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AN EMPIRICAL DISSEMINATION OF THE PERSONAL INCOME TAX REGIME IN SOUTH AFRICA USING A MICROSIMULATION TAX MODEL

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ABSTRACT

This article is primarily concerned with the profile of the tax liability of individual taxpayers in South Africa as well as the impact of tax reform policies since the mid-nineties on the progressivity of their tax liability using a static microsimulation tax model. Using the 2005/06 Income and Expenditure survey data from Statistics South Africa, the revenue base had to be determined and aligned to the official figures published by the South African Revenue Services and the National Treasury. This exercise required substantial manipulation of the data but the outcome is surprisingly close to the official R104 billion compared to the published SARS figure of R96 billion. The model allows for the dissemination of individual taxpayers by income groups, gender, educational level, age group, etc. Testing for progressivity, the results show that although still more progressive than most other tax structures world-wide, the level of skewness has marginally declined over the past few years with the share of those in the lower income groups gradually increasing. This phenomenon is also enhanced by relatively more taxpayers entering the tax net at this level. With the top marginal rates already at the current high levels little can be done at the higher end of the scale to expand the revenue base and therefore the solution lies in raising the contribution of those in the lower but especially the middle income groups. As far as gender is concerned, disparities in the labour market require an examination of tax policy that may contribute towards a more equal distribution of individual tax on a gender basis. The results also show that tax policy adjustments that contribute towards the improvement of the quality of education would also be a positive investment for future revenue collection.

JEL: D31, H24

Key words: Micro-simulation, Tax revenue base, Personal income tax, Tax Policy.

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1. INTRODUCTION

Internationally in the field of public economics, micro-simulation (MS) models are used for the empirical analysis of fiscal policy changes on revenue collection and expenditure, especially health care and retirement as well as other socio-economic expenditures (Buddelmeyer, Creedy & Kalb, 2007:3). It allows for individual characteristics such as the composition of the taxpaying population in terms of age, gender, income levels, etc. and is especially useful to simulate individual income and expenditure behaviour to policy changes that affect revenue (Citro & Hanushek, 1991:15). This is in contrast to macro models which are structured on an aggregate level without the detailed information of individuals/households captured in the micro model (Štěpánková, 2002:36). Furthermore, static models should be distinguished from dynamic models. In a static MS model the demographic characteristics of a particular survey are kept unchanged whereas in a dynamic model the demographic characteristics adjust over time (the data ages). However, in the domain of public economics, both procedures are useful to simulate the effect of a fiscal policy change on revenue and expenditure patterns within households. Static models are preferred though given the sensitivity of dynamic models and the sometimes extreme results due to small policy changes (Merz, 1991:79). In general, microsimulation procedures involve data validation, imputation of data, re-weighting and the up dating of data to characterise the population as closely as possible (Redmond, Sutherland & Wilson, 1998:4).

The model developed is an extension of the microsimulation (MS) model framework as structured by Thompson and Schoeman (2006) as well as Wilkinson (2009). It differs from the aforementioned models in the sense that in this model Stats SA data are aligned with published data from the South African Revenue Services (SARS). Given the scarcity of data (limited surveys) this model is a static model assuming that the population characteristics do not change significantly over the period of the analysis. The structured model applies a tax calculator to compute the tax liability for each individual under the 2005/2006 tax regime.

The tax calculator is structured in such a way that it captures the continuous change in tax rates, income thresholds and overall tax structures as reflected in each year's tax policy proposals. Such a change in tax proposals is mainly due to the gradual enactment of tax reforms informed by international best practice and/or simply to adjust for bracket creep to protect taxpayers from the impact of inflation on their disposable income. The stratification of income groups according to identified tax brackets allows for the calculation of the Gini co-efficient based not only on pre-tax income but also the tax liability of individuals.

The layout of the rest of the paper is as follows: Section 2 explains the data base and the adjustments that had to be made in order to bridge the gaps in published data. Section 3 outlines the general structure of the model In Section 4 the model results are validated against actual

published SARS data with a discussion of the impact of tax reform measures on the PIT revenue base in Section 5. Section 6 concludes with some policy recommendations.

2. COMPILING A DATA BASE FOR THE CONSTRUCTION OF A MICRO-SIMULATION (MS) TAX MODEL

MS models are as reliable as the micro datasets on which they are based (Lau, Yotopoulos, Chou & Lin, 1981:175). In the case of South Africa, data sources that are representative of the population feature a high level of versatility. Databases have many missing values as a result of non-responses due to refusal, non-usable information and disqualified answers which limit their usefulness. As a result such incomplete surveys have to be dealt with accordingly.

The problem of missing values has been addressed through imputation using the techniques explained by Peichl & Schaefer (2009:3). The technique replaces missing values in each categorical group by the mean value of the non missing values in the specific categorical group. In the model a tax calculator computes the tax liability for each individual under the 2005/2006 tax regulations and rules (Table 1). The results based on IES data are then benchmarked against the latest published SARS data for tax filers in the bulletin Tax Statistics (2009) and the relevant data in the latest (2010) publication Budget Review from the National Treasury. A problem encountered was that the IES and SARS databases have different base years (calendar versus fiscal year). Given the fact that this model is based on tax data, calendar year data were reworked to fiscal years. The IES data have been re-weighted to take account of the population change for the fiscal year 2005/2006. The method used is the CALMAR re-weighting program (Sautory, 1993), which recalculates the weights according to gender, race and age group to match the population totals produced by Stats SA (Statistics South Africa, 2005).

The following categorical variables have been identified for each individual, namely gender, age group, education level, population group, settlement and household size - all available from the IES. Some individuals earn income from different sources and these incomes are aggregated in order to calculate taxable income for each individual in the model. Table 2 indicates the income sources defined and used in the 2005/2006 IES. Gross income excludes imputed rent and is divided into six main groups, namely income from employment, income from capital, pensions and annuities, social insurance and grants and other income. Gross income mainly originates from employment income which comprises 82.1 per cent of the total gross income while approximately 17.1 per cent originates from the other sources. Individuals receive most of their income as salaries/wages (71.3 per cent of total gross income). Business income comprises 10.8 per cent of the total gross income.

The profile of individuals is explained through the categorical variables from the survey. The gender variable differentiates between males and females and shows the extent to which each

group is represented in the survey. Also, each individual in the household is categorised within a specific population group namely: African/Black, Coloured, Indian/Asian and Whites. Education groups range from no schooling, primary and secondary schooling to degrees and diplomas. Only qualifications already obtained are included. Diplomas and certificates only count if a course of at least six months has been completed. Age is captured in complete years to the nearest complete number and categorised in five-year age groups. Household size is the number of persons living in the same dwelling including children. Settlement is where the dwelling unit is located. Urban areas include cities and towns characterised by higher population density, economic activity and infrastructure. Rural areas include farms and traditional areas characterised by low population density, economic activity and infrastructure (Statistics South Africa, 2008:1-2).

The categorical data contains missing/unspecified values and the values had to be imputed to improve the quality of the data set. These missing values resulted from non-responses, refusal, unusable information and disqualified answers.

For the categorical variables in the IES survey containing missing/non-response data, a frequency table was obtained for each variable to determine the distribution of the missing values. When computing values for the missing categorical variables the frequency distribution of the original responses remained unchanged. This methodology is available in the SAS programme known as RANUNI[3]. The algorithm is briefly as follows:

In equation 1 R_i is the i^{th} random number, a is the multiplier and c the percentage increase.

$$R_{i+1} = (aR_i + c)(\mathrm{mod} m) \quad i = 0,1,2,\ldots\ldots \qquad (1)$$

The RANUNI function then generates a random number using a generator developed by Lehmer (1951) from a uniform $(0, m)$ distribution and turns it into (0,1) by dividing by m. The number in parentheses is the seed/random number of the random number generator. If the seed is adjusted to a non-zero number, the same random number is generated, every time the program is activated (Fan, Felsovalyi, Sivo & Keenan, 2002:26).

Table 3 shows that prior to imputation, male responses accounted for 47.1 per cent and female for 52.8 per cent of the total, while non-responses amounted to 0.1 per cent of the total population. Using the RANUNI statistical method a missing value is replaced by a female response when the RANUNI is less than 52.8 or alternatively to a male response should the RANUNI be less than 47.1 per cent. It is evident that the female and male distribution before and after the imputation has only deviated slightly between males and females. The male ratio

[3] Uniform random number generator

only increased from 47.1 to 47.17 per cent and the female ratio from 52.8 per cent to 52.83 per cent.

In Table 4 the racial distribution before imputation is as follows: Africans 78.5 per cent, Coloureds 13.6 per cent, Indian/Asian 1.6 per cent and Whites 6.2 per cent. The non-response number amounts to 0.1 per cent of the total population in the survey. After imputation, the distribution between the racial groups only changes marginally. For example, the ratio for African/Black only increases from 78.5 to 78.6 per cent.

Table 5 shows that before imputation the age group 0-14 years accounts for 33 per cent of the population. For the age group 15 to 24 years, 25 to 44, 45 to 64 and 65 years and older, the distribution is 21.3, 25.1, 14.5 and 5.8, respectively. The non-response number amounts to 0.23 per cent. Again the age group distribution after imputation only adjusts marginally. For example, the age group 15 to 24 years increases from 21.34 to 21.38 per cent while the age group 65 years and older increases from 5.81 to 5.82 per cent.

The distribution of the education categories before and after imputation can be seen in Table 6. The group with no schooling represents 20.7 per cent of the population. Those with primary and secondary schooling (Grade R - Grade 12), represent 73.8 per cent while those with a national diploma only represent 3.6 per cent of the population and those with a degree only 1.3 per cent. After imputation the distribution amongst the education groups only changes marginally. For example, the share of the group with no schooling increases from 20.7 to 20.8 per cent, while those with school education increases from 73.8 to 74.2 per cent.

Table 7 shows that the income from labour (salaries, wages and self employment) in the MS data (R745 billion) is overestimated when compared to the National Accounts Compensation of Employees figure of R709 billion (SARB Quarterly Bulletin, 2010)[4] meaning that only 95 per cent of income is accounted for in the Quarterly Bulletin. Although not researched, this raises an important question namely, the accuracy of income reported and the numbers used in the national accounts with their impact on savings as the balance between income and allowances.

After having adjusted the levels of the data, total income is estimated and compared to taxable income as published by SARS for the 2005/2006 tax year (Table 8). The SARS data serves as a benchmark based on the principle that it represents the closest proxy to the full tax base of the South African economy. It is evident from the table that the average income per taxable income group in the two different databases is comparatively close to each other indicating that the adjusted IES data are sufficient for use in an MS model. The data shows that the survey income

[4] National accounts aggregates are a weighted average of 2005 and 2006 data (696 302*10/12 + 775 085*2/12)

data seem to be biased towards the lower income groups where the difference in the average gross income is close to 15 per cent. In the case of the other income groups the difference only varies between 0.9 and 2.4 per cent.

One would generally assume that the income figures reported by SARS originate from activities in the formal sector while income from the Stats SA data are more representative of both the formal and informal sectors. Therefore, one would expect the income levels of the survey data to be higher than in the SARS data. According to SARS the number of individuals assessed (tax filers) for the tax year 2005/2006 amounted to 3.8 million (Tax Statistics, 2008). According to the Labour force survey (2005) the formal sector accommodated about 8.6 million jobs. Therefore, 4.8 million of the individuals employed in the formal sector have not been accounted for in the SARS filer data. Obviously, a large number of them only pay the Standard Income on Employees Tax (SITE) and fall below the threshold income level. Therefore, they are not registered as filer taxpayers.

Table 9 shows a summary of the number of taxpayers, taxable income and tax liability by taxable income group comparing the MS model and SARS data. A large number of taxpayers, (almost 50 per cent of total taxpayers) fall within the lower income group (< R80 000). The first two income groups (< R130 000) earn in total 42 per cent of taxable income and pay 38 per cent of total tax liability. The highest income group earning above R300 000 contributes 27 per cent of taxable income and pays 46 per cent of total tax liability. Tax liability is skewer towards the higher income groups indicating more sensitivity of this level. The income group, R180 000 – R230 000, comprises only 4 per cent of total taxpayers but earns 7 per cent of taxable income and pays an equal percentage of total tax liability.

3. THE STRUCTURE OF THE MODEL

3.1 Nature of the model

In microsimulation tax modelling codes are applied to existing micro-data sets containing observations described by taxpayer characteristics (Merz, 1991:79). These micro units can be firms, individuals or families and are identified by characteristics such as age, gender, population group, income, expenditure and educational levels.

Figure 1 reflects the general structure of an MS model. A salient feature is that more than one database can be used for the model. As part of the process of constructing an MS model, the quality of the survey data are evaluated and shortcomings are addressed by the imputation of missing variables as described in the previous section.

Two types of MS models are being used namely static and dynamic models. The former assumes unchanged population characteristics and are widely used for shorter-term simulation exercises. Surveys used are conducted periodically with the implication that data are usually dated when published. To adjust the database to the actual period of investigation involves a static ageing process. The structure of the sample has to be re-weighted with the sample size, age and gender profile unchanged. Each micro unit now represents a different number (new weight) of individual units in the total population (Citro & Hanushek, 1991:3).

Dynamic MS models age each micro unit based on probabilities such as the history of each individual, taking into account the whole life cycle from birth to death (e.g. a child ages until old enough to join the labour force, workers age to become pensioners, newborns are added to the population, etc). These changes affect the characteristics of the survey sample size and also change the profile of the population which is important for tax, pension and social policy analyses (Merz, 1991:79-81). The tax calculator then considers all such changes before estimating the tax liability.

The structure of the analytical framework is outlined in Table 10. Gross income is the result of the income specification in Table 2. From gross income tax allowances are deducted (exclusions, allowances and deductions) which then provides taxable income. Tax liability is calculated according to the tax rates and rebates in the tax tables of 2005/2006 (Budget review, 2006). By deducting rebates from the gross tax liability, net tax liability is derived.

In this model the net tax liability for each individual (i) is calculated using the IES dataset. Tax allowances are not accurately recorded in the IES and therefore the SARS published data in Tax Statistics 2009 has been used as a proxy to calculate a ratio for allowances to be applied to each individual income group. An average allowance ratio (τ_{allow}) is derived from taxable income (tby_i) and gross income (y_i) per taxable income group in equation (2).

$$\tau_{allow} = \frac{y_i - tby_i}{y_i} \qquad (2)$$

Equation (2) is applied to the SARS dataset and in Table 11 the calculated allowances ratio for each taxable income group is recorded.

These ratios by taxable income group (equation 2) are then applied to each individual IES gross income group in equation (3) to calculate individual allowances.

$$allow_i = y_i * \tau_{allow} \qquad (3)$$

Taxable income is defined as gross income less allowances:

$$\text{tby}_i = \text{y}_i - \text{allow}_i \tag{4}$$

The tax liability for each individual is calculated in equation (5) by applying the official tax codes (Table 1) to taxable income:

$$\text{pit}_i = \text{f}(\text{tby}_i : \tau_{\text{structure}}) \tag{5}$$

Table 1 contains the rates of normal tax payable by natural persons in respect of the year of assessment ending 28 February 2006. In terms of the above rates of taxation, a person who has a taxable income of up to R80 000 pays tax at a fixed rate of 18 per cent. Income of up to R300 000 is taxed at increasing rates. All income in excess of R300 000 is taxed at 40 per cent.

Thus, the model calculates tax liability given the existing tax codes which can be changed for policy simulation purposes. It should also be mentioned that this procedure is of course a static method and that behavioural changes are not discounted for. However, it allows for policy simulations with regard to thresholds, marginal tax rates, allowances and income brackets according to the six income categories. Obviously the impact of tax policy changes is much broader than only the static effects and therefore, in the next phase of the model development, the model will be adjusted to include dynamic behaviour of individuals or households.

As a cross-check on the model results, the tax liability elasticity is estimated on an aggregate/macro level. For elasticity purposes a simple Ordinary Least Square Regression procedure with data from SARB[5] is used. This study used only 29 observations with the result that the number of feasible methods has been limited. Differencing the series once, the ADF unit root test confirms stationarity of the series, (all series are I(0)). The income elasticity of taxes with regard to taxable income is defined as follows (Girourd and André, 2005:7):

$$\varepsilon_{t,y} = \varepsilon_{t,tby}\varepsilon_{tby,y} \tag{6}$$

The elasticity of tax liability with respect to the gross domestic product (gdp) $\varepsilon_{t,y}$, comprises the multiplied sum of two different co-efficients. Firstly, the elasticity of tax liability to taxable income is estimated $\varepsilon_{t,tby}$. Again, macro data such as national income from the national accounts as a proxy for taxable income are used. A dummy variable is included to account for the

[5] A detailed description of the data are provided in Table 12.

structural break in the data series caused by major tax reforms in 2001 (see Nyamongo & Schoeman, 2007:482). The elasticity of tax liability is expected to be greater than unity because of South Africa's progressive tax system (marginal tax rates increase with taxable income). Tax liability (PIT) is positively correlated with taxable income. The function used to estimate PIT takes the logarithm form:

$$ltax = f(\overset{+}{ltby})_{6} \qquad (7)$$

Table 13 shows the elasticity of tax liability for the macro model and MS model is 1.13 and 1.56 respectively. Secondly, the elasticity of the taxable income to gdp, $\varepsilon_{tby,y}$ is determined. Since taxable income is positively correlated to gdp the function used to estimate taxable income takes the logarithm form:

$$ltby = f(\overset{+}{lgdp})_{5} \qquad (8)$$

Table 13 indicates that the elasticity of taxable income for the macro model is 0.95. Finally, the elasticity of tax liability to gdp[7] is derived by multiplying the above mentioned two estimated elasticities. The results are combined and the calculated tax liability to output is 1.07. Thus, a one per cent increase in gdp would lead to a 1.07 percentage increase in taxable income. These results are in line with the results of Jooste's (2009:16) result of 1.08 using the output gap to account for structural changes.

3.2 Validation of model results

After simulating tax liability with the MS model, the results are then compared with published SARS data. All data sets have been adjusted to the tax year 1 March 2005 to 28 February 2006. Table 7 shows that the MS model outputs are very close to those of SARS indicating the accurateness of the MS model. Taxable income as computed by the model amounts to R104 billion compared to the SARS estimated liability of R96 billion.

It should be noted though that the MS model only calculates tax liability while advanced payments and lags affect the actual amount collected (R126 billion). Once the tax liability of the different income groups has been estimated and benchmarked against the SARS figures, the profile of the taxpayers is analysed based on gender, age groups, education and race classification.

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[6] The variables are cointegrated at a 10% level of significance. All the variables included in the ECM were originally I(1). Differencing them once transformed them into I(0) series. The error correction co-efficient is negative and statistically different from zero. The Adjusted R^2 value indicates that 65 per cent of the variation in taxes is being explained by the ECM. Thus given the diagnostic results at a one percentage level of significance, it is reasonable to conclude that the residuals do satisfy the assumptions of the classical normal linear regression model.

[7] To account for structural and cyclical changes in the business cycle, the output gap is used (Jooste, 2009)

Table 14 shows that in the case of gender, the SARS data accounts for the taxable income of females to be approximately R148,8 billion compared to the R168,3 billion of the model calculation based on IES data. In terms of the number of taxpayers, the two sets of data are actually very close (1,60 million compared to 1,64 million). The average taxable income and tax liability based on the IES data are slightly higher than in the case of SARS data. The reason is probably the fact that more females fall into the lower taxable income groups with the IES data slightly biased toward the lower income groups indicated in the next paragraph. As far as males are concerned, the IES data shows more males than the SARS data with taxable income and tax liability higher as well. The reason probably being that in the case of the former data set (IES) more males are included that do not reflect on the official SARS database. As a result the total adjusted tax liability, as calculated and based on IES data, exceeds the official SARS number by just more than R7.6 billion. Males account for almost 72 per cent of the total tax liability and comprise 58 per cent of the registered taxpayers earning 66 per cent of total taxable income. The data indicates the uneven distribution of taxable income between males and females a (difference of 32 per cent) despite the fact that the numbers only differ by 16 per cent.

Table 15 shows the number of taxpayers, taxable income and tax assessed by age group. In the case of the first age group (<18), the numbers included in the SARS data are close to the model data, but taxable income in the SARS data are about 47 per cent less than the model data (R680 million compared to R1 716 million). This is interesting but not unexpected given the fact that a number of young people are listed on the SARS data based on the earning and taxable income from inheritances, grants, and/or other sources of income which are not reflected in the IES data and are not formally employed. In the case of all the other age groups (except the category above 65) the IES taxable income and tax liability data are close to the SARS data.

For the age group under 34 years of age, the number of taxpayers as a percentage of total taxpayers hovers around 25 per cent and contributes about 23 per cent of total tax liability. The age group 35-44 comprises 29 per cent of total taxpayers and contributes 27 per cent of total tax liability. The age group 45-64 comprises 35 per cent of total taxpayers and is responsible for 48 per cent of total tax liability. As far as the age group >65 is concerned, the IES data comprises only about 24 per cent of the SARS number of taxpayers and clearly does not reflect the full number of taxpayers. Concerning the age groups in between, the differences are small.

In terms of racial and educational classification data could not be validated against the published SARS data. Table 16 shows the racial classifications with the African/Black and White taxpayer groupings accounting for 43 per cent and 42 per cent of total number of taxpayers, respectively. In the first income group (< R80 000) African/Black taxpayers account for the largest share (65 per cent) while whites have the smallest share (29 per cent) with Coloureds and Indians on 57 per cent and 50 per cent, respectively. Taxable income and tax liability of the racial groups are shown

in tables 17 and 18, respectively. Whites contribute 59 per cent to total taxable income and pay 70 per cent of total taxes. Whites earning above R300 000 earn 39 per cent of total taxable income and pay 55 per cent of total tax liability. In contrast, the African/Black group earns 29 per cent of total taxable income and pays 20 per cent of total tax liability. A large share of this group falls into the category below R80 000, which pays only 16 per cent of total tax liability.

Tables 19, 20 and 21 contain the number of taxpayers, taxable income and tax liability based on educational level. Four different groups are identified, namely, No Education, Grade R – Grade 11, Grade 12 and Other after school qualifications. The groups Grade 12 and Other qualifications comprise 31 per cent and 44 per cent of total taxpayers, earning 27 per cent and 59 per cent of total taxable income and respectively contributing 23.5 per cent and 67.9 per cent of total tax liability. Individuals with no education only comprise 1 per cent of total taxpayers, earning 1 per cent of total taxable income and contributing only 0.4 per cent to total tax liability. This clearly shows the importance of education in expanding the tax base.

4. SIMULATING THE IMPACT OF A TAX REFORM ON THE PROGRESSIVITY OF INDIVIDUAL TAX

The model analyses individual tax liability by taxable income group and the results indicate the gains and losses to the revenue base with changes in the tax codes on individuals. Progressivity is measured after discounting the full impact of such tax reforms which include changes in marginal rates, thresholds, income brackets and the fixed tax amount per income bracket (Urban, 2006:2). Once the tax liability is stratified per taxable income group, progressivity is measured by means of various techniques such as the Kakwani index (disproportionality approach) which is based on the difference between the concentration index of tax liability (G_t) and the Gini co-efficient of pre-tax (G_{tbya}) income. Thus, the index measures the concentration of personal income tax in terms of its progressivity – the index is defined in terms of departure from proportionality formally defined as[8]:

$$RS = 2\int_0^1 [L_a(P) - L_t(P)]dP = G_t - G_{tbya} \qquad (9)$$

The co-efficient increases when tax liability becomes skewer than pre-tax income or when pre-tax income becomes less skew than tax liability. The difference between the two can only be affected by tax reform. Thus, tax reform that increases the proportionality of tax liability (the rich now pay more than those at the lower end of the liability scale) will decrease the Kakwani co-efficient (the distribution is now closer to the diagonal). In addition, the Reynolds–Smolensky (RS) index is used to quantify the redistributive effect of tax reform by analysing the change in the income

[8] For a full explanation of progressivity indices see Nyamongo and Schoeman, 2007:487, Kakwani, 1997 and Reynolds & Smolensky, 1977.

distribution inequality. This is done by measuring the difference between the Gini co-efficients of pre-tax income (G_{tbya}) and post-tax income (G_{tbyb}) formally stated as:

$$RS = 2\int_0^1 [L_b(P) - L_a(P)]dP = G_{tbyb} - G_{tbya} \quad (10)$$

Again it is assumed that the difference is affected by tax reform which could increase or decrease the proportionality of post tax liability. The index declines when the distributional effect of tax reform increases (the tax system becomes more progressive).

In this study both the Kakwani and RS indices are based on the 2005/2006 and 2010/2011 fiscal years to compare the progressivity of taxes over this period and the results are as follows:

In Table 22 the Kakwani index declines from 0.267 in 2005/06 to 0.244 in 2010/11. This means that the concentration of the individual tax burden has become slightly less progressive with the increase in the Gini co-efficient for pre-tax income increasing by 5.6 per cent and the concentration index for tax liability by only 0.3 per cent. Within the different taxable income groups it is evident that although the Gini co-efficient of pre-tax income and tax liability declined in the case of the first three income groups the rate of decline in the case of the higher taxable income groups was actually higher.

This trend is confirmed when using the RS index which quantifies the change in pre-and post tax income. Although the co-efficient shows little change at 0.064 the relevant co-efficients per taxable income group indicate that the progressiveness of the individual tax structure declined less for the lower income groups than for the higher ones. Again it should be noted though that the contribution per income decile group is also affected by the change in the number of taxpayers in each group and it is suspected that the proportional increase in the contribution of lower income groups could have been affected by the proportionally greater increase in the number of taxpayers in this group as a result of *inter alia* more effective revenue collection by SARS as well as their proportional increase in taxable income.

Table 23 contains a comparison with a few other countries for which data could be obtained. From the table it can be seen that the progressivity of the South African tax system is lower than that of Columbia (Kakwani index amounts to 0.357) and Portugal (0.272), but slightly higher than Spain (0.201). In all three cases the RS index for SA is higher than that of the other countries indicating that tax reform had a proportionally more marked effect on tax liability in South Africa.

Next, the impact of tax reform over the period 1995/06 – 2010/11 on individual tax liability is measured by changing the parameters underlying the tax structure (marginal tax rates, rebates and threshold levels). First we assume that between the mid-nineties and the 2011 fiscal year, fiscal policy remains unchanged other than adjustments for bracket creep. In order to do this, the 10 income brackets that existed in the 1995/96 tax structure (Table 24) are collapsed into the current 6 brackets (Table 25). Applying the inflation adjusted tax codes for 1995/96 to the taxable income of 2010/11 shows an estimated tax liability of R403 billion which is 67 per cent more than the actual amount collected in 2010/11. This "loss" in revenue is mainly because of a 2 million "loss" in the number of taxpayers (more taxpayers would have been included due to lower thresholds), higher marginal rates (which increased tax liability by about R5 billion) and the lower thresholds in the 2010/2011 tax structure. If the tax structure had only been adjusted by means of inflationary adjustments to the relevant income brackets, Figure 3 shows that the Gini co-efficient of tax liability would actually have been smaller indicating a less progressive tax regime (co-efficient 0.689) the reduction of inequality of taxation with the Kakwani index on 0.186 compared to the current 0.244. Also, comparing tables 27 and 28 the average tax liability per taxable income group would on average, be 58 per cent less because of the increased number of taxpayers.

From this analysis it can be concluded that tax reform did have an effect on the progressiveness of the South African tax system over the period 2005/2006 to 2010/2011. Adjustments to threshold levels and income brackets more than compensated for bracket creep adjustments with the result that the tax liability of individuals is now less than what it would have been under the 1995/06 tax regime. However, the results show that those at the higher end of the taxable income scale seem to have benefited more from the changes in the tax structures.

5. SUMMARY AND CONCLUSIONS

This paper disseminates the individual tax revenue base by using a microsimulation model based on individual and household data from the Income/Expenditure surveys of Statistics-SA. After substantial imputation the data are calibrated to tax data published by the South African Revenue Services.

For the missing categorical variables in the IES survey, a frequency table for each variable was obtained to determine the distribution of the missing values. The RANUNI statistical method was used to impute the missing values. The frequency distribution of the original responses remained unchanged. More than one source of gross income (Table 2) is aggregated and linked to individuals. A problem encountered is that data on tax liability are not accurately recorded in the survey data. Furthermore, the IES and SARS databases differ in terms of base years (calendar versus fiscal years) and to be able to compare, the IES data had to be adjusted to fiscal year data (1 March 2005 to 28 February 2006) using the CALMAR re-weighting program. After the

manipulation of the IES data in order to close the gaps in the data set, the two data sets compare remarkably well in terms of income earned. Using unadjusted IES income data, the estimated tax liability exceeded the official SARS figures by about 33 per cent. However, using the adjusted IES data the difference in liability decreased to only 7 per cent. An analysis of the demographics of the data shows that income (and therefore tax liability) is slightly more skewly distributed according to the IES data. Both datasets indicate that the wealthiest 10 per cent of individuals pay almost half of total revenue collected.

The model also allows for comparisons between different gender groups indicating that males contribute 76 per cent of total tax liability. Furthermore, different race groups are compared and it is interesting to note that the African/Black group (which comprises 78 per cent of the total population) only pays 20 per cent of total tax liability compared to the 70 per cent of the White population group. The model also indicates that tax liability increases substantially with higher levels of education. More than 90 per cent of taxpayers possess at least a Grade 12 or higher qualification. The age distribution analysis shows that most income is earned by individuals in the age group 35 – 44 year of age (more than 28 per cent) followed by those in the age group 45 – 54 years. However, as far as tax liability is concern, the share of the two groups is reversed by 30 per cent and 27 per cent, respectively.

The model also analyses the impact of tax reform over the period 2005/2006 – 2010/2011 on individual tax liability in South Africa which is then compared to the indices of some other countries. The results show that in comparison with other countries the tax burden in South Africa is extremely skewly distributed (a reflection of the skewness of the taxable income spread) but tax policy adjustments are gradually addressing this issue so that South Africa can become more in line with international trends. With the top marginal rate remaining at 40 percent very little can be done to expand the revenue base at the higher end of the scale. Therefore the solution lies at the lower and maybe in particular, the middle end of the scale to increase their tax liability. For too long these sections have received too little attention by simply assuming that their contribution is not significant and therefore not relevant to tax policy adjustments. The revenue base has to become more inclusive with more taxpayers registered on the SARS data base - a process which is now gaining momentum.

The distribution of the tax liability also shows disparity with the taxable income (and therefore tax liability) of females being far below that of males. Thus, in the workplace much more should be done to correct this imbalance which may not necessarily be part of tax policy but could be if tax incentives and expenditures are considered that could improve the labour market imbalances. Also, improving educational skills contributes not only towards finding jobs but also to increasing the proportional share of individuals with regard to the revenue base. Again, tax policy adjustments that enhance the quality of education would also be a positive investment for future

revenue collection.

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Appendix

Table 1: Personal Income Tax structure 2005/2006

Taxable income Brackets	Marginal Rates of Tax	
R0 – R80 000		18 % of each R1
R80 001 – R130 000	R14 400 +	25 % of the amount above R80 000
R130 001 – R180 000	R26 900 +	30 % of the amount above R130 000
R180 001 – R230 000	R41 900 +	35 % of the amount above R180 000
R230 001 – R300 000	R59 400 +	38 % of the amount above R230 000
R300 001 and above	R86 000 +	40 % of the amount above R300 000
Primary Rebate: R6 300		
Secondary Rebate: R10 800		
Tax thresholds for Below 65 years: R35 000		
Tax thresholds for 65 year and older: R60 000		

Source: South African National Treasury

Table 2: Sources of gross income, IES 1 September 2005 – 31 August 2006

Source	R (billion)		per cent
Income from work:	690.8		82.1
Salaries and wages		599.9	
Self-employment and business income		90.9	
Income from capital:	10.8		1.3
Interest received		4.2	
Dividends		1.6	
Rent income		4.9	
Royalties		0.1	
Private pensions and annuities:	24.3		2.9
Pensions from previous employment		19.8	
Annuities from own investment		4.5	
Social insurance and grants:	56.8		6.8
Old age and war pensions		25.3	
Disability grants		10.4	
Family and other allowances		20	
UIF, Workmen's Compensation		1.1	
Other income:	58.3		6.9 %
Alimony, palimony and other allowances		11.1	
Other income from individuals		3.9	
Benefits, donations and gifts, and cash labola		3.7	
Tax refunds received		1.7	
Other : Letting of fixed property, Annuities, Hobbies, Gratuities, Income from gambling		37.9	
Gross income (Excluding Imputed rent on owned) dwelling)	841		100

Source: Statistics South Africa (2008:9)

Table 3: Gender distribution

Gender	Distribution before imputation	Distribution after imputation
Male	47.1 %	47.17 %

Female	52.8 %	52.83 %
Non-response	0.1 %	
Total	**100 %**	**100 %**

Source: Authors calculation in SAS 9.2

Table 4: Racial distribution

Racial	Distribution before imputation	Distribution after imputation
African/Black	78.5 %	78.60 %
Coloured	13.6 %	13.64 %
Indian/Asian	1.6 %	1.56 %
White	6.2 %	6.20 %
Non-response	0.1 %	
Total	**100 %**	**100 %**

Source: Authors calculation in SAS 9.2

Table 5: Age group distribution

Age (years)	Distribution before imputation	Distribution after imputation
0 -4	10.25 %	10.27 %
5 -9	10.78 %	10.81 %
10 – 14	12.04 %	12.07 %
15 - 19	11.73 %	11.75 %
20 - 24	9.61 %	9.63 %
25 - 29	7.11 %	7.12 %
30 - 34	6.47 %	6.48 %
35 - 39	5.97 %	5.99 %
40 – 44	5.56 %	5.58 %
45 - 49	4.59 %	4.60 %
50 - 54	4.09 %	4.10 %
55 - 59	3.18 %	3.19 %
60 - 64	2.58 %	2.59 %
65 - 69	2.15 %	2.15 %
70 - 74	1.52 %	1.52 %
75 -79	1.11 %	1.11 %
80 -84	0.53 %	0.53 %
> 85	0.51 %	0.51 %
Non-response	0.23 %	
Total	**100 %**	**100 %**

Source: Authors calculation in SAS 9.2**.**

Table 6: Highest level of education distribution

Level of education	Distribution before imputation	Distribution after imputation
No schooling	20.67	20.81
Grade R	3.25	3.26
Grade 1	3.19	3.21
Grade 2	3.71	3.73
Grade 3	4.27	4.30

Grade 4	4.61	4.63
Grade 5	4.91	4.94
Grade 6	5.46	5.49
Grade 7	6.94	6.99
Grade 8	7.33	7.37
Grade 9	6.39	6.42
Grade 10	7.21	7.24
Grade 11	6.03	6.06
Grade 12	10.52	10.57
NTC I	0.09	0.09
NTC II	0.08	0.08
NTC III	0.26	0.26
Diploma/certificate with less than Grade	0.20	0.20
Diploma with less than Grade 12	0.26	0.26
Certificate with Grade 12	0.74	0.75
Diploma with Grade 12	2.00	2.01
Bachelors Degree	0.64	0.65
Bachelors Degree and Diploma	0.27	0.27
Honours Degree	0.25	0.25
Masters/ Doctorate Degree	0.16	0.16
Non-response	0.60	
Total	**100**	**100**

Source: Authors calculation in SAS 9.2

Table 7: Comparison of IES, MS model and SARS for the survey year 2005/2006

Data	Gross Income	Taxable Income	Tax Liability
IES Survey data	R841,000,000,000 *(Total population)*	n/a	R64,700,000,000
SARB *Compensation of employees*	R709,432,000,000 *(Total population)*		
MS Model	R 557,991,082,020 *(only taxpayers income)* R745,312,979,502 *(Total population income)*	R 533,484,867,329	R 103,912,670,991
SARS Tax Statistics	n/a	R 469,228,000,000	R95,994,000,000 *(Assessed)* R125,645,300,000 *(Actual collected)*

Source: Statistics South Africa (2008:12), Tax Statistics (2009:15, 36)

Table 8: Average Gross income

Taxable income group	SARS	IES	Scale factor
R0 – R80 000	R 48,064.02	R 56,294.00	0.854
R80 001 – R130 000	R 103,643.88	R 102,704.15	1.009
R130 001 – R180 000	R 150,840.37	R 153,224.20	0.984
R180 001 – R230 000	R 202,659.59	R 202,365.21	1.001
R230 001 – R300 000	R 261,202.39	R 260,355.87	1.003

R300 001 and above	R 558,246.47	R 571,723.34	0.976

Source: Authors calculation in SAS 9.2

Table 9: Comparison of MS model and SARS data by taxable income group

Taxable income group	Number		Taxable income		Tax liability	
	MS	**SARS**	**MS**	**SARS**	**MS**	**SARS**
R0 – R80 000	48 %	44 %	20 %	14 %	6 %	5 %
R80 001 – R130 000	26 %	28 %	22 %	24 %	15 %	16 %
R130 001 – R180 000	10 %	11 %	13 %	14 %	12 %	13 %
R180 001 – R230 000	4 %	6 %	7 %	9 %	7 %	10 %
R230 001 – R300 000	5 %	5 %	11 %	10 %	14 %	12 %
R300 001 and above	6 %	6 %	27 %	29 %	46 %	44 %

Source: Authors calculation in SAS 9.2

Table 10: Calculation of personal income tax base

Gross income
***Less*, Allowances**
Exclusions
- Entertainment expenses
- Telephone allowances
- Computer allowances
- Current pension fund contributions
- Provident fund contributions
- Medical fund contributions
- Donations
- Other allowance and expenses

Taxable income
- Calculate tax with tax tables

Gross Tax liability
***Less,* Rebates**
Net Tax liability

Source: Tax Statistics (2009:52)

Table 11: Allowance factor

Taxable income group	Allowance factor
R0 – R80 000	0.1085
R80 001 – R130 000	0.0458
R130 001 – R180 000	0.0348
R180 001 – R230 000	0.0184
R230 001 – R300 000	0.0087
R300 001 and above	0.0175

Source: Authors calculation in SAS 9.2

Table 12: Selected variables used for estimating personal income tax revenue

Abbreviation	Description	Transformation used
gdpn	gross domestic product at market prices	R millions current prices
pitrev	personal income tax as % of total revenue	Percentage
revgdp	total revenue as a percentage of gdp	Percentage
tax	personal income tax	pitrev/100*revgdp*100*gdpn
coe	compensation of employees	R millions current prices R millions current prices
propinc	property income	R millions current prices
tbinc	taxable income	coe + propinc

taxratio	tax ratio	tax(-1)/tbinc(-1)*100
dum	Structural break from 2000	

Source: South African Reserve Bank quarterly bulletin, various issues

Table 13: Elasticities

	Macro data	MS model data
Elasticity of tax liability to taxable income	1.13	1.56
Elasticity of taxable income to GDP	0.95	n/a
Elasticity of tax liability to GDP	1.07	n/a

*The adjusted co-efficients are statistically highly significant as their respective t-statistics are all larger than 1.96 in absolute value terms

Table 14: Number of taxpayers, taxable income and tax assessed by gender group

	SARS 2005/2006			MS 2005/2006		
Gender	**Number of taxpayers**	**Taxable income (R million)**	**Tax Liability (R million)**	**Number of taxpayers**	**Taxable income (R million)**	**Tax Liability (R million)**
Female	1,602,563	148,779	26,445	1,643,340	168,629	26,890
Male	2,204,423	292,729	69,549	2,715,035	364,840	77,023
Total	**3,806,986**	**441,507**	**95,994**	**4,358,375**	**533,469**	**103,913**

Source: Tax Statistics (2009:45), Authors calculation in SAS 9.2

Table 15: Number of taxpayers, taxable income and tax assessed by age group

	SARS 2005/2006			MS 2005/2006		
Age	**Number of taxpayers**	**Taxable income (R million)**	**Tax Liability (R million)**	**Number of taxpayers**	**Taxable income (R million)**	**Tax Liability (R million)**
< 18	19,385	680	85	25,788	1,750	173
18 - 24	120,729	7,494	994	190,324	16,676	2,394
25 - 34	889,692	98,218	19,051	1,282,385	127,747	20,991
35 - 44	1,128,305	145,646	32,072	1,250,625	151,173	28,450
45 - 54	860,828	113,828	26,821	1,001,748	142,527	30,980
55 - 64	492,607	55,941	13,506	513,579	81,649	19,217
> 65	295,440	19,701	3,464	93,926	11,947	1,707
Total	**3,806,986**	**441,507**	**95,994**	**4,358,375**	**533,469**	**103,913**

Source: Tax Statistics (2009:45), Authors calculation in SAS 9.2

Table 16: Racial group Number of taxpayers

Taxable income group	African/Black		Coloured		Indian/Asian		White		Total
R0 – R80 000	1,216,662	65 %	248,353	57 %	115,382	50 %	519,735	29 %	**2,100,132**
R80 001 – R130 000	454,401	24 %	118,571	27 %	46,867	20 %	533,581	29 %	**1,153,420**
R130 001 – R180 000	119,168	6 %	43,060	10 %	23,032	10 %	264,599	15 %	**449,859**
R180 001 – R230 000	35,404	2 %	9,182	2 %	22,952	10 %	107,813	6 %	**175,351**
R230 001 – R300 000	21,019	1 %	11,280	3 %	15,153	7 %	182,245	10 %	**229,697**
R300 001 and above	30,720	2 %	6,590	2 %	6,661	3 %	205,945	11 %	**249,916**
Total	**1,877,374**	43 %	**437,036**	10 %	**230,048**	5 %	**1,813,917**	42 %	**4,358,375**

Source: Authors calculation in SAS 9.2

Table 17: Racial group Taxable income

Taxable income group	(R millions)								
	African/Black		Coloured		Indian/Asian		White		Total
R0 – R80 000	60,605	40 %	12,493	32 %	5,983	22 %	28,504	9 %	**107,585**
R80 001 – R130 000	45,820	30 %	12,002	31 %	4,868	18 %	55,033	18 %	**117,722**
R130 001 – R180 000	17,671	12 %	6,393	16 %	3,508	13 %	40,160	13 %	**67,732**
R180 001 – R230 000	7,132	5 %	1,888	5 %	4,639	17 %	21,590	7 %	**35,249**
R230 001 – R300 000	5,467	4 %	2,902	7 %	4,133	15 %	47,533	15 %	**60,036**
R300 001 and above	16,396	11 %	3,542	9 %	3,926	15 %	121,279	39 %	**145,143**
Total	**153,091**	29 %	**39,221**	7 %	**27,057**	5 %	**314,100**	59 %	**533,469**

Source: Authors calculation in SAS 9.2

Table 18: Racial group Total Tax liability

Taxable income group	(R millions)								
	African/Black		Coloured		Indian/Asian		White		Total
R0 – R80 000	3,225	16 %	683	12 %	350	7 %	1,760	2 %	**6,018**

R80 001 – R130 000	6,036	29 %	1,588	28 %	644	13 %	7,256	10 %	**15,523**
R130 001 – R180 000	3,101	15 %	1,125	20 %	629	13 %	7,131	10 %	**11,986**
R180 001 – R230 000	1,526	7 %	409	7 %	992	20 %	4,579	6 %	**7,506**
R230 001 – R300 000	1,355	7 %	708	12 %	1,051	21 %	11,806	16 %	**14,919**
R300 001 and above	5,319	26 %	1,151	20 %	1,302	26 %	40,188	55 %	**47,960**
Total	**20,562**	20 %	**5,664**	5 %	**4,967**	5 %	**72,720**	70 %	**103,913**

Source: Authors calculation in SAS 9.2

Table 19: Education group Number of taxpayers

Taxable income group	No Education		Grade R - Grade 11		Grade 12		Other Qualification		Total
R0 – R80 000	41,491	74 %	809,305	78 %	701,908	52 %	547,428	28 %	**2,100,132**
R80 001 – R130 000	10,456	19 %	154,445	15 %	371,791	28 %	616,728	32 %	**1,153,420**
R130 001 – R180 000	629	1 %	31,287	3 %	122,450	9 %	295,493	15 %	**449,859**
R180 001 – R230 000	1,514	3 %	11,621	1 %	37,663	3 %	124,553	6 %	**175,351**
R230 001 – R300 000	1,370	2 %	12,633	1 %	61,064	5 %	154,629	8 %	**229,697**
R300 001 and above	368	1 %	16,989	2 %	42,487	3 %	190,071	10 %	**249,916**
Total	**55,829**	1 %	**1,036,280**	24 %	**1,337,363**	31 %	**1,928,902**	44 %	**4,358,375**

Source: Authors calculation in SAS 9.2

Table 20: Education group Taxable income

Taxable income group	No Education		Grade R - Grade 11		Grade 12		Other Qualification		Total
R0 – R80 000	994	26 %	15,202	21 %	37,619	27 %	63,908	20 %	**117,722**
R80 001 – R130 000	105	3 %	4,856	7 %	18,260	13 %	44,511	14 %	**67,732**
R130 001 – R180 000	293	8 %	2,361	3 %	7,462	5 %	25,133	8 %	**35,249**
R180 001 – R230 000	383	10 %	3,258	4 %	16,016	11 %	40,379	13 %	**60,036**
R230 001 – R300 000	127	3 %	7,979	11 %	25,850	18 %	111,187	35 %	**145,143**
R300 001 and above	1,949	51 %	39,084	54 %	36,637	26 %	29,915	9 %	**107,585**
Total	**3,851**	1 %	**72,740**	14 %	**141,845**	27 %	**315,033**	59 %	**533,469**

Source: Authors calculation in SAS 9.2

Table 21: Education group Tax liability

Taxable income group	No Education		Grade R - Grade 11		Grade 12		Other Qualification		Total
R0 – R80 000	120	28 %	1,924	23 %	4,885	20 %	8,594	12 %	**15,523**
R80 001 – R130 000	20	5 %	873	10 %	3,221	13 %	7,871	11 %	**11,986**
R130 001 – R180 000	61	14 %	506	6 %	1,580	6 %	5,359	8 %	**7,506**
R180 001 – R230 000	98	23 %	800	9 %	3,983	16 %	10,038	14 %	**14,919**
R230 001 – R300 000	36	8 %	2,506	29 %	8,627	35 %	36,791	52 %	**47,960**
R300 001 and above	89	21 %	1,914	22 %	2,121	9 %	1,893	3 %	**6,018**
Total	**425**	0.4 %	**8,522**	8.2 %	**24,418**	23.5 %	**70,547**	67.9 %	**103,913**

Source: Authors calculation in SAS 9.2

Table 22: Basic indicators for progressivity and redistribution 2005/2006 and 2010/2011 fiscal year

Income groups	Gini co-efficient for pre-tax income			Gini co-efficient for taxes			Gini co-efficient for post-tax income			Kakwani Index			RS index		
	2005/2006	2010/2011 1		2005/2006	2010/2011 2		2005/2006	2010/2011 3		2005/2006	2010/2011 4 = 2-1		2005/2006	2010/2011 5 = 1-3	
1	0.012	0.011	-8.3%	0.297	0.265	-10.8%	0.021	0.023	9.5%	0.285	0.254	-10.9%	-0.009	-0.012	33.3%
2	0.070	0.059	-15.7%	0.396	0.377	-4.8%	0.098	0.091	-7.1%	0.326	0.318	-2.5%	-0.028	-0.032	14.3%
3	0.122	0.104	-14.8%	0.464	0.449	-3.2%	0.151	0.137	-9.3%	0.342	0.345	0.9%	-0.029	-0.033	13.8%
4	0.156	0.161	3.2%	0.505	0.508	0.6%	0.216	0.224	3.7%	0.349	0.347	-0.6%	-0.060	-0.063	5.0%
5	0.224	0.231	3.1%	0.541	0.545	0.7%	0.255	0.266	4.3%	0.317	0.314	-0.9%	-0.031	-0.035	12.9%
6	0.443	0.468	5.6%	0.710	0.712	0.3%	0.379	0.404	6.6%	0.267	0.244	-8.6%	0.064	0.064	0.0%

Table 23: Comparison with some other countries

		Portugal	Spain	Panama	Colombia
		2001	**2001**	**2003**	**2003**
Gini for pre-tax income	1	0.422	0.399	0.538	0.537
Gini for taxes	2	0.694	0.6	0.739	0.894
Gini for post-tax income	3	0.387	0.36	0.534	0.513
Kakwani Index	4 = 2-1	0.272	0.201	0.201	0.357
RS index	5 = 1-3	0.035	0.039	0.004	0.024

Table 24: Inflation adjusted 2010/2011 with 10 brackets

Taxable income		Marginal rate	Fixed tax
-	12,265	17	-
12,266	24,529	18	2,085
24,530	36,794	19	4,293
36,795	49,059	20	6,623
49,060	73,588	21	9,076
73,589	98,118	31	14,227
98,119	122,647	42	21,831
122,647	171,706	43	32,134
171,707	196,235	44	53,229
196,236	-	45	64,022
Rebate:		**Threshold**	
Primary	6,439	Primary	37,873
Secondary	6,132	Secondary	73,949

Table 25: Inflation adjusted 2010/2011 reduced to 6 brackets

Taxable income		Marginal rate	Fixed tax
0	49,059	20	-
49,060	98,118	31	9,812
98,119	122,647	42	25,020
122,648	171,706	43	35,322
171,707	196,235	44	56,418
196,236		45	67,210
Rebate:		**Threshold**	
Primary	7,575	Primary	37,873
Secondary	7,215	Secondary	73,949

Table 26: Actual 2010/2011 Tax table

Taxable income		Marginal rate	Fixed tax
0	140,000	18	
140 001	221,000	25	25,200
221 001	305,000	30	45,450
305 001	431,000	35	70,650
431 001	552,000	38	114,750
>552 001		40	160,730
Rebate:		**Threshold**	
Primary	10,260	Primary	57,000
Secondary	5,675	Secondary	88,528

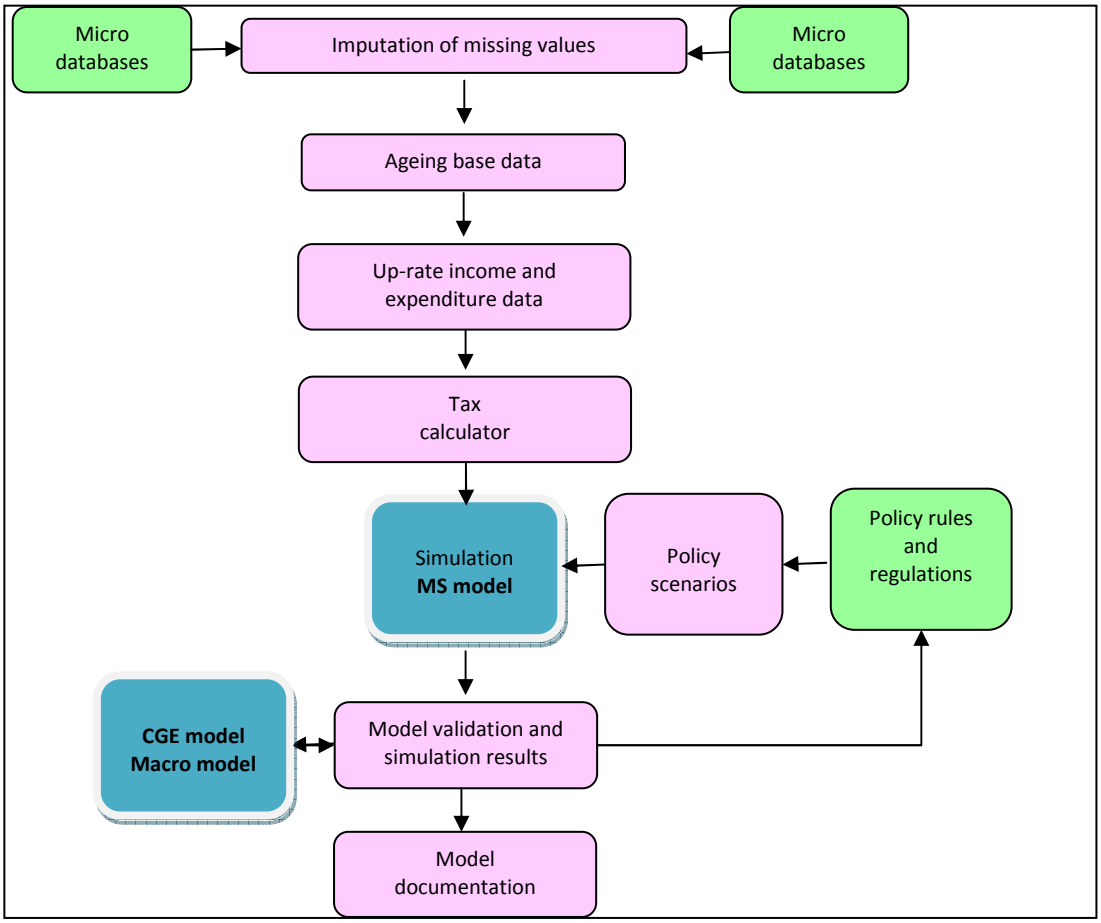
Table 27: Actual 2010/2011 fiscal year

2010/2011	Gini of taxes		No Taxpayers		Gross income		Taxable income		Tax Paid		Average Tax paid
0 – 140 000	0.256	36%	2,261,109	45%	223,180,629,573	18%	191,527,279,198	17%	11,094,372,345	5%	4,907
140 001 –221 000	0.376	53%	1,322,456	26%	246,705,151,218	20%	228,358,166,465	20%	30,307,235,664	13%	22,917
221 001 –305 000	0.45	63%	546,754	11%	143,952,329,202	12%	135,674,068,773	12%	23,600,306,930	10%	43,164
305 001 –431 000	0.508	71%	285,037	6%	102,125,077,633	8%	98,893,978,347	9%	21,352,028,935	9%	74,910
431 001 –552 000	0.545	77%	333,191	7%	163,446,927,794	13%	160,617,806,120	14%	41,245,312,749	17%	123,789
>552 001	0.712	100%	316,292	6%	350,293,019,870	28%	339,610,089,172	29%	113,561,563,548	47%	359,041
Total			**5,064,838**	**100%**	**1,229,703,135,289**	**100%**	**1,154,681,388,075**	**100%**	**241,160,820,171**	**100%**	

Table 28: Inflation adjusted 2010/2011 Fiscal year

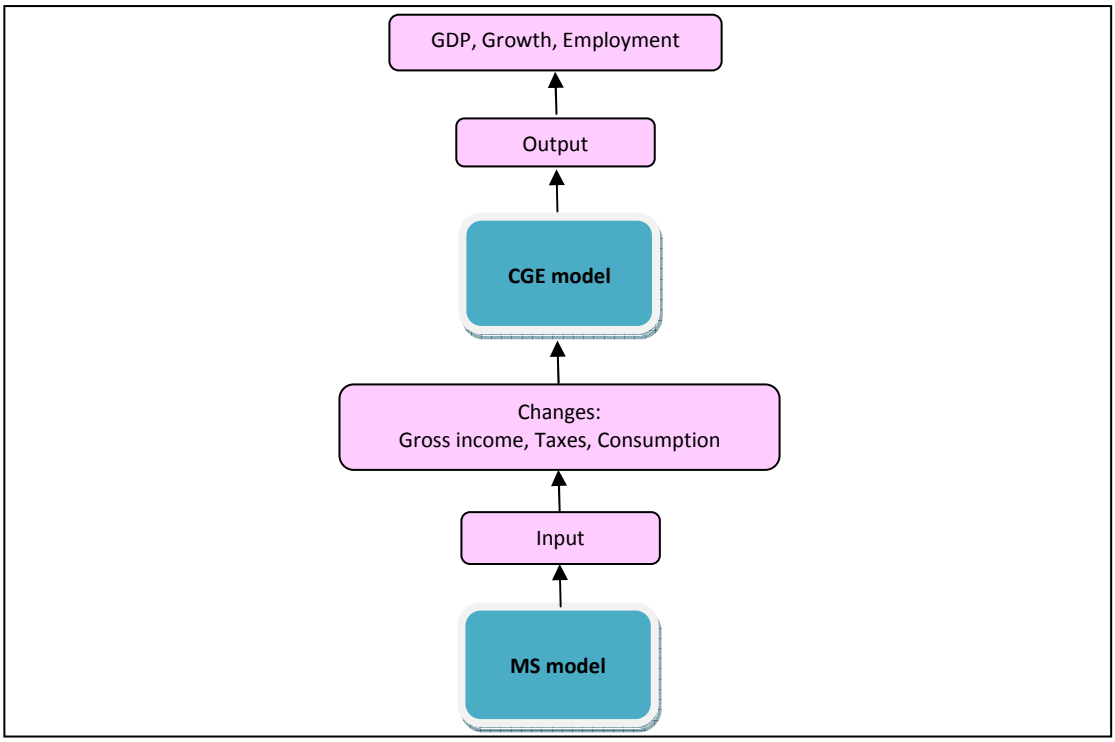
2010/2011	Gini of taxes		No Taxpayers		Gross income		Taxable income		Tax Paid		Average Tax paid
0 – 49 059	0.057	8%	850,475	12%	41,601,268,083	3%	37,128,629,174	3%	983,716,169	0%	1,157
49 060 –98 118	0.176	26%	2,766,359	39%	206,646,773,532	15%	191,475,751,527	15%	23,226,546,888	6%	8,396
98 119 –122 647	0.215	31%	270,794	4%	29,253,117,409	2%	27,570,211,742	2%	5,022,249,308	1%	18,546
122 648 –171 706	0.293	43%	908,421	13%	138,831,582,824	10%	134,563,541,518	10%	34,930,293,336	9%	38,452
171 707 –196 235	0.323	47%	524,764	7%	99,176,641,475	7%	97,121,556,588	8%	28,620,421,689	7%	54,540
>196 235	0.689	100%	1,805,490	25%	830,137,123,387	62%	804,820,326,145	62%	310,028,429,464	77%	171,714
Total			**7,126,304**	**100%**	**1,345,646,506,710**	**100%**	**1,292,680,016,694**	**100%**	**402,811,656,853**	**100%**	

Figure 1: Structure of an MS model



Source: Citro and Hanushek (1991:2-4).

Figure 2: MS model & Computable General Equilibrium (CGE) model bottom up approach



Source: Peichl, (2008:12).

Figure 3: Inflation adjusted and actual Gini co-efficient for 2010/2011