

The Macroeconomic impact of a Food Vouchers Program in South Africa

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Abstract

A CGE model is used to find the effects of a food voucher scheme in South Africa. If firms consider the issuing of vouchers as increased remuneration, they will hire fewer labourers. The higher labour cost will increase total cost and they will produce fewer commodities. In this case, real GDP will probably decrease and the economy will be worse off. However, certain tax policy combinations by the government would increase real GDP would increase despite the assumptions about firm behaviour.

No matter which modelling assumptions are made, or which fiscal policies implemented, a food voucher scheme would probably always benefit the poor, and improve upon the distribution of wealth in the country.

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Introduction

This is a fascinating topic that should be studied much further and deeper, because the possibilities for the eradication of poverty are tremendous. Also, different models would give different results, and even choosing one model and applying different assumptions would markedly influence the results. The model used for this study has a longstanding reputation, and the results obtained make economic sense. However, we have mostly used the existing model, which was not initially built for the food industry, to acquire our results. We did manage to add some equations for the specific study, but time did not allow for complete testing of all the possible simulations that could be run on the model. In the next section a brief description of the model is given, followed by the assumptions made and scenarios tested. Thereafter follow the results and conclusion.

The Model

The model is similar to the general equilibrium ORANI-G-model of the Australian economy, and is written and solved using GEMPACK (Harrison and Pearson 1996). It is a typical computable general equilibrium (CGE) model where all the markets in the economy are in equilibrium at the same time. Shocks are applied to the model and then the model calculates the values of prices and quantities that will constitute a new equilibrium. We compare the deviations from the initial equilibrium due to the shocks

applied. In general, the model allows for limited substitution on the production side while it focuses on substitution in consumption. It is a static model with an overall Leontief production structure and CES¹ sub-structures for (i) the choice between labour, capital and land, (ii) the choice between the different labour types in the model, and (iii) the choice between imported and domestic inputs into the production process. Household demand is modelled as a linear expenditure system that differentiates between necessities and luxury goods, while households' choices between imported and domestic goods are modelled using the CES structure.

The model is based on the official 1998 social accounting matrix (SAM) of South Africa, published by Statistics South Africa (SSA 2001). This SAM divides households into 12 income and 4 ethnic groups, and distinguishes 27 sectors. For the purpose of this study, we use an extended version of the SAM, with 39 industries and 39 commodities². The elasticities used for the CES functions in the model have been taken from De Wet (2003).

The model's closure rules reflect a short-run time horizon. The capital stock is assumed fixed, while the rate of return on capital is allowed to change. Labour supply could be modelled in two ways: (i) by employing an elastic demand and supply of labour as in the traditional short-run closure for CGE models; and (ii) by modelling skilled and unskilled labour differently. We employ the former option. The South African labour market is characterised by large unemployment of unskilled labour, and a shortage of skilled labour. The model differentiates between 11 different labour groups that are classified as either skilled or unskilled. Skilled labour could be treated as human capital with inelastic short-term supply, but for this study all labour is assumed perfectly elastic, with fixed real wages. However, if more time were available, a distinction between skilled and unskilled labour supply would reflect the South African labour market realistically and would allow for investigating the effect of certain policies on the levels of employment of unskilled labour. The supply of land is also assumed inelastic.

¹ Constant elasticity of substitution

²The extension was done for a study published in *The Energy Journal*, entitled "Fighting CO₂ pollution and poverty while promoting growth: Searching for triple dividends in South Africa" by Van Heerden, *et.al.*

With reference to the macroeconomic variables, it is assumed that aggregate investment; government consumption and inventories are exogenous, while consumption and the trade balance are endogenous. This specification allows us insight into the effect of the suggested policies on South Africa's consumption and competitiveness. All technological change variables and all tax rates are exogenous to the model. .

Assumptions and scenarios

A thorough read of the study “Meal Vouchers, a tool serving the interests of the social pact in Europe”, by ICOSI³, revealed that the contributions to food vouchers by employers are usually tax deductible. We are convinced that it would be quite unreasonable to expect that firms would voluntarily pay for food vouchers and dish them out to employees. Hence we assume that they will receive some tax benefit. The second assumption is that firms would think about the food vouchers of paying higher wages. We model the total labour cost to the firm as one expense, and assume that firms “think” like that as well. The third assumption is that employees buy food with the vouchers, and not necessarily restaurant meals. That is, we model the effect of “food vouchers” rather than “meal vouchers” on the South African economy. However, it would be quite unrealistic to assume that the total expenditure on food will increase by the amount that employees receive in the form of food vouchers. Just like firms would think in terms of their total expenditures, households would also think in terms of an increase in total remuneration. Consider two imaginative persons' behaviour:

Person A had no lunch before, and spends R20 on food after receiving a voucher, which is the ideal scenario whereby spending on food will increase by R20.

Person B, however, used to spend R20 on lunch from his own money, and now uses the R20 voucher for the lunch, and uses the R20 from his wallet to buy other things, so that spending on food may not increase at all. On average, however, we know what proportion of their income consumers spend on food, and we assume that

³ Institute of International Social cooperation

they will at least spend that proportion of the additional R20 on food⁴. A fourth assumption is that the government would raise new taxes to pay for the food voucher scheme.

Target variables

A number of target variables are calculated by the model, and utilised as instruments to guide our policy conclusions, namely (i) the set of government revenue variables, (ii) GDP, (iii) employment, (iv) total consumption and more specifically, consumption by the poor, (v) exports and imports, and obviously, (vi) the effect on the food industry. We generally compare the macroeconomic variables by implementing the concept of “marginal excess burden” (MEB), which is the change in a real macroeconomic variable divided by the change in real government revenue. If one has to compare two possible policy scenarios, say A and B, it is important to “scale” the results such that they are comparable. One way of doing that is to calculate the effect on a target variable per Rand of government revenue gained or lost. Policy X might let GDP grow by 60c while government revenue decreases by R1, while policy Y might let GDP grow by 70c with a R1.50 decrease in revenue. Then we would generally say that policy X is better in terms of GDP per unit of revenue, even though the absolute value of the GDP is larger under policy Y. The outcomes might be the other way around in terms of another target variable such as total consumption, in which case it becomes a political decision whether to implement policy X or Y.

Results

The ideal situation for a study like this is to build a model or adjust an existing model and do the total exercise on it. On a short notice as we’ve had, one can mostly use an existing model and use it as far as possible to obtain reasonable results. We have done a mixture of these two approaches. Firstly, the CGE model of South Africa has been adjusted by adding equations, and a full model simulation done. Time did not allow modelling all the possible quirks at once, but a very useful modelling exercise was

⁴ Most of the studies that we’ve seen on food vouchers in Europe and Eastern Europe assume that spending on food will increase by the amount of the vouchers, which is unrealistic. It should increase by the marginal propensity to consume food times the value of the vouchers.

done and the results are reported in the next section. We call it the “closed circuit” approach.

While doing the closed circuit modelling, many more possibilities and ideas came up and we tested some of them individually in the second approach, which we call “comparing the forces of impact.” This is explained in the section following the next.

FIRST APPROACH: THE “CLOSED CIRCUIT”

The ideal method for studying the influences of a food voucher scheme in South Africa, or any other country, would be to model all the possible effects, and allow for the economy to react to all the effects, and compare the values of variables before and after the changes. Important insights are gained from which we can draw valuable conclusions, but we extend the analysis in the second approach, by introducing more possible policy combinations.

We call it the closed circuit approach because we attempt to capture the full circle of the flow of “funds⁵” in the model that is associated with the food voucher scheme. There are three components to the circuit, linked to the three “players” in the game⁶: (i) firms increase their payments to employees, in the form of food vouchers and receive a proportion of the payments from the government; (ii) employees receive higher remuneration packages from their employers and spend more on food (and probably everything else also); and (iii) the government subsidizes a proportion of the voucher scheme, and collect new taxes to fund it. In brief, some players in the economy pay more taxes, which is transferred to firms who use the funds to supplement increased payments to employees, who buy more food and other commodities. The process can therefore be seen as a “closed circuit” and therefore a CGE model is ideal to model it. However, there are still many assumptions to be made about the variables in the model, and these assumptions will always influence the outcome of the exercises. For example, this entire exercise is done for the short run: we are studying the effects of a voucher scheme during the first few years of

⁵ Money is not explicitly modelled in a CGE model, but we do think in terms of transactions taking place while prices and interest rates are determined in the economy.

⁶ Game theory is often applied to economic situations, whereby any economic scenario has players in it. In our story there is a government, employers, and employees.

implementation, and therefore do not allow for technological changes or changes in producer behaviour at this stage, amongst other things. The additional model equations for the food voucher exercise are given in the Appendix at the end of the report, and could easily be understood by any modeller.

Assumptions explicitly made in the closed circuit scenario are: (i) The size of the voucher scheme is a proportion of the starting value of total expenditure on food, retail trade and hotels⁷. This is a trivial assumption and any size of the scheme can easily be modelled – size doesn't matter here. (ii) The government funds a portion of the food voucher scheme, say 20%. This portion is to be debated or given by the client, and it matters. The effects of different proportions are discussed below. (iii) A proportion of the value of food vouchers might not be spent on food. This is also debatable, but the database indicates that households spend between 20 and 65 per cent of their incomes on food, depending on how affluent they are. If they receive extra “remuneration”, they will probably not spend 100 per cent of that on food, whether the remuneration is in terms of money or vouchers. In this exercise we assumed that they would spend 80 per cent of the value of vouchers on food, which is quite high. The prices of food are not manipulated, but determined by demand and supply forces, so we (iv) adjust the behaviour of households so that they would like food better and consume relatively more of it, endogenously⁸. (v) We levy new taxes to pay for the government's contribution to the voucher scheme. This is also debatable and could be a study on its own to find the most efficient and equitable way to finance the voucher scheme. We modelled increases in indirect taxes on all commodities either paid by all players in the economy, or by households alone. For example, we did not increase wage taxes, because that would be against the general principle that food vouchers are not taxable – from a modelling perspective it would not make much difference whether one taxes the vouchers or increase the taxes on wages!

The results of the circuit are given in Table 1 below. The different columns depict different tax combinations to collect the funds for the government's contribution to the program. The first row contains the same values everywhere, so we have kept the

⁷ Industries are grouped together, and restaurants fall into a more general category called “hotels.”

⁸ Endogenously means that the model calculates how much the preference for food must increase to obtain the result of 80% marginal propensity to consume food.

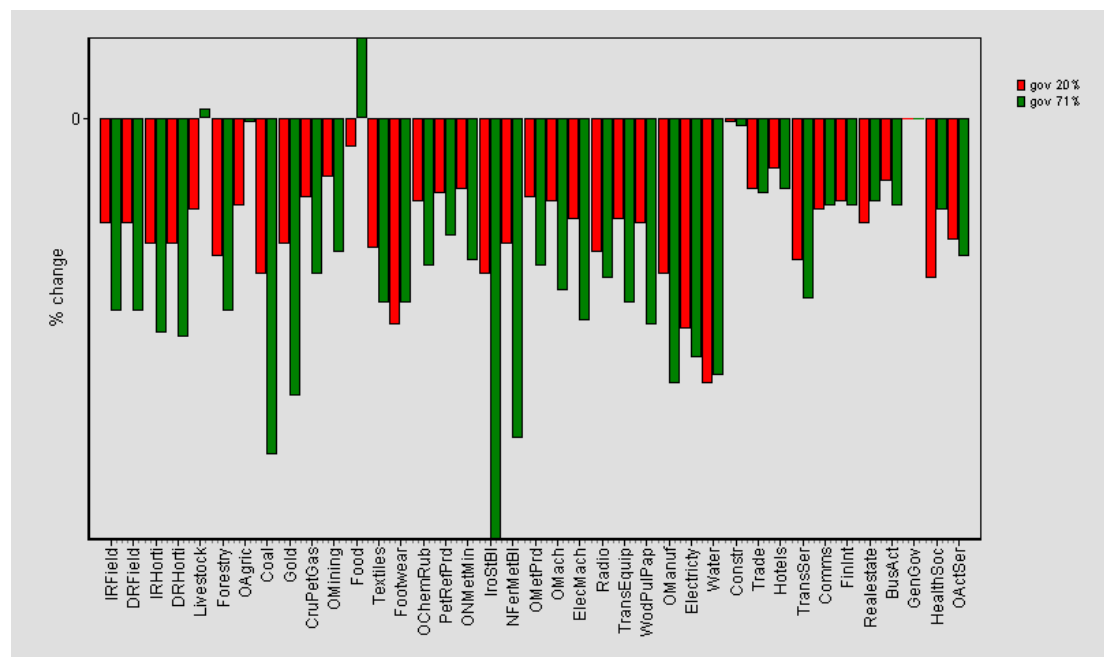
size of the program constant, while changing the tax structure. The second row shows the change in nominal GDP, and shows quite nice multiplier effects. We could stop right here and make everyone believe that a food voucher scheme would be very beneficial to the economy. In all cases the nominal GDP increases by much more than the size of the voucher scheme, even though we assume that only 80% of the voucher face value is spent on extra food. (If the assumption had been 100%, the multipliers would have been even larger). Incidentally, the sizes of the multipliers in other studies resemble these orders of magnitudes. We are convinced that other studies in the food voucher literature ignored the general equilibrium price effects and the resulting values of real variables. However, prices and interest rates do change, and we should only be concerned with the effects on the real values of variables.

Table 1 Different taxing scenarios to fund food voucher scheme

Variable	Capt tax		No lab tax		
	All Ind	Prod tax	HH tax	tax	
Size of program in million Rands (Rm)	123.45	123.45	123.45	123.45	123.45
Change in nominal GDP (Rm)	142.22	140.03	140.96	139.74	172.6
Size of government contribution	30.86	30.86	30.86	30.86	30.86
Change in tax revenue	30.86	30.86	30.86	30.86	30.86
Direct tax rev from non-labour factors (Rm)	-5.292	1.53	1.676	1.488	2.88
Change in real GDP (Rm)	-77.16	-73.84	-72.853	-74.691	-69.61
Change in real Gov revenue (Rm)	-51.637	-49.066	-48.944	-50.942	-49.33
Marginal Excess Burden (MEB)	1.494	1.505	1.488	1.466	1.411
Aggregate rev from all ind taxes (Rm)	12.162	5.334	5.195	5.359	27.98
Change in all-industry production tax rev (Rm)	0	0	-7.07	0	0
Aggregate rev from ind taxes on intermediat (Rm)	-0.618	-4.248	-0.506	-0.467	-0.103
Aggregate rev from ind taxes on investment (Rm)	0.588	0.571	0.562	0.588	0.607
Aggregate rev from ind taxes on households (Rm)	12.785	10.451	12.79	5.848	28.123
Aggregate rev from ind taxes on export (Rm)	-0.934	-0.923	-0.909	-0.947	-0.974
Aggregate rev from ind taxes on government (Rm)	0.34	-0.517	0.328	0.337	0.33

In nominal terms the government collected the same amount of money as their contribution to the voucher program. The problematic outcomes of the “closed circuit” approach are depicted in the 6th and 7th rows, where it is made clear that no matter which tax combination is used, both the real GDP and real government revenue are declining. The marginal excess burden (MEB) is the ratio of change in real GDP to the change in real government revenue, and should be small in these cases (a smaller decrease in GDP per unit of government revenue lost is better than a large

Figure 1 Different impacts on employment of governments participation in food vouchers



decrease). Hence, of the five tax combinations tested, the best one would be to keep total labour tax revenue constant while increasing the VAT rates paid by households on all commodities. Figure 1 shows the familiar result that the larger the involvement of the government in the economy, the higher the damage cost – here in terms of employment.

To summarise, if the government subsidizes a food voucher scheme, we find that no matter which new taxes are levied to finance the subsidy, nominal GDP will always grow by much more than the total value of the voucher scheme. However, we have not succeeded to find an increase in real GDP using the policy combinations that we have implemented.

Explanation of results

In brief, two forces are at play in the model when food vouchers are given to employees: (i) higher real cost of labour increases the total cost of production and therefore decreases the supply of most commodities, while (ii) the increases in take home “wages” increase the demand for food and other commodities by households, which increases overall demand. With supply decreasing and demand increasing, upward pressure must be put on price levels, with the result that real values are

smaller than nominal values, or even negative. Also, price increases of commodities reduce the competitiveness of South African commodities, and exports decrease as a result, which has a further detrimental effect on GDP⁹. Equilibrium levels of household consumption and imports increase, due to higher real income. As expected, the food industry benefits greatly from the scheme.

The very familiar macroeconomic identity, $Y = C + I + G + X - Z$ can be used to summarise the results of the “closed circuit” approach. The identity is also a closed circuit, in that the left hand side (LHS) must always be equal to the right hand side (RHS). The LHS depicts total income or production, and in the model its sign is determined by capital and labour. Firms increase payments to employees – some of the payments are made in the form of food vouchers – and hence the cost of labour increases. Firms will employ fewer labourers if the per unit cost of a labourer increases. Capital is fixed in the short run, so that total production decreases. On the RHS we find that consumption expenditures (C) and imports (Z) increase as a result of increased demand, while exports (X) decrease, due to higher domestic prices. The net result on GDP is negative.

SECOND APPROACH: COMPARING THE FORCES OF IMPACT

The second approach is more flexible, namely that we do not try to balance all the government’s funds on the income and expenditure sides per se in nominal terms, but we apply different single shocks to the model, and then add up the results in a manner that the government budget remains in balance – in real terms. We are applying different shocks to the CGE model, and utilise the combined effects to draw conclusions about the macroeconomic effects of a food voucher scheme in South Africa. In the next paragraph the overall macroeconomic effects are summarised, but to understand the said combined effects we continue to report on the results when the shocks are applied one at a time. The linearity of the CGE model makes it very convenient to dissect the respective effects that the various components of the voucher scheme would have on the economy. Policy makers should then weigh the positive

⁹ We did not find a reference to foreign trade in other studies, but for South Africa, which is a small open economy, this is a crucial aspect to model.

and negative effects of the scheme, and implement a policy that they deem beneficial for the country.

In the closed circuit approach above we controlled nominal government revenue to remain constant by letting the government collect the amount of the food voucher scheme in new taxes. However, a CGE model calculates all the movements in all economic variables as a result of some set of exogenous¹⁰ shocks. We are interested to see what happens to real values of variables, and they are calculated after all prices have adjusted. We would like to stress that policy makers often do make decisions on the basis of nominal variables, and that it would be quite acceptable to some of them to look at the first two lines in Table 1 and conclude that the food voucher scheme has significant benefits for the economy. For example, annual government budgets are done in nominal terms. They do estimate the price deflators and speak of real expenditures and real incomes, but they generally do not calculate the general equilibrium impacts of the budgets on all price levels in the economy, nor adjust their estimates of real impacts.

In this second approach we do not apply all the shocks to the model simultaneously. We isolate the various shocks and apply them separately, and then compare the real values of the marginal excess burdens with regard to GDP and other target variables. That is, we compare changes in various target variables as a proportion to the change in real government revenue. The outcomes are depicted in Table 2. The respective columns show the results for (i) a decrease in the tax on production; (ii) an increase in all indirect taxes; and (iii) a combined effect of a wage increase and a decrease in taxes on food. The last two effects are shown together so that the calculation of the marginal excess burden becomes possible¹¹. The third row from the bottom is the crux of this approach: a R1 decrease in real government revenue will cause an increase of 54.5 cent in real GDP. If wages are increased and taxes on food decreased simultaneously, a R1 loss of real government revenue will

¹⁰ Applied to the model from outside, often by policy makers. New taxes or food subsidies are examples.

¹¹ MEB has government revenue in the denominator, and only makes sense if some tax policy change occurs. A mere increase in wages do not imply tax changes per se.

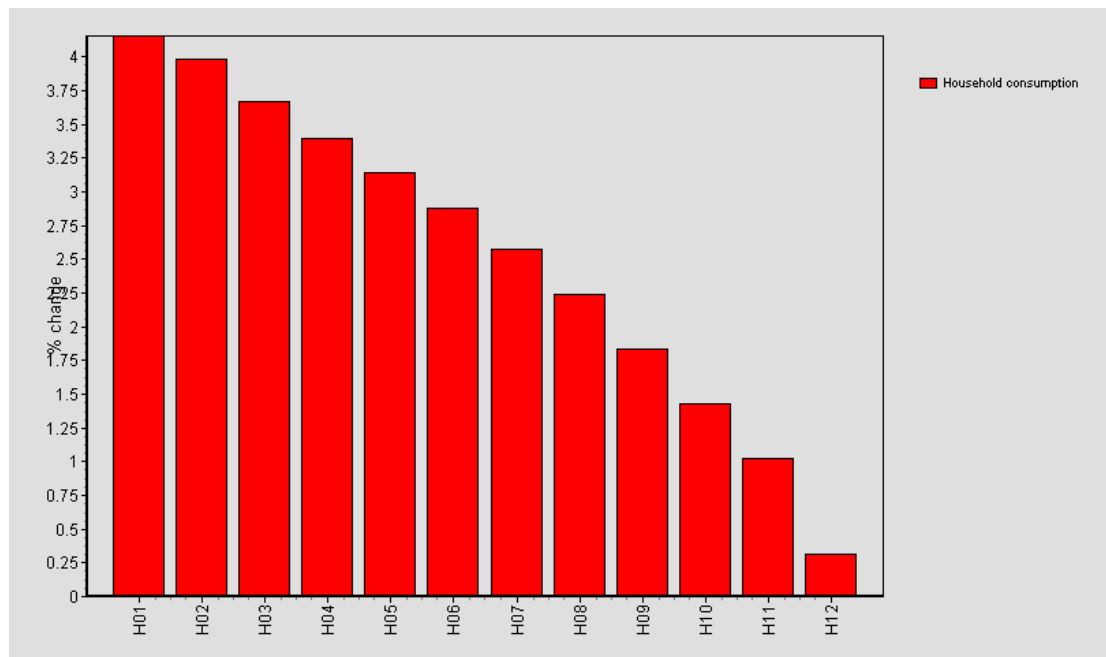
Table 2 **Macroeconomic results of different shocks to the CGE model**

Description	- Prod		
	tax	+ Ind tax	Wage/food
Change in nominal GDP (Rm)	4783	1270	-5893
Change in direct + indirect tax revenue (Rm)	-10238	9577	-10119
Change in real GDP (Rm)	4865	-4439	3978
Change in real Govinc (Rm)	-8931	6493	-8578
Aggregate employment: wage bill weights %	1.152	-1.031	0.931
Real GDP from expenditure side %	0.658	-0.598	0.542
Import volume index, duty-paid weights %	0.704	-0.621	0.928
Real household consumption %	1.137	-1.019	1.433
Export volume index %	0.429	-0.418	-0.572
Meb-gdp	+0.545	-0.684	+0.464
Meb-C	+0.127	-0.157	+0.167
Meb-X	+0.048	-0.064	-0.067

lead to an increase of 46.4 cents in GDP. The net results of different policy combinations can now be calculated by adding up the MEB's of all policy impacts that would apply at the same time. For example, if wages rise, and food taxes decrease by R1; production taxes decrease by R1 and indirect taxes increase by R2, the government budget in real terms would remain unchanged, and GDP would decrease by 0.36 cents ($0.545 + 0.464 - 2 \times 0.684$). However, from Van Heerden, *et.al* (2005) we found MEB's for new direct taxes of 0.101, and indirect taxes of 0.136, for the case where skilled labour is modelled as human capital, and not in the same way as unskilled labour as we have done here. If new indirect taxes are levied to subsidise the food voucher scheme, real GDP will increase by 0.80 cent ($0.545 + 0.464 - 2 \times 0.101$), which is a favourable result. One advantage of this approach is that the sizes of the shocks do not matter much, because the results are read in a standardized and relative manner, not in absolute terms, and not in nominal terms.

A very significant result from the wage/food combination is the percentage increases in total consumption by households, as shown in Figure 2. It clearly shows that poor households' consumption increases much more than rich households, with a significant resulting improvement in the distribution of wealth.

Figure 2 Percentage change in household consumption – poorest on left

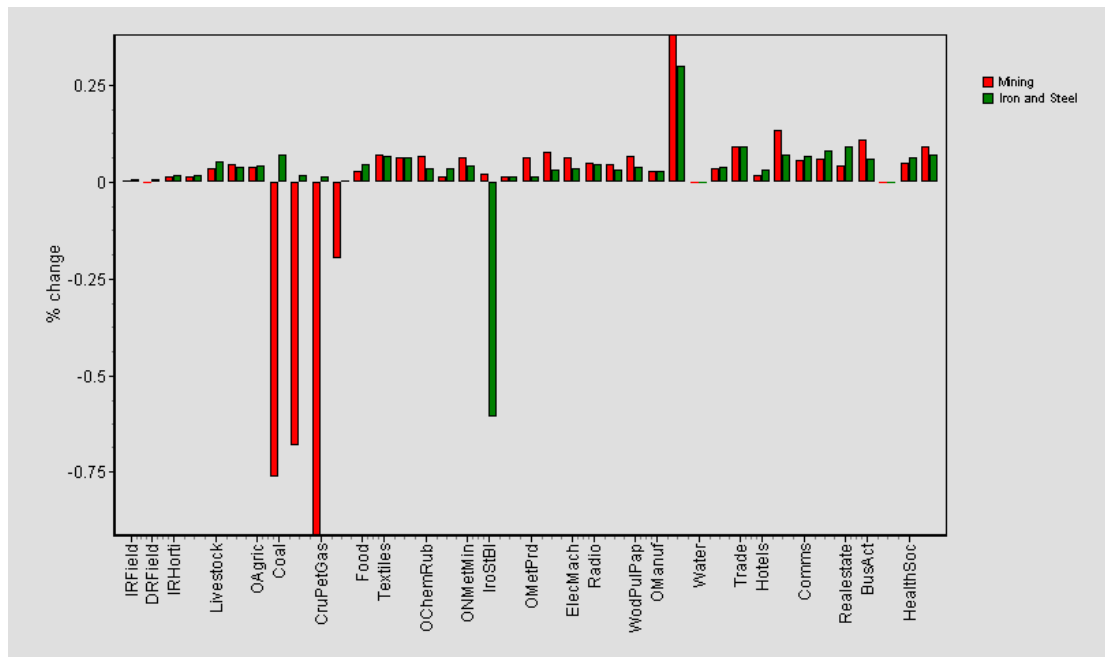


In the next few paragraphs we dissect the effects of a food voucher program. It makes a big difference by which industries the food vouchers are given, and we therefore compare the effects between different industries and the general case.

First Shock: an increase in the cost of labour

The first scenario is an increase in the real wage in (i) the iron and steel industry, (ii) the mining industries, and (iii) all industries. We model a 1% increase in the real wage in the said three groups of industries, and find valuable results. The size of the increase does not matter here, since the CGE model is linear in its equations, so that a 2% increase will have twice as large an impact as a 1% increase. Only relative changes matter. For example, in the figure below the percentage changes in export are

Figure 3 Percentage change in exports due to a 1% increase in real wage



compared between an increase in the real wage in mining on the one hand, and in iron and steel on the other. An increase in the real wage in any industry increases the cost of production, and hence the price of the commodities produced by the industry. The export prices are also adversely affected and hence the quantities exported decrease. The affected industry produces less and therefore demands less from other industries, so that their prices drop, which has a positive effect on their exports, as shown in the figure. The figure shows that if a particular industry is chosen for the food vouchers, the economy will be distorted, because all industries are not affected in the same fashion. However, if all industries would increase wages, the distortion would be spread evenly through the economy. Figure 4 compares a case where all wages are increased by 1 %, to the case where wages in Iron and Steel are increased by 10¹²%. The latter shows that exports of I&S decrease while all other industries are made better off, while with the former, all industries would export less.

¹² 10% was used to be able to compare the effects on the same graph.

Figure 4 Changes in exports as a result of increased wages

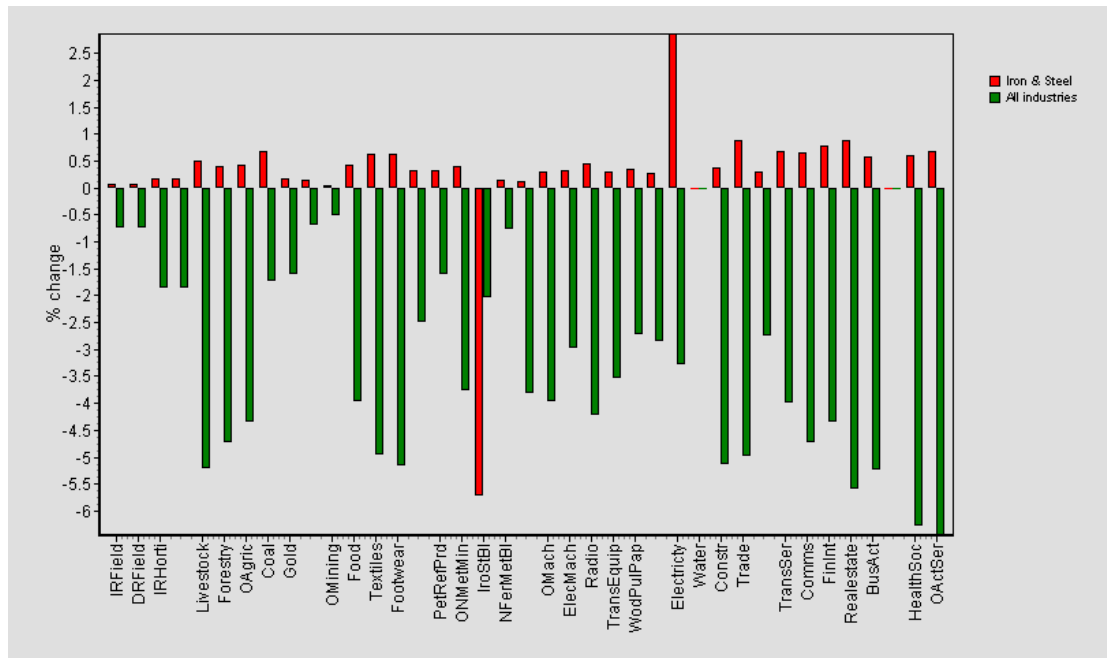


Table 3 below shows the model results for the various industry wage policy scenarios are calculated, and confirms the results of Figure 3. The MEB is the change in real GDP divided by the change in real government income. The MEB measures the change in GDP per unit of government revenue lost or gained by the policy measure. Here it is very clear that in terms of this comparison, a general rise in real wages would be much “better” for the economy per Rand of government revenue. The table shows that the general wage rise lets GDP decrease by R1.63 per R1 revenue lost, while wage rises in iron and steel and mining let GDP decrease by R8.20 and R9.10 respectively, per R1 revenue lost.

Table 3 General results of increases in real wages

Description	Gen-wage	Iron-wage	Min-wage
Change in real GDP (Rm)	-2456.102	-43.215	-213.401
Change in real Gov income (Rm)	-1510.930	-5.242	-23.429
Marginal excess burden	1.626	8.244	9.108
Aggregate revenue from all indirect taxes (Rm)	348.659	-6.936	-8.502
Aggregate revenue from indirect taxes on intermediate (Rm)	2.921	-2.581	-7.708
Aggregate revenue from indirect taxes on investment (Rm)	21.669	-0.153	-0.204
Aggregate revenue from indirect taxes on households (Rm)	343.586	-3.668	-0.961
Aggregate revenue from indirect taxes on export (Rm)	-31.145	-0.454	0.453
Aggregate revenue from indirect taxes on government (Rm)	11.627	-0.079	-0.081
Aggregate employment: wage bill weights %	-0.643	-0.011	-0.056
Consumer price index %	0.811	-0.011	-0.011
Average real wage %	1.000	0.008	0.061
Import volume index, C.I.F. weights %	0.038	-0.015	-0.012
Real GDP from expenditure side %	-0.330	-0.006	-0.029
Real household consumption %	0.344	-0.002	0.005
Export volume index %	-2.202	-0.032	-0.143

Second Shock: a decrease in production tax

The best policy that any government could ever implement is to decrease the tax burden on producers. That will simply free them up to produce more, and employ more labour. The same general argument as with Shock I holds, namely, that it would in general be better to decrease the production tax for all industries, rather than reducing the tax only for one industry. In Figure 5 two cases are compared: a reduction in the production tax on the iron and steel industry in red, with a general reduction in the production tax on all industries by 1 %. It is clear from the figure that all industries would benefit from a general reduction in the tax rate, while only iron and steel would benefit if their tax rate were reduced. However, as explained above, we are not interested in the absolute values of target variables, but in their values relative to something like real government revenue.

Figure 5 Percentage change in industry production with reduction in producer taxes

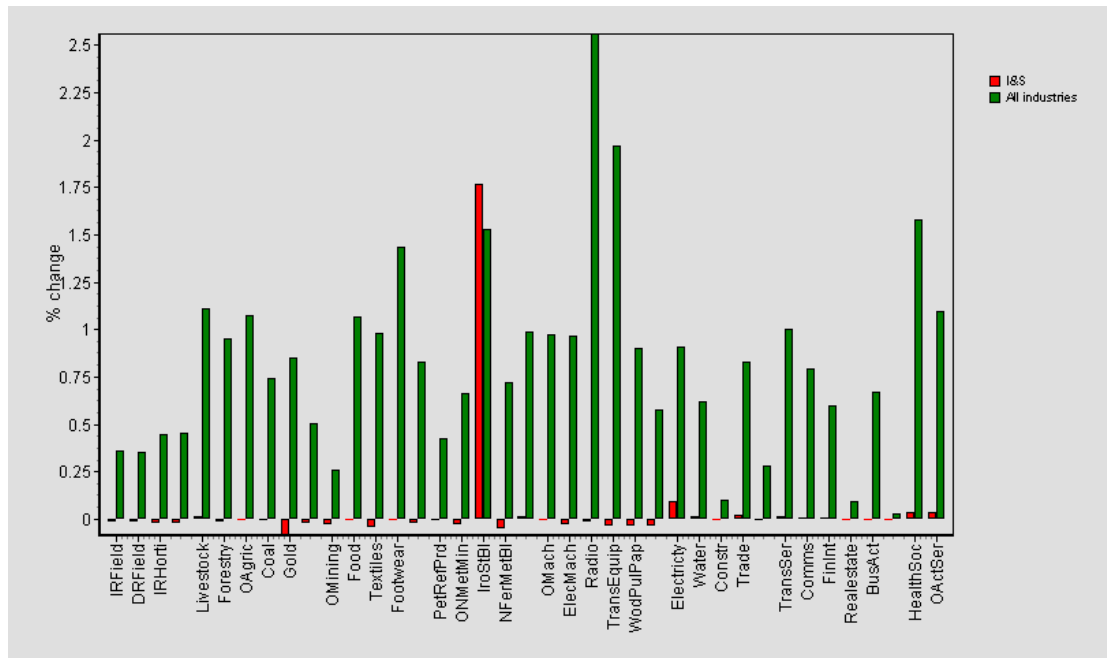
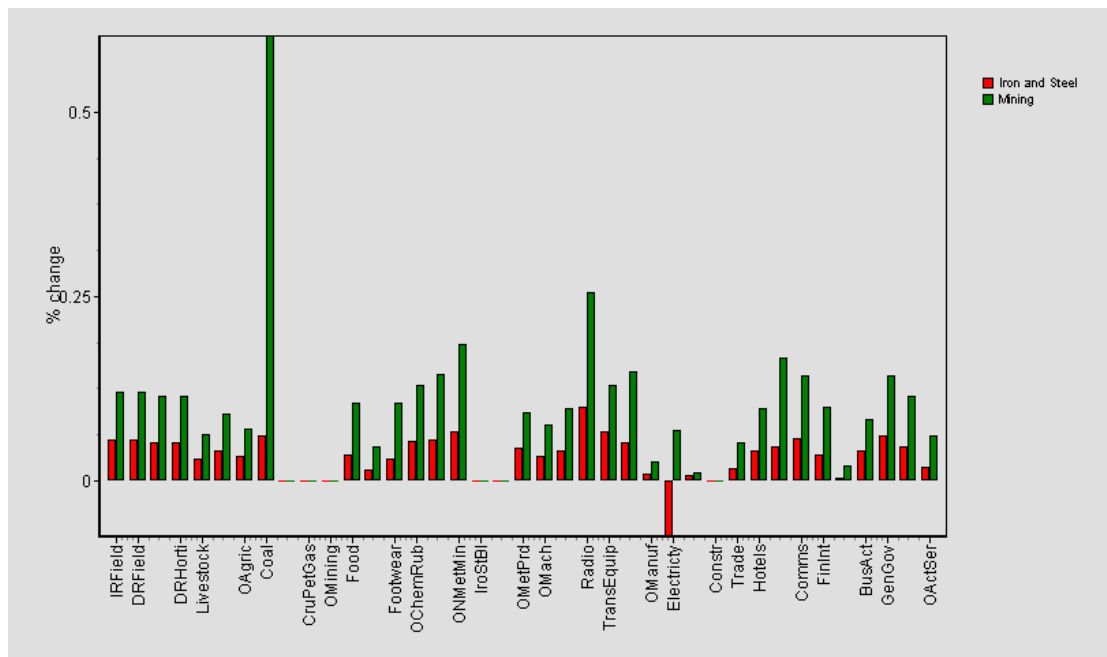


Figure 6 Increase in total consumption with reduction in producer tax



The first impression that one gets from Figure 6 is that it would be much better to decrease the producer tax rate on all mining industries than the tax rate on iron and steel. However, this is exactly what is meant that anything can be proven by statistics. We must compare the relative impacts of the respective taxes and not the absolute values of the impacts. For example, real government revenue would decrease four

times as much if all mining industries pay less producer taxes than iron and steel, at the same rate decrease. Figure 6 shows that consumption of most commodities after a tax break for mining would be double the consumption after a tax break for iron and steel. Hence the net result of consumption per unit of change in real government revenue is higher for iron and steel.

Table 4 General results of decreases in producer taxes

Description	General	Iron & Steel	Mining
Change in real GDP (Rm)	4865.214	142.828	366.654
Change in real Govinc (Rm)	-8931.369	-160.514	-634.666
Marginal excess burden	-0.5447	-0.8898	-0.5777
Aggregate revenue from all indirect taxes (Rm)	-13029.18	-173.121	-719.545
Ordinary change in all-industry production tax revenue (Rm)	-13699.156	-216.681	-816.46
Aggregate revenue from indirect taxes on intermediate (Rm)	216.016	11.903	25.827
Aggregate revenue from indirect taxes on investment (Rm)	-20.908	0.987	2.207
Aggregate revenue from indirect taxes on households (Rm)	476.175	29.529	72.541
Aggregate revenue from indirect taxes on export (Rm)	4.209	0.67	-4.612
Aggregate revenue from indirect taxes on government (Rm)	-5.515	0.472	0.953
Aggregate employment: wage bill weights %	1.152	0.034	0.09
Consumer price index %	0.418	0.069	0.138
Import volume index, C.I.F. weights %	0.704	0.064	0.066
Real GDP from expenditure side %	0.658	0.019	0.05
Real household consumption %	1.137	0.033	0.099
Export volume index %	0.429	0.053	0.011
Marginal excess burden of total consumption	-0.1273	-0.2056	-0.1560
Marginal excess burden of total exports	-0.0480	-0.3302	-0.0173
Marginal excess burden of total imports	-0.0788	-0.3987	-0.1040

Third Shock A decrease in the effective price of food

The tax break on food has the highest MEB, and this could be explained by implementing a number of arguments: (i) The supply of unskilled labour is sensitive to the producer real wage of poor consumers, which increases when food prices decrease. (ii) The food tax break increases demand for food; the food industry has high inputs from agriculture, which uses large amounts of unskilled labour. Total agricultural production increases with this scenario.

Effects on poverty

There are twelve household income groups in the model and the results are shown for the poorest income group, for all four race groups: namely Africans (a), Coloureds (c), Indians (i) and Whites (w). Even though average income statistics imply that

South Africa is a middle-income country, most of the population experience serious absolute poverty or are vulnerable to poverty (May 2000; Klasen 2000). Poverty in South Africa is concentrated among the African and Coloured race groups. In 1995, 61% of Africans, 38% of Coloureds, 5% of Indians and 1% of Whites were classified as poor (May 2000). Aliber (2002) quoting Schlemmer's work based of the All Media and Products Surveys (AMPS) shows that overall poverty has been increasing since 1993. A poverty line of R400 in 1989 Rand prices was used. Further, the data also shows that Africans and Coloureds have been the worst affected in terms of increasing poverty over the years. The table below shows this evidence.

Table 5 Proportion of households below the poverty line

	Africans	Coloureds	Indian	White
1989	51%	24%	6%	3%
1993	50%	26%	8%	3%
1996	57%	22%	9%	3%
1997	55%	21%	6%	4%
2001	62%	29%	11%	4%

Source: Aliber quoting Schlemmer 2002: 3.

A decrease in food tax has only positive results. Poor consumers spend most of their consumption basket on food, so that this result is to be expected.

Conclusion

Most other studies on food or meal voucher schemes stressed the fact that assumptions are crucial, and that a change in the assumptions will change all the results. We have experienced exactly that. We made a strict assumption that firms would behave as if they are paying higher wages, and will therefore hire fewer labourers. The higher wages will increase cost and they will produce fewer commodities. In this case, real GDP will probably decrease and the economy will be worse off. If we manipulate the tax policies of the government well enough, and raise taxes in the correct manner, real GDP would increase despite the assumptions about firm behaviour.

However, firms do not change their hiring behaviour, the economy would easily benefit from the voucher scheme.

No matter which modelling assumptions are made, or which fiscal policies implemented, a food voucher scheme would probably always benefit the poor, and improve upon the distribution of wealth in the country. We did not even touch on the nutritional aspects of the voucher scheme, which would improve upon this conclusion.

Appendix Modelling equations and their explanations

```
Set FoodSet (Food,Hotels,Trade); ! to include
restaurants, etc !
Subset Foodset is subset of COM;
```

Coefficient

```
FACEVALUE # face value of food vouchers #;
GOVCONT # government contribution to firm cost of
purchasing vouchers #;
FIRMNETCOST # net firm cost of purchasing vouchers #;
MOREFOOD # additional expenditure on food #;
```

Formula¹³

```
FACEVALUE = 0.001*sum{f,FOODSET, V3PUR_S(f)}; ! size of
scheme !
```

The total value of the voucher scheme is a proportion of all spending on food by households

```
GOVCONT = 0.2*FACEVALUE;
FIRMNETCOST = FACEVALUE - GOVCONT;
MOREFOOD = 0.8*FACEVALUE;
```

We assume that the government will contribute 20% of the face value of the scheme, and that 80% of the value of the vouchers will be spent on extra food. These assumptions can easily be changed without changing the fundamental results.

```
Variable (change) delUnity; ! new exogenous...shock=1 !
Variable fFood_f; ! new exogenous !
Variable fgFood_f; ! new exogenous !
```

¹³ The values highlighted in yellow can be changed, depending on assumptions made. However, the fundamental trends in the outcomes of the model do not change if these are altered.

```

! increase in wage cost !
Variable (change) delWageBill;
Equation E_delWageBill # definition # delWageBill =
0.01*V1LAB_IOP*wllab_iop;
Variable (change) delFW;
Equation E_delFW # rule # delWageBill =
FIRMNETCOST*delUnity + delFW;
! to activate rule, swap delFW = fllab_iop !

! increase in food spending !
Variable (change) delFoodSpend ;
Equation E_delFoodSpend # definition # delFoodSpend =
0.01*sum{f,FOODSET, V3PUR_S(f)*[x3_s(f)+ p3_s(f)]};
! to enforce taste change toward food !
Variable (all,f,FOODSET) fFood(f);
Equation E_fFood # rule # (all,f,FOODSET) a3_s(f) =
fFood(f)+ fFood_f;
Variable (change) delF2;
Equation E_delF2 delFoodSpend = MOREFOOD*delUnity +
delF2;
! to activate,
    swap fFood= A3_s(FOODSET);
    swap delF2 = fFood_f; !

! gov contribution modelled as a food subsidy !
Variable (change) delGOVCONT;
Equation E_delGOVCONT # definition #
delGOVCONT = sum{f,FOODSET, sum{s,SRC, Delv3tax(f,s)}};
Variable (all,f,FOODSET) fgFood(f);
Equation E_fgFood # rule # (all,f,FOODSET) f3tax_s(f) =
fgFood(f)+ fgFood_f;
Variable (change) delFG;
Equation E_delFG delGOVCONT = GOVCONT*delUnity + delFG;
! to activate,
    swap fgFood= f3tax_s(FOODSET);
    swap delFG = fgFood_f; !

```

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