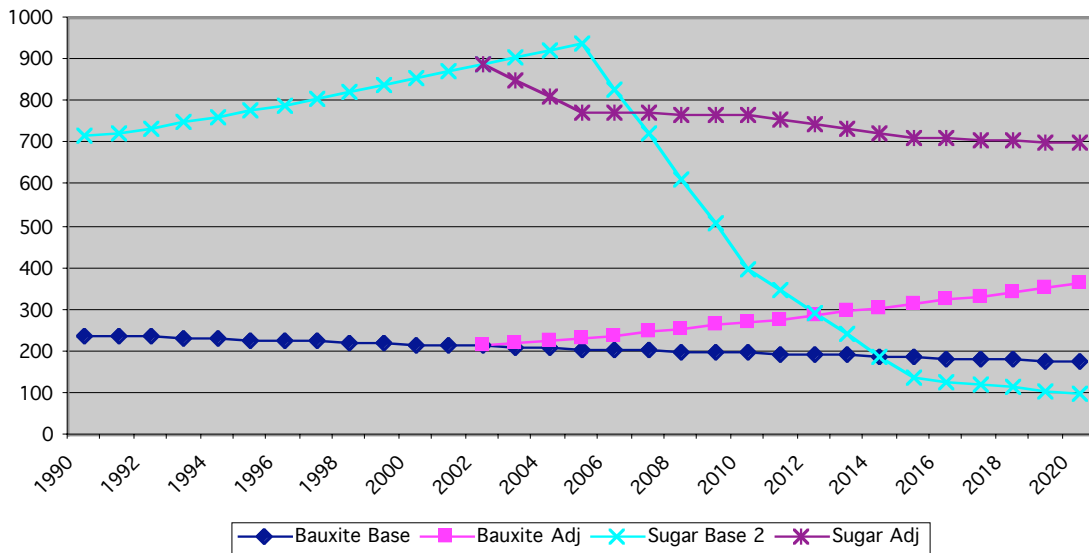
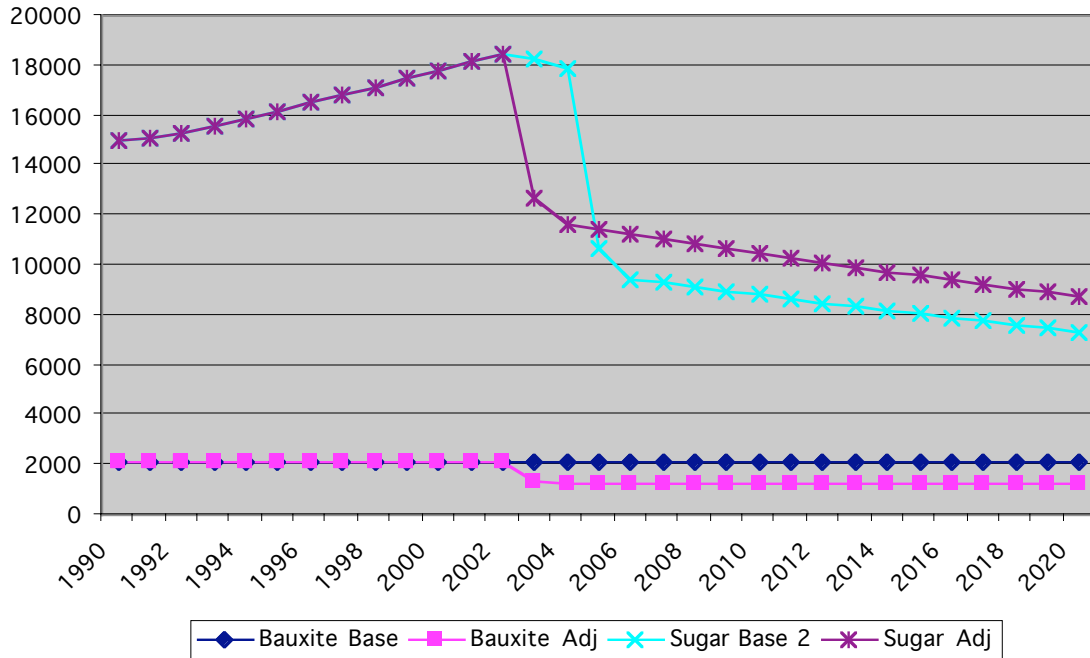
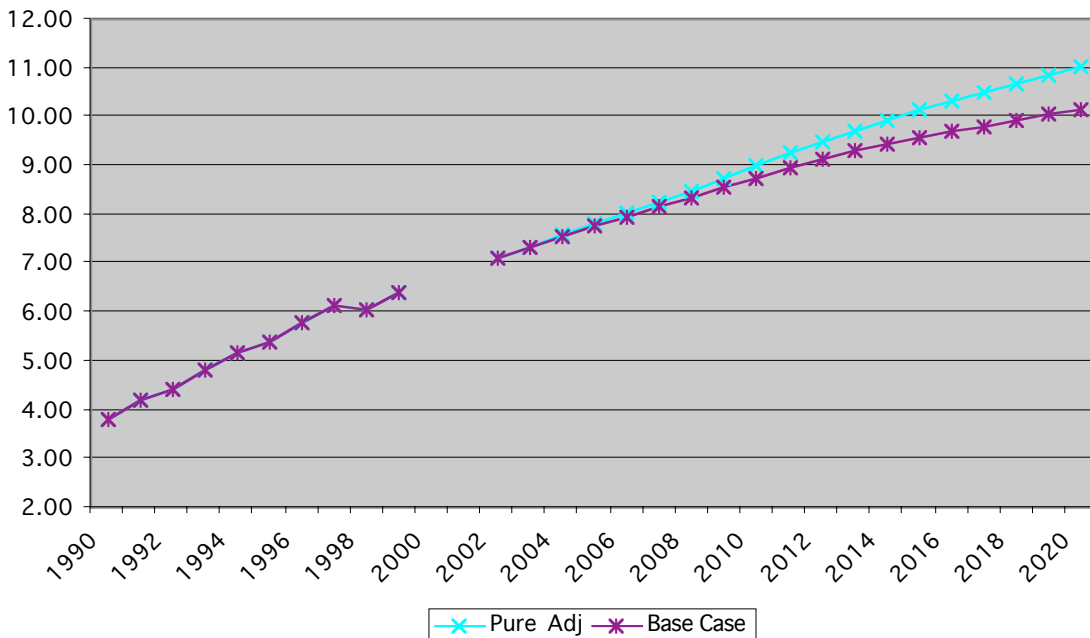


Figure 10: Impacts of Adjustment on Employment in Sugar and Bauxite



GDP grows faster than in either base case (Figure 11). Employment initially declines, but catches up and surpasses the level of likely base case employment by about 2009. If the subsidies are continued, it would take until 2017 for employment in the adjustment scenario to pass that base case – if the subsidies could be continued (Figure 12).

Figure 11: GDP Trends with Pure Adjustment



The poverty share increases marginally above the likely base case in 2004 and 2005, then declines (Figure 13). It falls below the likely base case 1 by 2006 and the subsidized case a few years later. The reforms have a positive effect over time and will lift the economy well above the base cases with no reform. The general pattern follows what was hypothesized in Figure 3. However, the short-term impacts are severe and probably not acceptable. Growth is maintained, due to increased efficiency and more government expenditures, the costs in terms of unemployment and poverty are high.

Figure 12: Employment Trends with Pure Adjustment

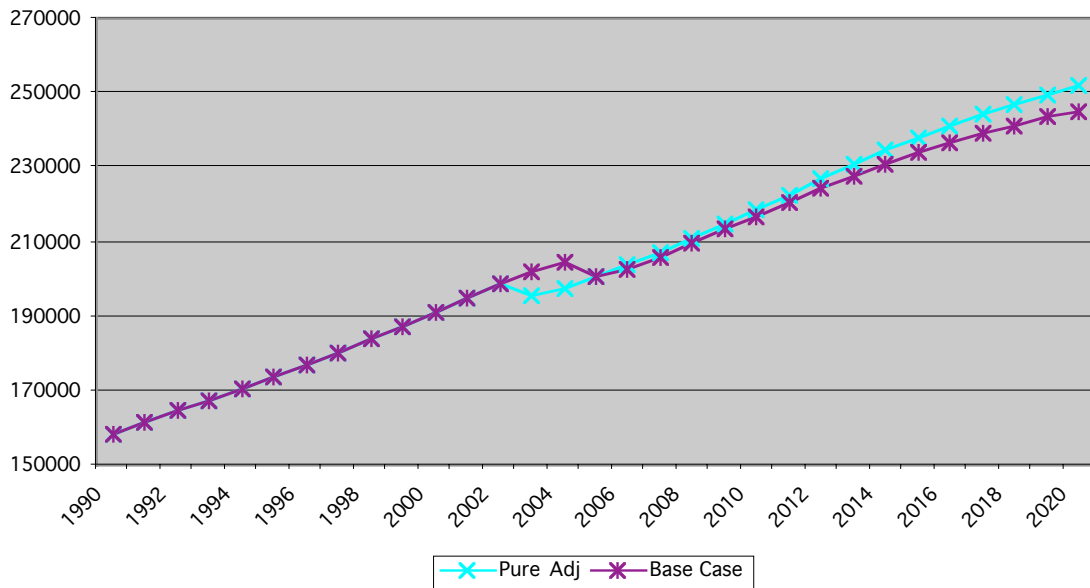
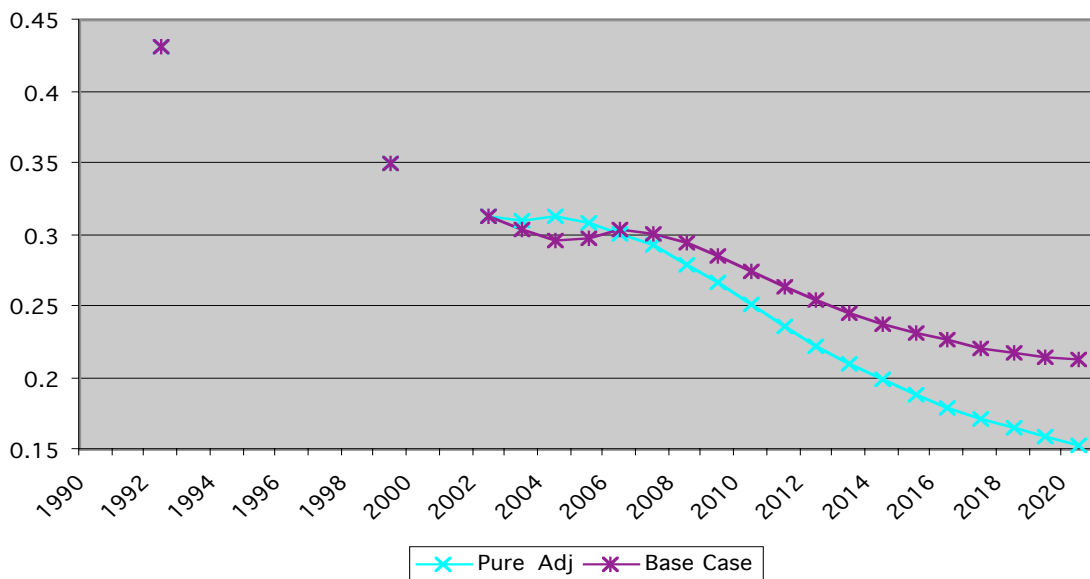


Figure 13: Poverty Trends with Pure Adjustment

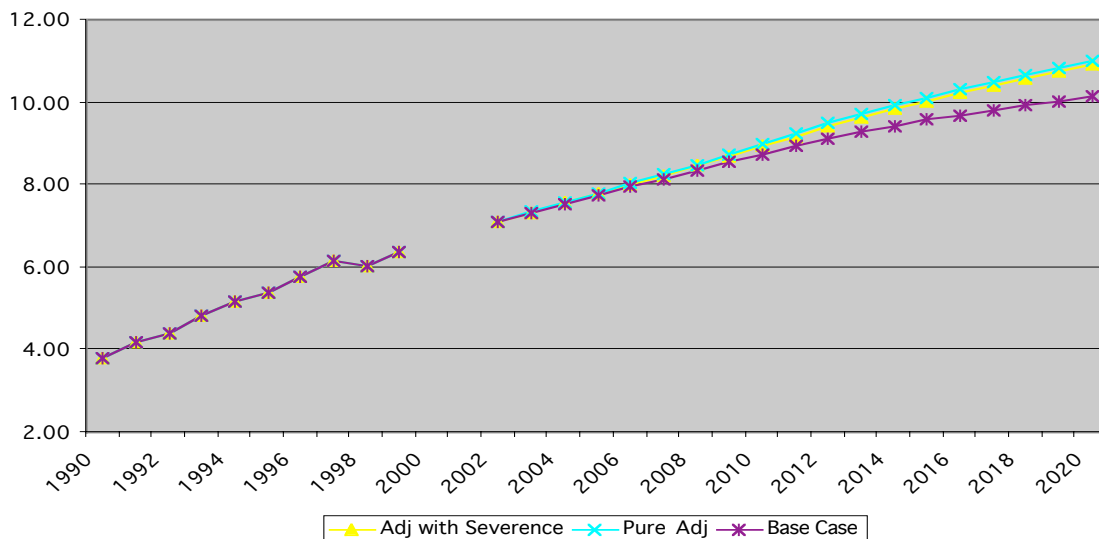


Adjustment plus safety net

- ❖ *Bauxite*: The government privatizes the mine, 800 workers are laid off. They receive a severance package paid from the former subsidy (at the base year level) of full wages in year 1, 2/3 wages in year 2, 1/3 wages in year 3, and nothing in year four (a total of two years' wages). This is more generous than previous practice (which is about 18 months wages). However, the actual policy provided about 2 year's salary in severance in a lump sum. We assume that the workers would save part of the severance and spread expenditures over time as suggested above. One third of the laid-off workers re-enter the labor pool in years 2-4.
- ❖ *Sugar*: The Demerara area is closed, Berbice undertakes the Modified Expansion Plan. A net of 6300 workers are laid off and receive the same severance package and are treated in the labor force in the same way as described above for bauxite. Since there is no net subsidy available to pay for this, we assume that the government runs a deficit off-line. This deficit is repaid from the 2/3 of the surplus the government receives after year 4 and the expansion plan is complete.

The government uses savings on the subsidies, when available, to pay severance to laid-off workers over three years. They are slowly absorbed back into the labor pool. Once the severance payments have been made, further savings on subsidies are used to increase other expenditures. This happens slowly because of the implicit borrowing against future subsidy savings in sugar. The changes in sector output and employment are the same as described above (Figures 9 and 10). GDP growth increases. GDP is higher than both base cases, and it is just marginally less than the case of pure adjustment. (Figure 14)

Figure 14: GDP with Adjustment and Severance Payments

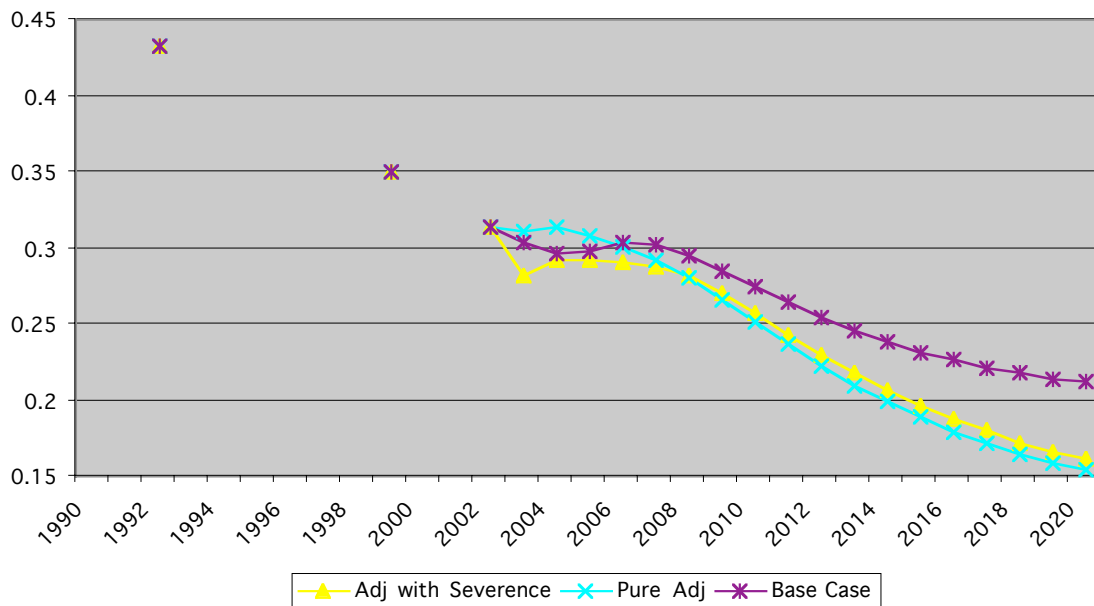


The level of employment is very similar to that with pure adjustment shown in Figure 12. It falls initially as the layoffs are absorbed, then surpasses that of the likely base case without subsidies in a couple of years. The longer term trend is slightly lower than the pure adjustment case due to the slightly slower long term growth.

There is more difference in the profile of poverty over time. The severance payments reduce poverty initially. The decline in the poverty rate levels out as the severance payments end, then resume their decline as higher income growth creates more employment. Poverty is always lower than in the base case without subsidies. The poverty rate also falls below that of the case with subsidies by 2011, and the differences in the poverty share are less than 1.5 percentage points during this transition.

It is reassuring that even this simple mitigating measure or providing severance payments, which the government has decided to do in the case of Bauxite, is sufficient to offset the negative impacts of the adjustment program. It is only if the government can maintain extensive subsidies that the poverty level would be lower for a time without adjustment, and that is not likely to be sustainable from a fiscal point of view, and it would endanger the continued flow of foreign aid necessary for the government's development strategy.

Figure 15: Poverty Trend with Adjustment and Severance Payments



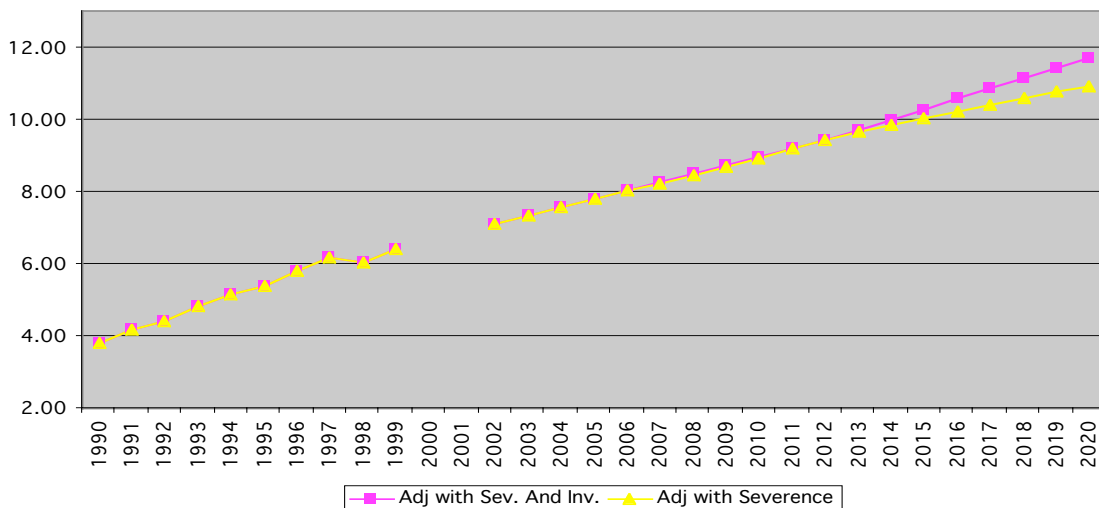
Adjustment plus safety net plus high productivity investment in infrastructure

- ❖ *Bauxite*: The government privatizes the mine and handles the severance payments and labor pool adjustment as above. Any left over money goes entirely into increased infrastructure investment, which is estimated to have a greater impact on growth.
- ❖ *Sugar*: The government handles the severance payments and restructuring the same as above. Any surplus beyond severance payments goes entirely into increased infrastructure investment.

This scenario looks at the impact of a carefully directed investment program using the additional resources liberated from government subsidies. The previous case allocated such savings across the board to all government expenditures. In this case, the savings are allocated to investment that will directly stimulate growth by reducing binding infrastructure constraints. Note that this will marginally reduce incremental expenditures on such things as health and education that would have resulted from the savings in the other two adjustment scenarios. However, these changes are small, and it would be possible to run scenarios increasing several selective categories of expenditure with the savings.¹⁹ This scenario illustrates the positive impacts of more directed use of the savings from subsidies. We will compare its results with the previous scenario with severance and adjustment.²⁰

GDP growth increases well above that registered with the severance and adjustment scenario due to the impact of increased investment in infrastructure. By using the additional resources freed up from the subsidies on highly productive expenditures, the government is able to increase the growth rate substantially – about double that of the base case (Figure 16).

Figure 16: GDP with Savings Allocated Infrastructure Investment

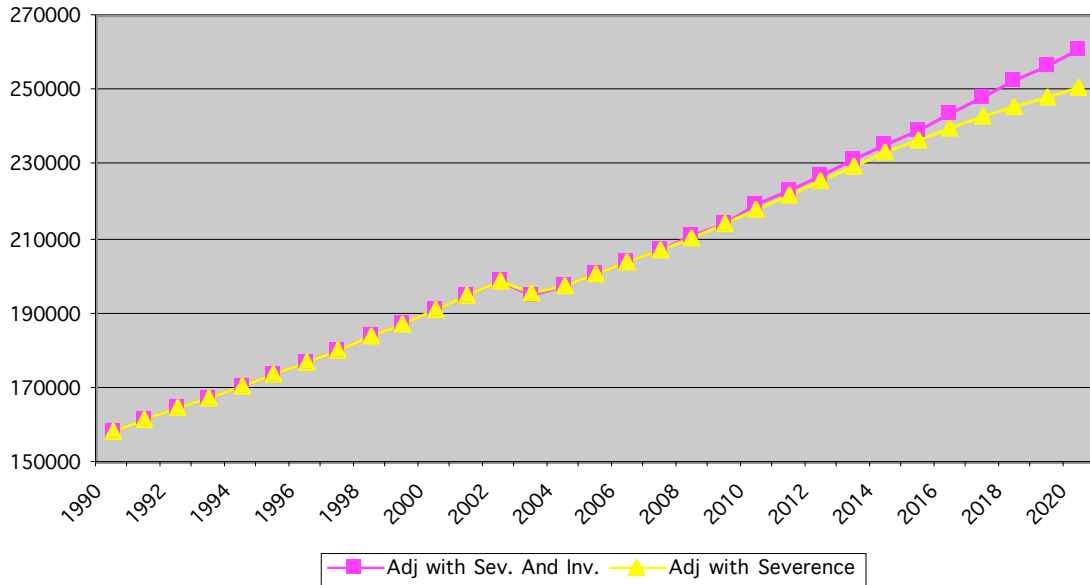


¹⁹ This kind of testing would be especially interesting once the social sectors of the model are more fully expanded.

²⁰ Another option would be to use saved funds to help former sugar workers develop other crops on the abandoned sugar land.

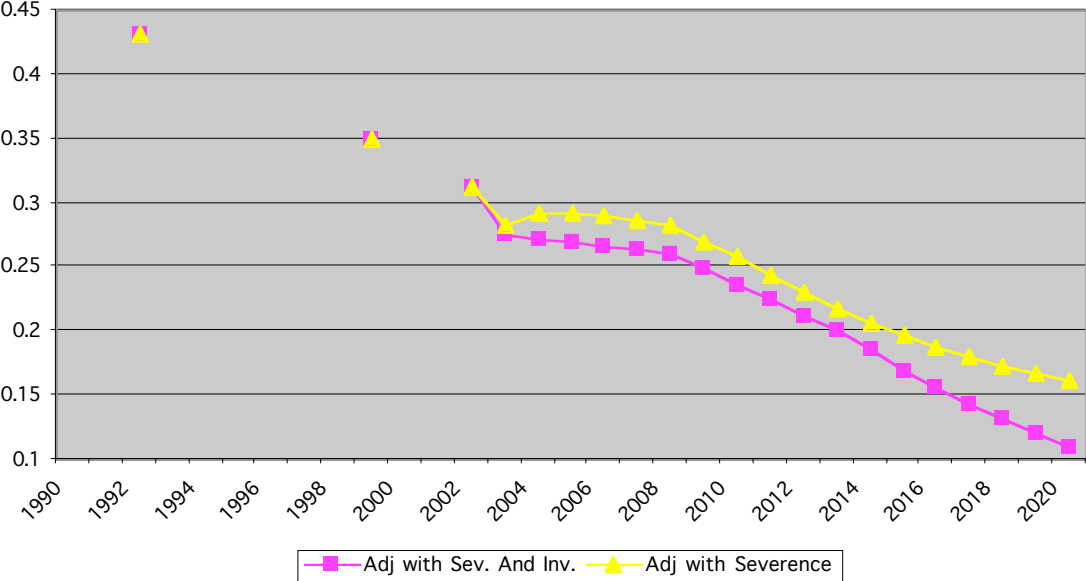
Employment dips and recovers as before. However, due to the higher overall growth rate of GDP and the employment creating impacts of the infrastructure investment, it increases faster than the case when the savings are not directed into more productive investment (Figure 17). The impact is particularly clear once the effects of the more productive investment begin to be felt after 2010. By 2020, there are more than 12,000 jobs created than in either base case and more than 10,000 more than in the adjustment scenarios.

Figure 17: Employment with Savings Allocated Infrastructure Investment



The story on poverty is also much improved over the earlier scenarios. The immediate dip in poverty remains because of the severance payments. The decline thereafter is sharper than with the other adjustment scenarios because of the employment created by the infrastructure investment and the higher GDP growth rate that is reflected in higher per capita incomes. The impact of the more productive investment in infrastructure begins to be felt after 2010. The poverty rate then recommences its strong decline. It falls to below 11% by 2020.

Figure 18: Poverty Incidence with Savings Allocated Infrastructure Investment



These scenarios illustrate the relative impacts of different policies and how mitigation can be undertaken to ease the adjustment. There are still costs in the short term for the individuals affected, but they can be offset in the short term by severance payments and other mitigating activities. In the longer term, gains from greater productivity, higher growth, and reduced waste of public resources on subsidies will generate more sustainable growth. These gains will be realized if the government uses the funds saved from the investment productively and if the government continues the rest of the reform program. Many other variations can also be run with the model.

The results confirm the benefits of the adjustment programs in bauxite and sugar. With reform, the economy will grow faster and achieve a higher level of employment and lower poverty in the medium term. However, as expected, the pure adjustment imposes a higher cost and does not achieve the poverty rate of the base case with subsidies for about seven years. Introducing the safety net mitigates the increase in poverty, and does shorten the transition period. This suggests that more needs to be done. In particular, if the government uses the money saved from the subsidies on highly productive expenditures, such as infrastructure, the results can be improved substantially, and poverty is held below the base case during the transition period and beyond.

These scenarios illustrate one set of trade-offs the government can consider, and in this case would argue for keeping the severance payments and directing the rest of the savings from the subsidies to highly productive infrastructure investments. More poverty reduction would be achieved with little sacrifice on overall growth and employment creation. The model did not consider what would have happened if the government ran

even larger deficits to pay those subsidies. That would have also disrupted the economy further than shown.²¹

These scenarios made no assumptions about the possible actions of the laid-off workers to create new jobs for themselves. They might be able to start up small businesses. When the sugar plantations in the Demerara region are closed, the land could be converted to other crops. While there would be initial costs to convert the land to rice or a tree crop, such a program would reduce unemployment and poverty. Minor changes in the rate of migration would also have an impact on the rate of poverty and on changes in per capita incomes. Such alternatives could also be tested in the model if the specific assumptions and data to be considered were provided.

Impacts of HIV/AIDS

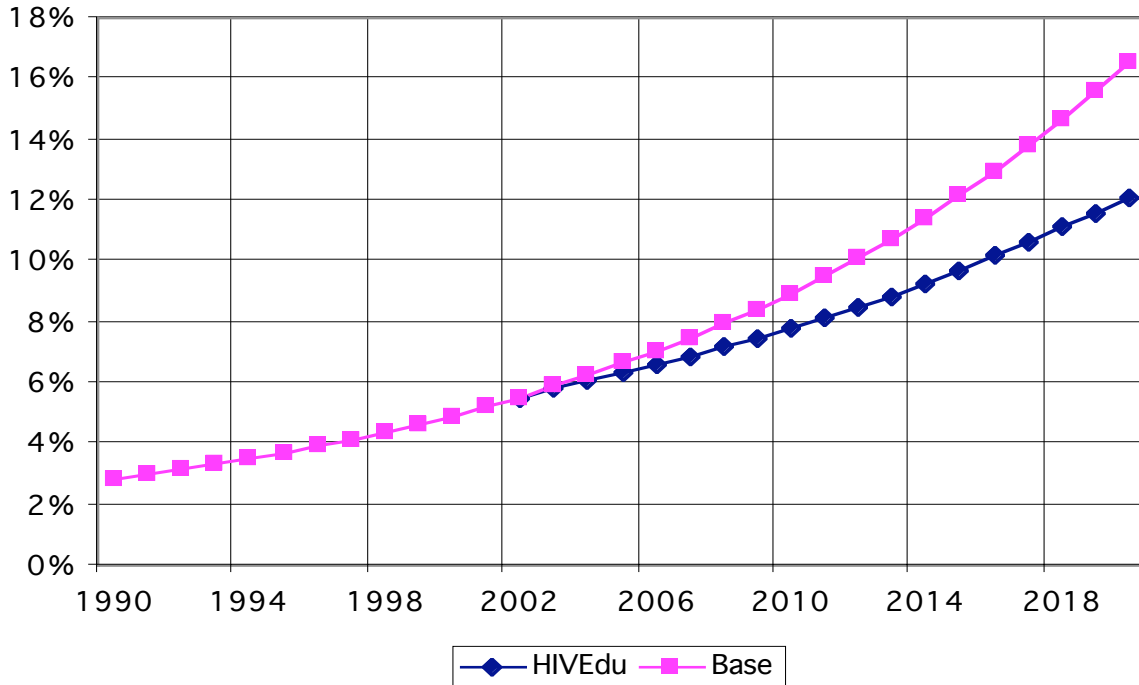
HIV/AIDS is a growing problem in Guyana. The T21 model has a full-fledged sector addressing the potential growth and impacts of this danger. The current rates indicate that about 6% of the adult population is infected with HIV; about 40% of that number have developed AIDS. However, the rate of infection is growing and is expected to affect over 17% of the adult population by 2020 if current trends continue, Figure 9.

In the future, about 60% of the HIV/AIDS population will be infected with HIV and about 40% will develop the disease of AIDS. Treatment will become very expensive. Assuming that 5% of HIV positive people get treated at \$200/person/year and all AIDS people get treated at \$2000/person/year, treatment would run more than US\$50 million per year, or about 10% of government revenues.

The T21 model tracks the incidence of HIV and AIDS by age cohort and sex, and can simulate the impacts of different degrees of prevention programs. Experience in other countries has demonstrated that providing widespread education about HIV/AIDS to the population has a significant effect in reducing the rate of infection. Assuming that the government institutes such a program and reaches double the share of the population currently estimated to be educated about HIV/AIDS (from 10% to 20%), the adult prevalence rate in 2020 can be reduced to 12%, or by one third. Additional efforts could reduce the rate further and bring forward the point at which HIV/AIDS plateaus and begins to fall. With some additional information, these possibilities could be explored further in the model."

²¹ We did not have sufficient information or time to include the impacts of excessive deficits in the model. The evolution of such scenarios depend a lot on the kinds of political decisions governments make to cope with the deficits and what happens to support from external donors, which often eventually gets cut. Experience in other countries indicates that things can fall apart very badly.

Figure 19: HIV/AIDS Prevalence



Conclusions and Recommendations

The results of the analysis are clear. Continuing ‘business as usual’ in the bauxite and sugar sectors will lead to a continued slow-down in growth, rising poverty and increasingly unmanageable public sector deficits. The proposed reforms in these sectors will benefit the economy and reduce poverty in the medium term. However, in the short term, there are significant costs in terms of lower employment and higher poverty. By instituting a safety net for those laid off and by directing the savings from subsidies into highly productive investment, the growth rate can be increased substantially beyond the pure reform program. The social costs in terms of employment losses and slower poverty reduction can be fully offset. More jobs will be created and poverty reduced more rapidly and further than either of the base cases.

This analysis is useful in looking at the longer-term implications of different policy paths. It also illustrates how prospects differ between the short term and medium term under different policy assumptions. What seems preferable in the short term may not be the best in the longer term, as demonstrated in this case.

Please note that the exact figures produced by the scenarios are not accurate projections, but primarily indicators of the relative impacts of the different assumptions used in the scenarios. Actual growth rates, employment, etc. will be affected by many factors not included in the model, such as weather, and fluctuations in world prices. But those

factors would affect all scenarios in a similar fashion, so the comparative results would hold.

The scenarios looked at a limited number of cases and arrived at this conclusion. With more detailed analysis of potential additional mitigating measures, it is likely that further measures to mitigate the negative impacts can be identified. Depending on the kinds of measures, it may be possible to include them in further scenario analysis.

Based on these findings, we would recommend proceeding with the reform programs identified, adopting mitigating measures along the lines presented, and assuring that savings were invested in highly productive activities. The scenarios used infrastructure, but the specific investment programs would have to be identified on their own merits. This reform program should be undertaken in the context of the broader structural reform program outlined in the National Development Strategy and PRSP.

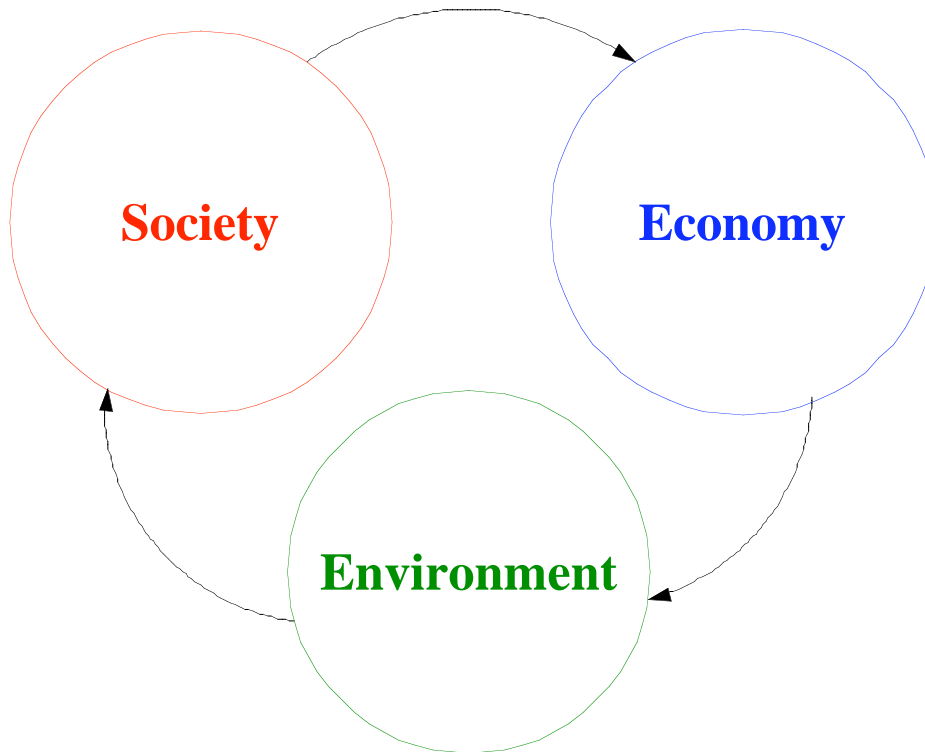
APPENDIX A: A brief description of additional sectors in T21 Guyana

This appendix presents an overview of the T21-Guyana and describes the basic assumptions in the model. A detailed technical documentation for model structure is available from MI.

Model overview

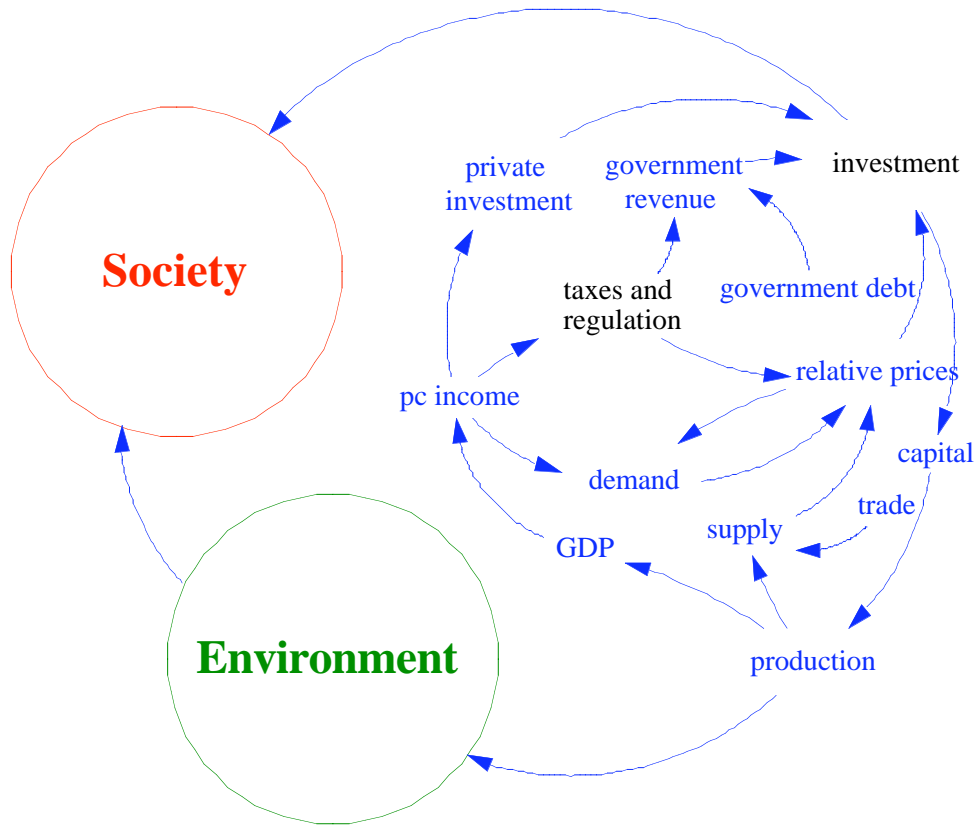
T21-Guyana is a customization of the T21 template model to Guyana. The T21 model is an integrated framework that includes economic, social, and environmental components, with key linkages between them. The series of figures (20 through 23) below present a conceptual overview of T21 in increasingly detailed stages.

Figure 20: Key components of T21



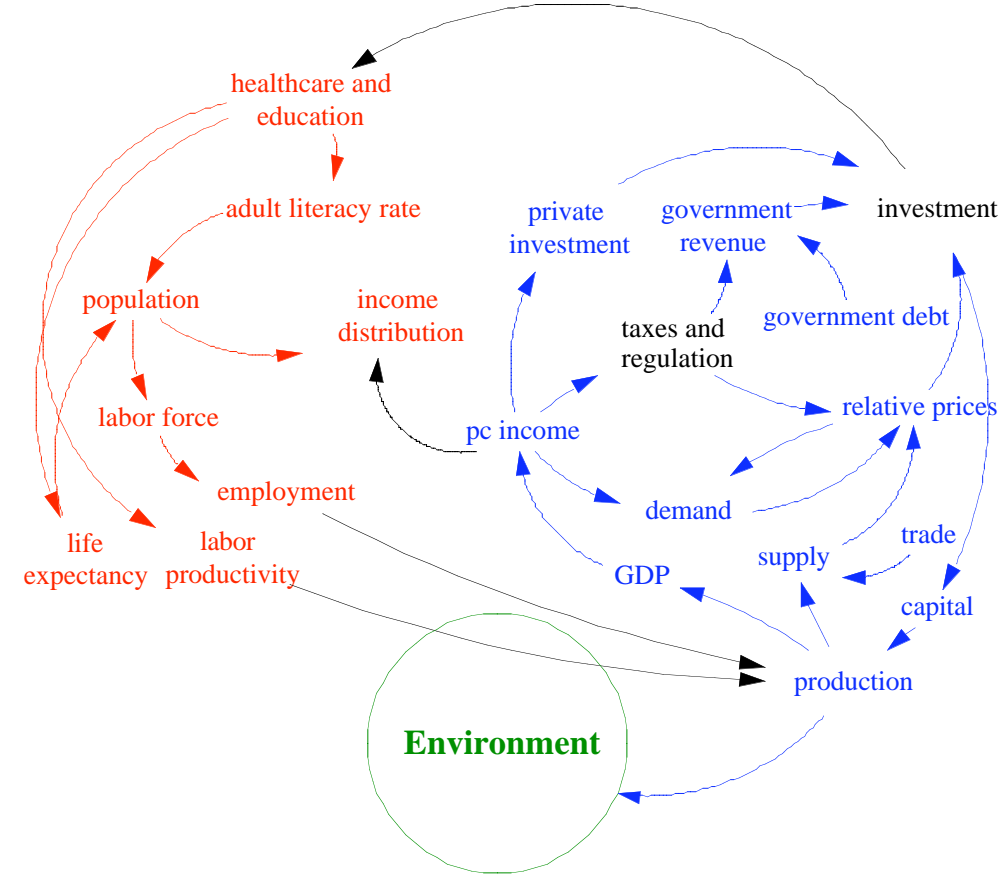
Economic component of the T21 model includes GDP and its determinants. It consists of agricultural, industrial, and service sectors. Production is determined by various inputs such as labor, capital and technology. Gross domestic product (GDP) is the sum of the production in each sector. GDP then gets distributed among the consumption, investment, exports less imports. GDP (and population) drive per capita income, which in turn influences other variables such as private investment and total fertility rate, life expectancy. Government revenues and expenditures and income distribution is also determined in the model. Taxes, regulation, and investment are the key variables that drive the dynamics of the economic sectors and its influence on the other components.

Figure 21: The major interrelationships in economic component



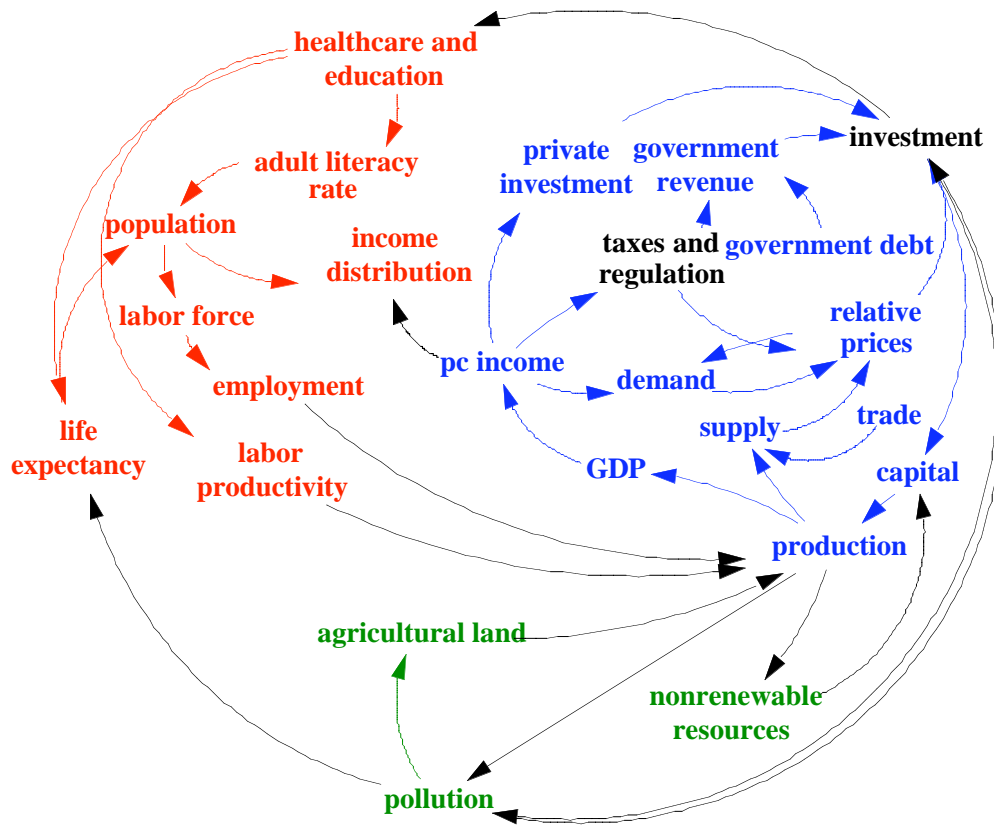
Social component of the T21 model includes population, births, deaths, and migration. Social conditions (especially health care and adult literacy rate) influence fertility and life expectancy, which in turn determine population. Population determines the labor force, which shapes employment. Education levels, together with other factors, influence labor productivity. Employment and labor productivity are inputs to production.

Figure 22: The major interrelationships in economic and social components



Production creates pollution and depletes non-renewable resources. Both feed back to influence production.

Figure 23: The major interrelationships in T21



Basic assumption

The focus of T21-Guyana is on assessing the production, employment, and poverty impacts of major reforms in the sugar and bauxite sectors. To answer questions related to intended and unintended consequences of implementing major reforms, we added more detailed structures for migration, unemployment, production in the sugar and bauxite sectors, and income distribution to calculate poverty as influenced by the dynamics of unemployment and wages in various sectors of the economy.

Production in sugar and bauxite sector

Production in sugar and bauxite sector is basically a function of capital and labor. The production function used in these sectors is fixed-coefficient (Leontief), so more labor does not actually expand the production capacity. One of the major problems faced in these sectors is surplus labor – leading to lower productivity, not higher output, as would be the case if the production functions were Cobb-Douglas. Capital is increased by investment. It is assumed that new investment under major reform leads to higher productivity of capital and labor, and thus less demand for labor per unit of capital. The basic structure for production in the sugar and bauxite sectors is provided in Appendix C.

Employment

Employment depends on labor supply and demand for labor from various sectors. The portion of the population in the age cohorts beyond 15 that participate in the work force are included in the labor pool, and those reaching the age of 65 exit the pool. The agriculture, industry, and service sectors, including bauxite and sugar withdraw labor from the labor pool and employ them. Those left constitute the unemployed. If the reforms are carried out in the bauxite and sugar sectors, about 7600 workers would flow back into the labor pool and become unemployed, until increased demand from other sectors and particularly from the investment in infrastructure, employ more labor. In some scenarios, those laid off receive severance payments. While they are in the safety net, they are not counted among the unemployed. Appendix B presents the basic structural relations for employment.

Poverty

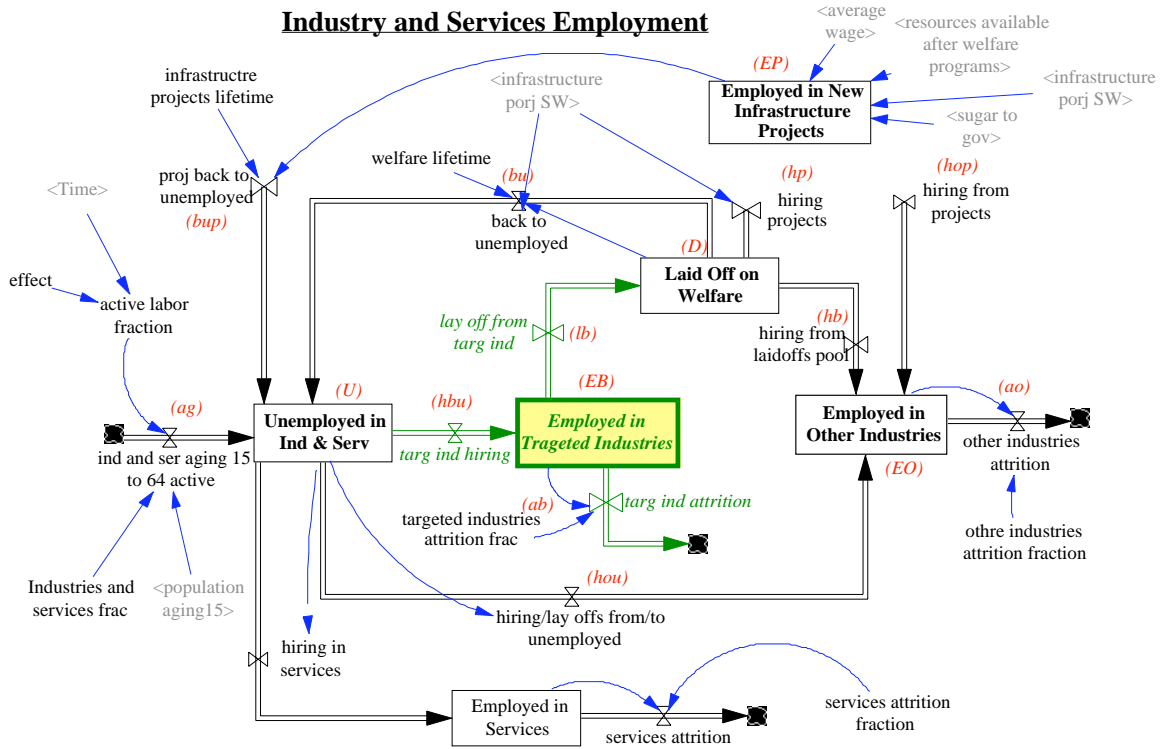
Poverty is measured by the percentage of households whose income is below poverty line. This figure is calculated by the income distribution function which is a Gamma probability distribution function. The inputs to the distribution function are average income and the standard deviation of income. Average income is actually the average wages of the employees in different sectors and the people who are unemployed. The average wage of unemployed is assumed zero unless they are on the welfare program. Since the unemployed are most likely to eke out a subsistence living or more in the informal sector, this function probably overstates the changes in poverty. Unfortunately, better means of estimating the change in poverty over time do not yet exist.

Migration

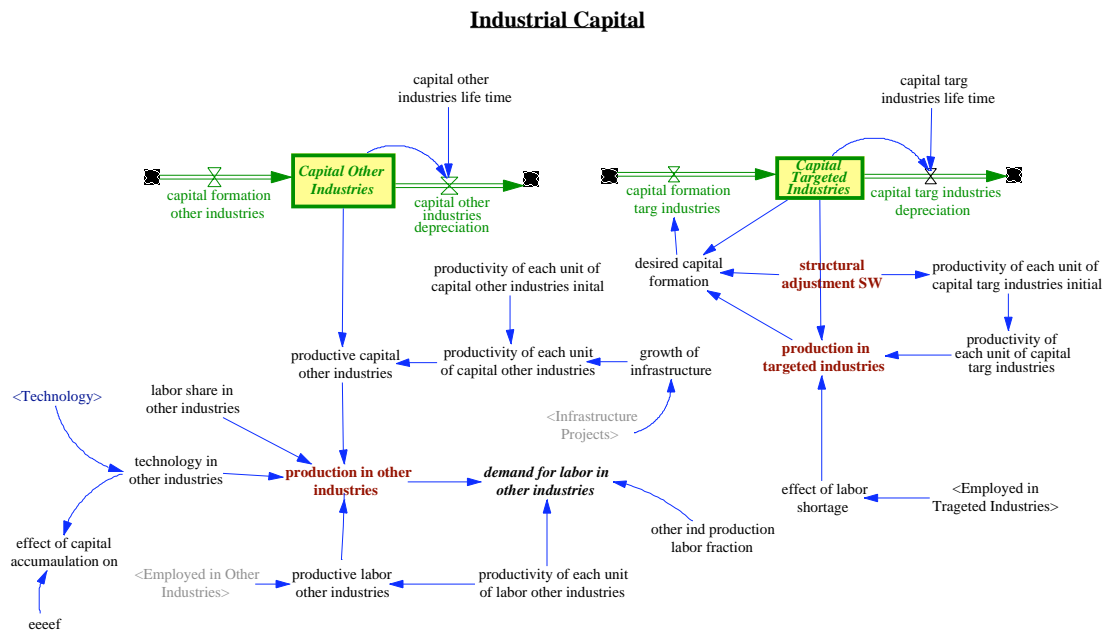
Migration is an outflow to the stock of population. There is not much data on the migration. However, there is an agreement that migration is significant in Guyana, to the extent that may be causing a decline in the population since 1998. Migration is important to the age structure of the population and supply of labor. Based on what data is available, we have assumed parameters for overall migration-rate and the distribution of migration among various age groups, which implies that migration among older people and children is distinctively less than in the younger and middle age population. The brain-drain impact of migration on production is not captured in T21.

For details about the equations in other sectors see T21 Technical Documentation available from MI.

APPENDIX B: Flow diagrams for employment



APPENDIX C: Flow diagrams for production



APPENDIX D: Macro economic framework used in the historical calibration of the model.

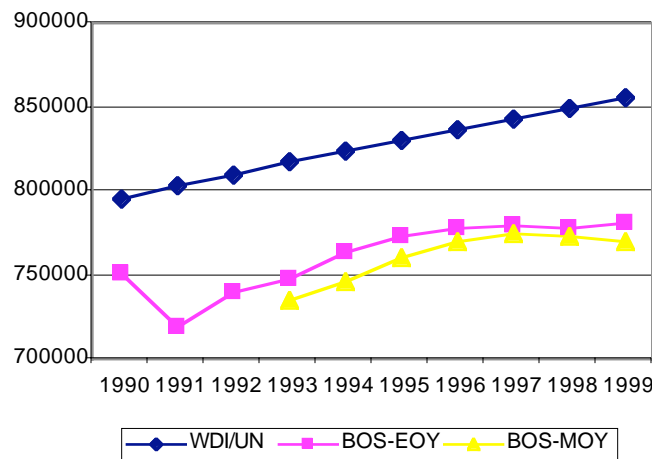
Trends in the macro indicators:

For this project, we begin by looking at the macro-social-and-economic indicators during the 90s.

Population

There is not much consistency among data sources on population. Figure 14 shows total population of Guyana according to WDI and UN population database and Bureau of Statistics of Guyana both for the end of the year and middle of the year. WDI and UN indicate that during the 90s population has risen from 795,000 in 1990 to 856,000 in 1999. Bureau of statistics gives two different, but close estimations for population. According to their mid-year based estimation, the population of Guyana has been decreasing slightly since 1997, basically due to migration.

Figure 24: Estimates for total population of Guyana¹



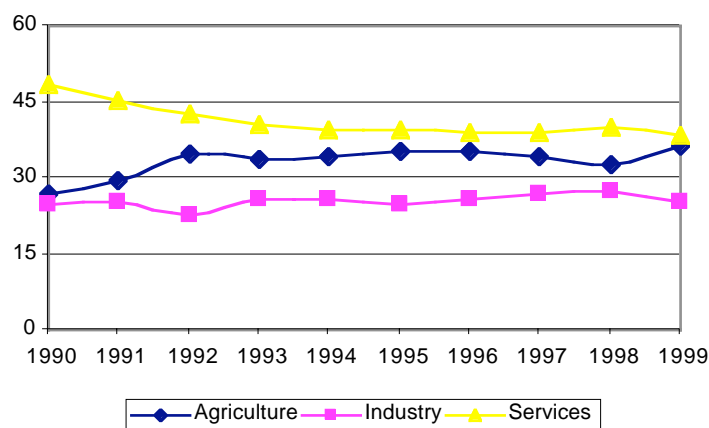
Gross Domestic Product (GDP) and Per Capita GDP

Real GDP has steadily grown during the 1990s with an average growth rate of slightly above 5 percent per year. Real per capita income has also increased by 4.9 percent per year.

Structure of GDP

Over the past decade, the share of services in total GDP has declined. Agriculture has increased and industry fluctuated around a roughly constant level. The growth in agriculture represents the recovery from the weather related problems of the end of the 1980s. It is likely that many agricultural workers displaced temporarily by the drought shifted into the informal service sector, then moved back to agriculture as the sector recovered. Figure 15 shows the share of the components of GDP (as a percentage of total GDP).

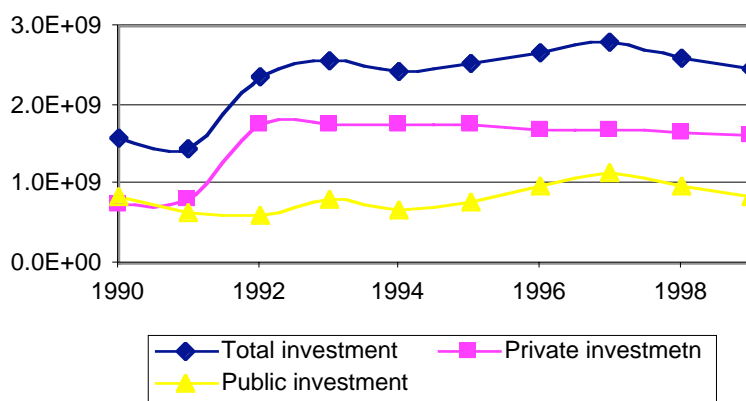
Figure 25: Components of GDP (percent of GDP)ⁱⁱ



Capital formation

Other than a big jump in 1992, probably due to devaluation of GUYD, capital formation has not changed much during the 1990s. Figure 16 depicts the trend of total capital formation as well as private and public investment from 1990 to 1999. While public investment fluctuates during the last decade, it shows low growth in its trend. Private investment has declined steadily during this period from 1.75 billion GUYD in 1992 to 1.62 billion GUYD in 1999.

Figure 26 Capital investment (total, public and private) during the 90sⁱⁱⁱ

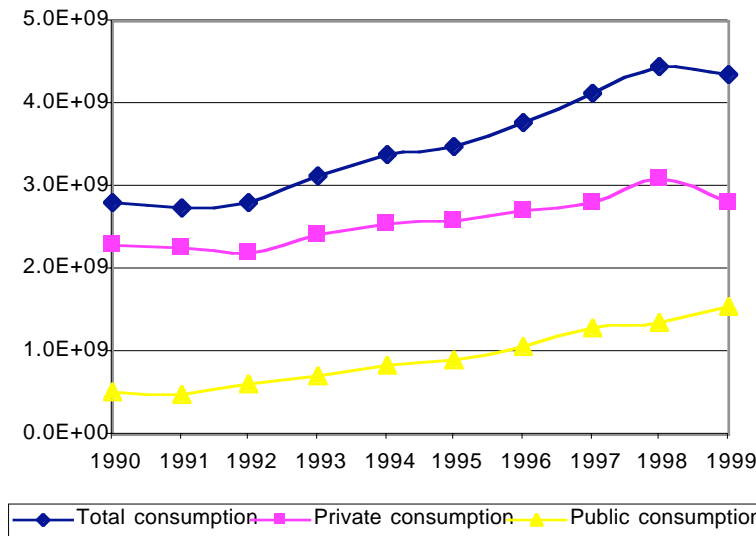


Consumption

Unlike capital formation, total consumption has grown at approximately the same rate as per capita income. Figure 17 shows total consumption, private and public consumption during the 90s. Public consumption has grown much faster than private consumption. The share of private consumption in total consumption has decreased from 85 percent in 1990 to 64 percent in 1999. The data on the components of public consumption is not

complete and thus is hard to determine what is exactly giving rise to the growth of public consumption. However, the 10 percent growth (per year) of wage and salaries in the central government expenditures, which is more than 40 percent of public consumption, could be a significant contributing factor to growth of public consumption.

Figure 27: Consumption (total, public and private) during the 90s^{iv}



ⁱ Caroline ____, Personal communication, Spreadsheet: Table set 1, May 2002.

ⁱⁱ Caroline ____, Personal communication, Spreadsheet: Table set 1, May 2002.

ⁱⁱⁱ Caroline ____, Personal communication, Spreadsheet: Table set 1, May 2002.

^{iv} Caroline ____, Personal communication, Spreadsheet: Table set 1, May 2002.