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RICE UNIVERSITY

PERSONAL WEALTH IN SOUTH AFRICA:
FACTS ABOUT ITS DISTRIBUTION
AND THE FORCES BEHIND ITS REDISTRIBUTION

by

JAN H VAN HEERDEN

A THESIS SUBMITTED
IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE DEGREE
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ABSTRACT

Personal Wealth in South Africa:
Facts about its Distribution
and the Forces behind its Redistribution

by

Jan Horn van Heerden

The Apartheid system in South Africa came to a close recently and a new majority government is ruling. This government represents a poor majority of the population, and there is great pressure on them to redistribute wealth in favor of their supporters, the poor.

This thesis consists of three essays. The first estimates the distribution of personal wealth in South Africa according to the estate multiplier method. It is found that the distribution is skewed, but not more so than in countries for which similar studies have been done. The distribution of wealth is, however, distributed along racial lines, which makes the distribution politically unacceptable. The white minority which constitutes 16 per cent of the total population, owns more than 90 per cent of all personal wealth.

The second part studies the major political role players in South Africa and their behavior in the Constitution making process that is still underway. A model of optimal behavior by political groups is constructed, and it is found that the majority government in South Africa will act rationally if they opt for majority rule in a unitary state. That is exactly what the ANC-government has been doing since the beginning of the negotiation process. The behavior of the other groups is also found to be rational and predictable within the context of the model.
The third part of the thesis consists of a computable general equilibrium model with overlapping generations. Three groups are modeled - a rich group, a middle class, and a poor group. A government implements three possible redistributive policy measures. First, the tax on the capital income which accrues to the two more affluent groups, is increased; second, an estate tax is implemented, and third, the sales tax is increased. The first policy measure improves upon the wealth distribution, but is inefficient. The second policy, which is implemented according to the lifetime endowment view of tax equity, generally improves upon the wealth distribution, and is relatively efficient under certain assumptions. The third policy may be very harmful to the poor.
ACKNOWLEDGEMENTS

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I must acknowledge my Creator, Jesus Christ, who gave me the strength and ability to finish this study.

I dedicate this thesis to my parents and my wife, Janie.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>List of Tables</td>
<td>viii</td>
</tr>
<tr>
<td>List of Figures</td>
<td>x</td>
</tr>
<tr>
<td><strong>Chapter</strong></td>
<td></td>
</tr>
<tr>
<td>1. Introduction</td>
<td>1</td>
</tr>
<tr>
<td>2. The Distribution of Personal Wealth in South Africa</td>
<td>5</td>
</tr>
<tr>
<td><strong>Background and Hypotheses</strong></td>
<td></td>
</tr>
<tr>
<td>Estimating the Distribution of Personal Wealth</td>
<td>7</td>
</tr>
<tr>
<td>The Estate Multiplier Method for South Africa</td>
<td></td>
</tr>
<tr>
<td>The Sample</td>
<td></td>
</tr>
<tr>
<td>The Distribution of Total Wealth in South Africa</td>
<td>14</td>
</tr>
<tr>
<td><strong>Inter and Intra Group Distribution of Wealth</strong></td>
<td></td>
</tr>
<tr>
<td>The Distribution of Wealth Within Race Groups</td>
<td>21</td>
</tr>
<tr>
<td>The Distribution of Wealth Across Age, Race and Gender</td>
<td></td>
</tr>
<tr>
<td>The Composition of Total Wealth in South Africa</td>
<td>24</td>
</tr>
<tr>
<td>Super Rich Wealth versus Average White Wealth</td>
<td></td>
</tr>
<tr>
<td>The Composition of White Wealth by Age</td>
<td></td>
</tr>
<tr>
<td>A Comparison between the Compositions of White and Black Wealth</td>
<td></td>
</tr>
<tr>
<td><strong>Conclusion</strong></td>
<td>27</td>
</tr>
<tr>
<td>3. The Political Roleplayers and the Constitutional Negotiation Process in South Africa</td>
<td>29</td>
</tr>
</tbody>
</table>
Decision Rules - Methods of Revealing Preference
Voice
Voting-with-the-Feet
Resistance

The Structures in which People make Decisions -
Different Forms of Government
The Unitary State
The Federal State

Rational Collective Choice
Rational Collective Choice with Certainty
A Poor Majority
A Rich Majority
A Rich or Poor Minority
   A Minority who Forms a Majority in One Region
   A Minority who Forms a Minority in Every Region
Summary
Rational Collective Choice with Uncertainty

The Proposals of the Major Negotiators for a New
Constitution in South Africa and the Interim Outcome
   The ANC-SACP-Cosatu-Alliance
   The National Party (NP)
   The Freedom Alliance

Conclusion

4. A General Equilibrium Model with Overlapping Generations for
   South Africa

Introduction

A Description of the Model
Consumer Behavior
Producer Behavior
Government Behavior
An Overview of Simulation Results
A Three-Period Model with Overlapping Generations
The Demand Side
Producer Behavior
Equilibrium
The Steady State
The Inclusion of a Government
  The Budget Constraint with an Income Tax
  The Budget Constraint with a Personal Cash Flow Tax
  A Retail Sales Tax and the Comparison with a
    Personal Cash Flow Tax
  A Wealth Tax and an Estate Tax
  The Intertemporal Budget Constraint with all the
    Possible Taxes
  An Unexpected Policy Change by Government

A 51-Period General Equilibrium Model with Eleven
Overlapping Generations and Three Groups
The Demand Side
The Supply Side
The Role of Government in the Overlapping Generations
  Model
Equilibrium
The Steady State

The Welfare Effects of a Policy Change
Calibrating the Model

Simulation Results
  An Increase in the Capital Income Tax
  The Implementation of an Estate Tax
  An increase in the general sales tax

5. Conclusion

Bibliography
## LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Mortality Multipliers by Race, Age Group and Gender</td>
<td>14</td>
</tr>
<tr>
<td>3.</td>
<td>Total Wealth of Living Population (in Millions of 1985 Rand)</td>
<td>16</td>
</tr>
<tr>
<td>4.</td>
<td>Estate Sizes by Race (per cent)</td>
<td>17</td>
</tr>
<tr>
<td>5.</td>
<td>Gini-Coefficients for Various Countries</td>
<td>19</td>
</tr>
<tr>
<td>6.</td>
<td>Wealth Distributions within Racial Groups</td>
<td>21</td>
</tr>
<tr>
<td>7.</td>
<td>Optimal Decision Rules and State Forms</td>
<td>41</td>
</tr>
<tr>
<td>8.</td>
<td>Overlapping Generations for Three Periods</td>
<td>61</td>
</tr>
<tr>
<td>9.</td>
<td>Overlapping Generations for 25 Periods</td>
<td>75</td>
</tr>
<tr>
<td>10a.</td>
<td>Steady State Consumption (Rich Group)</td>
<td>91</td>
</tr>
<tr>
<td>10b.</td>
<td>Consumption with Unexpected and Unadjusted Capital Income Tax</td>
<td></td>
</tr>
<tr>
<td>10c.</td>
<td>Ratio of Consumption: After-tax/Before-tax</td>
<td></td>
</tr>
<tr>
<td>10d.</td>
<td>Ratio of Consumption: Poor Group Unadjusted Capital Income Tax</td>
<td>92</td>
</tr>
<tr>
<td>Table</td>
<td>Description</td>
<td>Page</td>
</tr>
<tr>
<td>-------</td>
<td>------------------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>11a</td>
<td>Ratio of Consumption: Rich Group (Estate Tax)</td>
<td>96</td>
</tr>
<tr>
<td>11b</td>
<td>Ratio of Consumption: Poor Group (Estate Tax)</td>
<td></td>
</tr>
<tr>
<td>11c</td>
<td>Ratio of Consumption: Rich Group (Estate Tax - one period warning)</td>
<td></td>
</tr>
</tbody>
</table>
# LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Lorenz Curves for Total Transvaal Population</td>
<td>18</td>
</tr>
<tr>
<td>2a.</td>
<td>Distribution of Total Wealth by Race (zero wealth for non-reporters)</td>
<td>20</td>
</tr>
<tr>
<td>2b.</td>
<td>Distribution of Total Wealth by Race (non-reporters prop. have same wealth as reporters)</td>
<td>20</td>
</tr>
<tr>
<td>3.</td>
<td>The Ranking of Groups by Wealth per Capita</td>
<td>22</td>
</tr>
<tr>
<td>5.</td>
<td>Assets of Whites by Age</td>
<td>25</td>
</tr>
<tr>
<td>6.</td>
<td>Ownership of Assets among Whites, by Age</td>
<td>26</td>
</tr>
<tr>
<td>7.</td>
<td>A Comparison between White and Black Wealth</td>
<td>27</td>
</tr>
<tr>
<td>8.</td>
<td>Two Lifetime Earnings Profiles</td>
<td>50</td>
</tr>
<tr>
<td>9.</td>
<td>Government Revenues</td>
<td>88</td>
</tr>
<tr>
<td>10.</td>
<td>Growth in the Total Capital Stock</td>
<td>89</td>
</tr>
<tr>
<td>11a.</td>
<td>Welfare Effects of Increased Capital Income Tax on Rich</td>
<td>93</td>
</tr>
<tr>
<td>11b.</td>
<td>Welfare Effects of Increased Capital Income Tax on Poor</td>
<td>94</td>
</tr>
<tr>
<td>12.</td>
<td>Growth in total capital stock</td>
<td>95</td>
</tr>
<tr>
<td>Figure</td>
<td>Description</td>
<td>Page</td>
</tr>
<tr>
<td>--------</td>
<td>-----------------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>13a.</td>
<td>Welfare Effects of a New Estate Tax (Rich)</td>
<td>98</td>
</tr>
<tr>
<td>13b.</td>
<td>Welfare Effects of a New Estate Tax (Poor)</td>
<td></td>
</tr>
<tr>
<td>13c.</td>
<td>Welfare Effects of Estate Tax: One Period Warning vs Surprise (Rich)</td>
<td>99</td>
</tr>
<tr>
<td>13d.</td>
<td>Welfare Effects of Estate Tax: One Period Warning vs Surprise (Poor)</td>
<td>100</td>
</tr>
<tr>
<td>14a.</td>
<td>Welfare Effects of an Increased Sales Tax (Rich)</td>
<td>101</td>
</tr>
<tr>
<td>14b.</td>
<td>Welfare Effects of an Increased Sales Tax (Poor)</td>
<td></td>
</tr>
<tr>
<td>14c.</td>
<td>Welfare Effects of an Increased Sales Tax: One Period Warning vs Surprise (Rich)</td>
<td>102</td>
</tr>
<tr>
<td>14d.</td>
<td>Welfare Effects of an Increased Sales Tax: One Period Warning vs Surprise (Poor)</td>
<td>103</td>
</tr>
</tbody>
</table>
CHAPTER 1

INTRODUCTION

The Apartheid system which marked institutionalized privileges for the white minority in South Africa came to a close with multi-racial elections in April of 1994. The legacy of a skewed distribution of wealth left behind by the system is a burden that needs to be dealt with. Massive political pressure has been put on the new government to find quick solutions to the problem of poverty in the country. However, the government is restricted by the fact that taxpayers are already paying very high income as well as indirect taxes. The government is left either to borrow funds to be used in development programs to benefit the poor, or to find new sources of taxation. This study tests the hypotheses that the wealth distribution in South Africa is very highly skewed and is determined along racial lines. Also I consider whether general tax reform, including estate tax reform, is necessary for South Africa.

The study consists of three parts. In Chapter 2 the distribution of personal wealth in South Africa is estimated by the estate multiplier method. In Chapter 3 a short analysis is developed of the constitution making process in South Africa. Finally in Chapter 4 a general equilibrium model for possible redistribution policies by the government is developed and simulated.

A strong perception exists among all South Africans that the wealth distribution in South Africa is very skewed and that it is determined along racial lines. A black majority
government has taken power recently and is under political pressure to redistribute wealth. The accuracy of the perception that the wealth distribution is highly skewed is tested in Chapter 2.

In Chapter 3 I attempt to explain the behavior of the major political parties and groups in the constitution making process currently underway in South Africa. An interim constitution has been negotiated for the first five post-Apartheid years (1994-1999). During this period a government of national unity will govern, and will negotiate a 'permanent' constitution¹. Imagine what would happen if the United States of America could start over and draw up a new constitution. Different groups choose representatives at the ballot box to take part in drawing up a constitution. Rational behavior for a group is to encourage their representatives to secure in such a constitution for them as many privileges as possible. A group is said to behave rationally if its members act in a way that will maximize its own welfare, given certain exogenous constraints. A typical political group will have to choose a suitable form of state - a federation or a unitary state. Another choice is between the type of decision rules by which the country should be governed. Should it be majority rule, unanimity rule, or even a benevolent despot? The political system of the United States is taken for granted by most Americans. But would they choose the same system if they could start over?

A simple model of rational behavior for a few representative political groups in any country is derived. The model is applied to South Africa by explaining the

¹The Constitution will be permanent in the sense that it will be hard to change the contents after it has been accepted by all the negotiating parties in South Africa.
behavior and the constitutional proposals of the major negotiating groups. The aim is to understand the behavior of a political group regarding the economic power that it may gain. What will be its attitude towards the private ownership of property, redistribution of wealth, and governmental intervention in the market? It is necessary not only to define and understand the political subjects in South Africa, but also the economic wealth that they will try to control.

The third part of the thesis describes a dynamic general equilibrium model for South Africa, and simulates the model for different policy regimes by the government. There are three consumer groups, each consisting of eleven overlapping generations in each period of the model. The groups are defined to have different levels of wealth: there is a rich group, a middle class, and a poor group. Each consumer maximizes lifetime utility subject to an intertemporal budget constraint. There is one utility function for each person, which depends upon the consumption of one commodity that is consumed in each of the eleven periods. The three consumer groups have the same preferences which is assumed to have CES properties. Borrowing and lending for consumption purposes are possible in all periods except the last one.

The consumers are the owners of both factors of production, namely labor and capital, and all the factor payments made by producers are consequently received by the consumers. One commodity is produced according to a constant returns to scale, Cobb-Douglas technology in each period. Competitive firms minimize cost in each period, while meeting the demand of the consumers. This is a consequence of the assumption of constant returns to scale where profits are maximized at a zero level.
A costless government operates in the economy and its aim is to improve upon the skewed distribution of wealth that is described in Chapter 2, by increasing the tax on capital income, by implementing an estate tax, or by increasing the sales tax. The government returns its tax revenue in the form of equal transfers to the poor consumers. These policy regimes are simulated in the third part of the thesis, and then welfare changes are calculated by group and by generation.
CHAPTER 2

THE DISTRIBUTION OF PERSONAL WEALTH IN SOUTH AFRICA

Background and Hypotheses

Many studies have been done on the overall distribution of income in South Africa, but no complete study of the distribution of personal wealth. A few studies were done for large countries such as the United States, Canada and the United Kingdom, but very few have been done for smaller countries like South Africa. To my knowledge, only a partial study was conducted in the early eighties for the province of Natal, but it cannot be considered as representative for the country as a whole.

Knowledge of the distribution of wealth has become very important in the new South Africa. If the current distribution is not skewed, no redistribution would be necessary. Contentions are made that ten per cent of the nation owns approximately ninety per cent of all wealth. This might be "normal" in other capitalist countries, but in South Africa the distribution of wealth is determined along racial lines. The white minority constituting approximately 16 per cent of the total population, has ruled over the black majority by force for decades and has institutionalized racial differences in affluence. For example, since 1913 blacks were prohibited from owning land in "white" areas constituting 87 per cent of the total area of the country. White laborers were allowed to bargain collectively, and minimum wages were determined for them, while blacks were not given such opportunities until the early 1980s. The result was the exploitation of black labor on
a large scale, with adverse effects on their ability to acquire wealth. Wealth has been accumulated by whites at the expense of others as a direct consequence of the Apartheid system, and this wealth could be taxed and redistributed in the form of public services such as education and health care.

Once the distribution of wealth is known, and if it is skewed, optimal policy measures of redistribution may be determined. It will also reveal the nature of the wealth in the hands of South Africans, and identify the owners. For example, if individuals have put their wealth into real estate, taxes on land or property could be introduced as redistributive measure. Before any policies are put into place, however, more information is needed about the composition and ownership of the wealth.

Also, information on the personal distribution of wealth can contribute much to the ongoing debate on tax reform in South Africa. Vast amounts of money are needed to build schools and provide the necessary infrastructure throughout the country. While the former white government provided high quality public services to white taxpayers, the policy under the new majority government is to provide equal levels of public services to everybody in the country. As the white minority has always been receiving superior quality services, the fundamental goal of the new government cannot be accomplished without some degree of redistribution of wealth. Additional taxes will have to be raised, and as high income and value added taxes are already a fact, new sources of revenue will have to be found. Personal wealth emerges as a strong contender for taxation.

According to McGrath (4), "personal wealth must be distinguished from the total wealth of a nation which would also include the net worth of the company and public
sectors. Personal wealth may be defined as consisting of physical assets such as houses and other consumer durables, and claims on other sectors, net of liabilities to those sectors."

The method used to estimate the distribution of personal wealth in South Africa reveals the types and magnitudes of wealth held by private individuals. It reveals whether there is room for levying some form of wealth tax that has not been used until now, or whether reform of the existing estate tax can generate sufficient income for the State. Two hypotheses are tested in Chapter 2:

(i) The distribution of wealth in South Africa is abnormally skewed in comparison with other countries in the world.

(ii) Wealth is owned disproportionately by whites.

**Estimating the distribution of personal wealth**

How does one estimate the distribution of personal wealth of a country? A random sample from the total population of a country needs to be drawn and the wealth distribution of the population inferred from the sample statistics. "One technique, which has been used occasionally in Britain, America and Canada, is to conduct sample surveys of households which ask about the ownership of wealth directly" (McGrath 6). These samples can be stratified to cover the whole population. A random sample from the population would be found from a list of the total population, and people would be interviewed to determine their personal wealth. Disadvantages of the sample survey method are low response rates and substantial understatement of the wealth of those who do respond, resulting in an underestimation of total wealth and of the extent of concentration among top wealth
holders. (Atkinson & Harrison 15).

"A second approach would be to infer the distribution of personal and total wealth from the distribution of the income from that wealth, with the data on income from wealth being obtained directly from surveys or income-tax returns" (McGrath 6). If the rate of return on an asset is 10 per cent, for example, and a person's income from it is $50, the person has assets worth $500. This technique is sensitive to variations in the rates of return from which the yield multipliers are derived, and the assumptions made about these rates may influence the estimate of the distribution of wealth significantly.

A third approach, which is used in this study, is the estate multiplier method. It is based on the accounts submitted for estate duty. The distribution of values of deceased estates is extrapolated into an estimated distribution of wealth among living persons, by using estate multipliers which are derived from the reciprocals of mortality rates for appropriate sub-groups of the population.

The simplest case with this method would be to assume that death draws a random sample from the living population. The personal wealth of everybody that dies in a specific year would be used as a random sample of all wealth. The mortality rate for a population is the ratio of the number of deaths to living persons in the population, \( R = \frac{D}{L} \), where \( R \) is the mortality rate and \( D \) and \( L \) are the number of deaths and living persons respectively. The inverse of \( R \) is the mortality multiplier. It follows that the living population is \( L = \frac{D}{R} \). If, for example, one per cent of all people in a country die every year, and their total wealth amounts to one million dollars, then the estimate of total wealth in the country would be one hundred million dollars.
If the mean probability of death for all individuals in a nation is around 0.01 per year, there is a 1 per cent sample available of the population each year (Smith 156). The simple example above is not quite relevant, since death is not a random event and is not necessarily representative of the living population under consideration. An elderly person has a higher probability to die than a young person. Gender, race, social class, marital status, place of residence, and even total family wealth may also influence mortality rates. In this study three characteristics were used to determine mortality multipliers, viz., age, gender and race.

The Estate Multiplier Method for South Africa

This study was conducted for 1985 for the province of the Transvaal. Was the wealth distribution in the Transvaal a good estimate of the distribution in the country at large? The former Transvaal had 46 per cent of the total population of South Africa. Its population was heterogeneous since the province contained some of the country’s poorest as well as richest regions, and included six of the ten major African tribes in South Africa. The Transvaal had 34 per cent of the agricultural units in the country, while containing 17 per cent of the total area devoted to agriculture. Its wealth distribution is therefore a good proxy for the distribution of wealth in the country at large.

In South Africa people who inherit private property through a written will, can receive their inheritance only with the permission of the Master of the Supreme Court of

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¹The country was divided into 9 new provinces during 1994, but all the information about the former Transvaal is still kept in the same locations as before.
the province in which they reside. All such wealth is therefore recorded and the
information stored in a central location in each province. Decedents' wealth statistics are
therefore obtainable from four places in the country. In particular, data on testate estates
of all races in South Africa\(^2\) are obtainable from the abovementioned estate accounts which
are lodged at the offices of the Masters of the Supreme Court in the four former provinces.

The Masters of the Supreme Court supply information to the Receiver of Inland
Revenue. These data could have been used directly to estimate the distribution of wealth
if they were processed in a suitable form. Unfortunately, the only tabulations which are
available fail to distinguish between race, gender and age groups. The researcher is thus
forced to consult the actual estate accounts in the Supreme Courts. (McGrath 8).

There is a critical qualification to be made to the ideal scenario about the
availability of data sketched out above: it is not customary for blacks to leave written wills
at death. Black South Africans are treated under the Indigenous Law of South Africa,
which allows Africans to live according to their own customs and culture, within the
westernized society of South Africa. An example is polygamy, which is allowed among
blacks in rural areas, while it is outlawed in the rest of South Africa.

Also, black South Africans are allowed to transmit their wealth according to
traditional African culture. According to this culture the wealth belongs to the family, and
the patriarch is the manager of the wealth. When he dies, the eldest son becomes the sole

\(^2\)South Africa has four different race groups, namely whites, blacks, coloreds and
asians, and everybody used to be classified according to one of these. "Blacks" refer to
native Africans; asians refer to immigrants from India; whites to former Europeans,
and coloreds refer to a mix between the other races.
executor of the wealth, and has the responsibility to take care of the family. The wealth need not to be recorded at the office of the Master of the Supreme Court. Only a few blacks that died in 1985 had left written wills.

Blacks usually leave their bequests according to traditional customs, and their wealth is not generally recorded for estate tax purposes, unlike the other three racial groups for whom registration of bequests is mandatory. However, there is some documentation of Black wealth. In testate cases their wealth is recorded in the same way as the other racial groups and all the relevant files were consulted for this study. Intestate wealth is recorded when families have a dispute over the wealth of the deceased, or whenever family members experience problems with obtaining their rightful shares of wealth. Funds often sit in a bank account and can be claimed by the legal heirs through the South African district courts.

Consequently, blacks frequently decide to make use of the justice system to adjudicate the rightful ownership of inherited wealth. Approximately 40 per cent of this intestate wealth was recorded in 1985. Data on intestate estates of blacks are lodged in decentralized offices of district Commissioners throughout the provinces. This renders the data on black wealth much harder to obtain than the other three racial groups.

The year 1985 was chosen for a variety of reasons. It was the last year in which a general census was conducted for South Africa and actual population statistics could be utilized to calculate the necessary estate multipliers. The most recent complete set of documents of deceased persons' wealth that is available is the set of 1988 files. A 1988 study could be performed, but the marginal benefit of using the 1988 files did not seem to
outweigh the cost of using estimated population statistics.

The second reason for using 1985 data was because the Estate Tax Law in South Africa changed shortly thereafter. Until then, the Law required that estates of more than R50,000 had to be handled by attorneys or registered financial institutions for estate tax purposes. The wealth of these estates was documented formally according to prescribed rules, and the data extracted from such documents were quite reliable. Estates smaller than R50,000 were exempt from estate tax and the wealth bequeathed was generally reported by the inheritors themselves. The margin was raised to one million Rand after 1985, with the result that most people no longer have to pay estate tax, and are allowed to file their own estate tax reports. The data in the files after 1985 are less reliable as a measure of true wealth.

The Sample

All the estate accounts of whites, coloards and asians reported during 1985 in the Transvaal were consulted, those deceased between mid-1984 and mid-1985. Files registered late, representing earlier deaths, were ignored. Close to 17,000 testate files were consulted, and a few core statistics recorded, namely gender, age, race and net worth. In a second round of data collection, more detailed information about the composition and magnitudes of assets and liabilities was gathered for all groups. The entire number of black testate files were studied, as well as random samples drawn from all the age groups and other racial groups. Finally, the files of the 300 richest estates were also studied in detail

\[^{3}\text{In 1985 one US dollar was equal to 2.22 South African Rand}\]
to determine the differences in the composition of wealth of the very rich and the overall population.

The information so obtained allows one to assess the total wealth of the different racial groups, different age groups, as well as the richest 2.5 per cent of the population.

Since black wealth was reported in 69 magistrates' districts throughout the province, time and financial constraints made it impossible to consult all the files on black wealth. To obtain a reliable estimate of black wealth in the Transvaal, a random sample of six magistrates' districts was drawn from all the districts in the province, namely, Carolina, Cullinan, Kempton Park, Louis Trichardt, Naboomspruit, and Witbank. All the information on intestate wealth that had been reported by blacks in these districts in 1985, was recorded. Three of the six districts had good data, while the rest had already discarded their 1985 files at the time of data collection in 1994. To get some idea of the affluence of those districts, we took the second best option and recorded more recent data. The data from 600 intestate black files of 1985 and 600 1993 files from the city of Pretoria were recorded to enlarge the sample of black files. Approximately 40 per cent of the wealth of black persons that had died in 1985 in the abovementioned districts, was reported to the District Attorneys, or the Master of the Supreme Court.

The final sample of the wealth of all racial groups consisted of 18,519 units of data. Other documents that were consulted contained insufficient information, and were discarded. Some files did not contain any vital statistics of the deceased persons, or some

---

4 Magistrates' districts in South Africa are like the Counties in the United States.
of the deceased had died much earlier than 1985. The information from these files was ignored.

The Distribution of Total Wealth in South Africa

Once all the documents had been identified, they were classified into 56 groups. The data were divided into four racial groups, seven different age groups, and two genders. Mortality multipliers for all the sub-groups were then used to estimate the total wealth distribution of the living population. The mortality multipliers were obtained from the Central Statistical Services in Pretoria, a government institution. Each multiplier is the number of living persons in a group, divided by the number of people that died, in a

Table 1

<table>
<thead>
<tr>
<th>Age</th>
<th>Gender</th>
<th>Asians</th>
<th>Blacks</th>
<th>Coloreds</th>
<th>Whites</th>
</tr>
</thead>
<tbody>
<tr>
<td>15-24</td>
<td>M</td>
<td>678.78</td>
<td>267.51</td>
<td>414.68</td>
<td>602.08</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>1889.90</td>
<td>696.67</td>
<td>932.38</td>
<td>1694.65</td>
</tr>
<tr>
<td>25-34</td>
<td>M</td>
<td>407.64</td>
<td>126.12</td>
<td>130.31</td>
<td>460.15</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>573.98</td>
<td>325.55</td>
<td>317.56</td>
<td>1066.98</td>
</tr>
<tr>
<td>35-44</td>
<td>M</td>
<td>248.17</td>
<td>84.72</td>
<td>108.10</td>
<td>259.58</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>558.39</td>
<td>172.68</td>
<td>203.04</td>
<td>545.64</td>
</tr>
<tr>
<td>45-54</td>
<td>M</td>
<td>91.61</td>
<td>51.81</td>
<td>54.85</td>
<td>115.66</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>141.41</td>
<td>93.98</td>
<td>100.37</td>
<td>207.81</td>
</tr>
<tr>
<td>55-64</td>
<td>M</td>
<td>41.42</td>
<td>28.50</td>
<td>30.33</td>
<td>46.40</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>60.41</td>
<td>57.93</td>
<td>38.20</td>
<td>89.51</td>
</tr>
<tr>
<td>65-74</td>
<td>M</td>
<td>15.15</td>
<td>18.42</td>
<td>17.15</td>
<td>22.40</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>22.91</td>
<td>33.27</td>
<td>24.04</td>
<td>39.78</td>
</tr>
<tr>
<td>75+</td>
<td>M</td>
<td>5.69</td>
<td>14.83</td>
<td>11.93</td>
<td>10.63</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>7.75</td>
<td>20.10</td>
<td>11.64</td>
<td>13.72</td>
</tr>
</tbody>
</table>

particular year. The multipliers are given in Table 1. The inverse of an entry in the Table gives the probability that someone from that group would die in 1985. There are considerable differences in the probabilities of death between the various groups. Younger persons obviously have longer life expectancies than the elderly, but some more interesting results are evident from Table 1. Women have longer life expectancies than men; whites and asians up to the age of 65 also have much higher life expectancies than coloreds and blacks. It will become clear that the former groups are more affluent than the latter. The multiplier for each group is then multiplied by the recorded wealth for each group, i.e., the total wealth of all the deceased persons in each group. The product of the multiplier and group wealth gives the total wealth of all the living persons of that group. In Table 2

<table>
<thead>
<tr>
<th>Age</th>
<th>Gender</th>
<th>Asians</th>
<th>Blacks</th>
<th>Coloreds</th>
<th>Whites</th>
</tr>
</thead>
<tbody>
<tr>
<td>15-24</td>
<td>M</td>
<td>2,847</td>
<td>1,230</td>
<td>2,094</td>
<td>18,735</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>2,100</td>
<td>1,200</td>
<td>428</td>
<td>8,092</td>
</tr>
<tr>
<td>25-34</td>
<td>M</td>
<td>9,619</td>
<td>2,161</td>
<td>3,251</td>
<td>47,968</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>952</td>
<td>1,430</td>
<td>184</td>
<td>21,079</td>
</tr>
<tr>
<td>35-44</td>
<td>M</td>
<td>18,480</td>
<td>2,663</td>
<td>6,324</td>
<td>65,826</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>9,888</td>
<td>2,260</td>
<td>508</td>
<td>28,970</td>
</tr>
<tr>
<td>45-54</td>
<td>M</td>
<td>36,487</td>
<td>4,586</td>
<td>1,668</td>
<td>62,746</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>3,742</td>
<td>1,598</td>
<td>408</td>
<td>30,916</td>
</tr>
<tr>
<td>55-64</td>
<td>M</td>
<td>28,464</td>
<td>2,819</td>
<td>1,751</td>
<td>73,709</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>17,592</td>
<td>1,831</td>
<td>3,378</td>
<td>43,489</td>
</tr>
<tr>
<td>65-74</td>
<td>M</td>
<td>46,963</td>
<td>3,148</td>
<td>2,224</td>
<td>58,872</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>16,630</td>
<td>1,491</td>
<td>1,005</td>
<td>36,983</td>
</tr>
<tr>
<td>75+</td>
<td>M</td>
<td>13,167</td>
<td>2,647</td>
<td>1,609</td>
<td>74,329</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>7,032</td>
<td>1,492</td>
<td>1,876</td>
<td>39,025</td>
</tr>
</tbody>
</table>

All the numbers are given in South African Rand (constant 1985 prices).
the average measured wealth for each group is reported, while Table 3 gives the total wealth for the living groups. Each entry in Table 3 is the product of the entries in Tables 1 and 2, and the number of deaths in each group.

The hypotheses I am testing is first that the wealth distribution in South Africa is abnormally skewed, relative to the rest of the world, and, second, that the distribution is highly unequal by racial groups. For the wealth distribution in the Transvaal, whites, who made up 36.3 per cent of the population in 1985, owned up to 91.01 per cent of total wealth. Blacks, who constituted 58.6 per cent of the population, owned between 7.46 and 15 per cent of total wealth. The other two groups constituted 5.14 per cent of the population and owned between 1.53 and 5.2 per cent of the wealth (see Figure 2).

Table 3

<table>
<thead>
<tr>
<th>Age</th>
<th>Gender</th>
<th>Asians</th>
<th>Blacks</th>
<th>Coloreds</th>
<th>Whites</th>
</tr>
</thead>
<tbody>
<tr>
<td>15-24</td>
<td>M</td>
<td>36.714</td>
<td>582.953</td>
<td>63.385</td>
<td>4,038.149</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>27.787</td>
<td>609.511</td>
<td>13.566</td>
<td>1,727.896</td>
</tr>
<tr>
<td>25-34</td>
<td>M</td>
<td>98.024</td>
<td>820.738</td>
<td>66.502</td>
<td>9,380.927</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>10.387</td>
<td>511.702</td>
<td>4.145</td>
<td>4,160.818</td>
</tr>
<tr>
<td>35-44</td>
<td>M</td>
<td>151.348</td>
<td>666.510</td>
<td>84.088</td>
<td>11,260.417</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>82.816</td>
<td>536.696</td>
<td>7.423</td>
<td>4,900.271</td>
</tr>
<tr>
<td>45-54</td>
<td>M</td>
<td>183.845</td>
<td>756.244</td>
<td>15.734</td>
<td>7,721.683</td>
</tr>
<tr>
<td>55-64</td>
<td>M</td>
<td>80.174</td>
<td>261.347</td>
<td>9.295</td>
<td>6,723.995</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>54.202</td>
<td>199.753</td>
<td>20.908</td>
<td>4,414.139</td>
</tr>
<tr>
<td>65-74</td>
<td>M</td>
<td>59.747</td>
<td>172.215</td>
<td>6.177</td>
<td>3,442.258</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>22.864</td>
<td>104.922</td>
<td>3.552</td>
<td>2,814.670</td>
</tr>
<tr>
<td>75+</td>
<td>M</td>
<td>5.242</td>
<td>64.241</td>
<td>1.804</td>
<td>1,902.612</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>3.271</td>
<td>55.329</td>
<td>3.364</td>
<td>1,871.838</td>
</tr>
</tbody>
</table>

All the numbers in millions of South African Rand (constant 1985 prices).
Table 4 shows the sizes of estates, and the percentages of the four racial groups that lay within the various wealth categories. 72.22 per cent of blacks reported total wealth of less than R5,000 in 1985, while 72 per cent of whites reported more than R5,000. Whites are clearly the most affluent group after the asians, while the coloreds and blacks are much poorer. 19.44 per cent of whites had estates larger than R100,000, while only 0.34 per cent of all blacks, and 2.01 per cent of all coloreds fell into this category. As the analysis

Table 4

<table>
<thead>
<tr>
<th>Estate Size (Rands)</th>
<th>Asians</th>
<th>Blacks</th>
<th>Coloreds</th>
<th>Whites</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-4999</td>
<td>26.94</td>
<td>72.22</td>
<td>54.03</td>
<td>28.12</td>
</tr>
<tr>
<td>5,000-24,999</td>
<td>32.84</td>
<td>23.43</td>
<td>32.66</td>
<td>21.94</td>
</tr>
<tr>
<td>25,000-49,999</td>
<td>16.24</td>
<td>2.75</td>
<td>8.06</td>
<td>13.14</td>
</tr>
<tr>
<td>50,000-74,999</td>
<td>6.64</td>
<td>0.66</td>
<td>2.82</td>
<td>10.23</td>
</tr>
<tr>
<td>75,000-99,999</td>
<td>5.54</td>
<td>0.61</td>
<td>0.4</td>
<td>7.14</td>
</tr>
<tr>
<td>100,000-149,999</td>
<td>4.80</td>
<td>0.11</td>
<td>0.4</td>
<td>7.97</td>
</tr>
<tr>
<td>150,000-249,999</td>
<td>3.32</td>
<td>0.06</td>
<td>0.4</td>
<td>5.85</td>
</tr>
<tr>
<td>250,000-499,999</td>
<td>3.32</td>
<td>0.17</td>
<td>1.21</td>
<td>3.99</td>
</tr>
<tr>
<td>500,000+</td>
<td>0.37</td>
<td>0</td>
<td>0</td>
<td>1.63</td>
</tr>
</tbody>
</table>

was done for reported wealth only, the estimated wealth inequality could be expected to be much worse if we took into consideration that non-reporters probably had zero wealth.

The overall distribution of wealth is shown in Figure 1, with two Lorenz curves. The bottom curve was drawn under the assumption that non-reported wealth implied zero or very little wealth. If someone had significant wealth, a second party could become the owner of that wealth only if it was reported to the Courts first. Therefore it is highly likely
that unreported wealth is quite small. A second curve was drawn to allow for the possibility that non-reporters had the same wealth as reporters. The top curve in Figure 1 shows how the wealth distribution in the Transvaal would look, if non-reporters proportionally had held the same wealth as reporters. The respective Gini-coefficients under these two assumptions are 0.6677 in the case of zero wealth for non-reporters, and 0.5672 in the case of proportional wealth.

Each Gini-coefficient was determined in the usual way by calculating the area
underneath the Lorenz curve; inferring the area between the Lorenz curve and the 45 degree line from that, and dividing the result by 0.5. The distribution of total wealth among the four racial groups, as well as the composition of the population is shown in Figures 2a and 2b. If it is assumed that non-reported wealth implied zero or very little wealth, whites owned 91.01 per cent of total wealth, while they constitute only 36.3 per cent of the population. The rest of the population (63.7 per cent) owned only 9 per cent of total wealth in 1985. This is shown in Figure 2a. If non-reporters proportionally held the same wealth as reporters, then whites still held 80.9 per cent of all wealth. Clearly, wealth is distributed along racial lines.

Table 5 shows Gini-coefficients for some countries for which the wealth distribution have been estimated. It is shown when the respective studies were conducted, as well as by whom. The distribution of personal wealth in South Africa is not more skewed than the distributions in other countries. The distribution may, however, be less

<table>
<thead>
<tr>
<th>Country</th>
<th>Gini-coefficient</th>
<th>Year of study</th>
<th>Performed by</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>0.81</td>
<td>1983</td>
<td>Greenwood</td>
</tr>
<tr>
<td>United States</td>
<td>0.788</td>
<td>1983</td>
<td>Wolff</td>
</tr>
<tr>
<td>Canada</td>
<td>0.724</td>
<td>1970</td>
<td>Poduluk</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>0.68</td>
<td>1968</td>
<td>Inland Revenue</td>
</tr>
<tr>
<td>Australia</td>
<td>0.52</td>
<td>1968</td>
<td>Podder &amp; Kakwani</td>
</tr>
<tr>
<td>South Africa</td>
<td>0.66</td>
<td>1972</td>
<td>McGrath</td>
</tr>
<tr>
<td>South Africa</td>
<td>0.67</td>
<td>1985</td>
<td>Van Heerden</td>
</tr>
</tbody>
</table>
Figure 2a

Distribution of Total Wealth by Race
(Zero Wealth for Non-Reporters)

Figure 2b

Distribution of Total Wealth by Race
(Non-Reporters Proportionally have the same Wealth as Reporters)
acceptable than those of other countries because of the racial elements underlying it.

**Inter and Intra Group Distribution of Wealth**

**The Distribution of Wealth Within Racial Groups**

The skewed distribution of wealth in South Africa is made much worse by the distribution within groups. Blacks, who constituted 58.6 per cent of the population, owned between 7 and 15.3 per cent of the wealth, as we have seen above. Also, twenty per cent of blacks owned between 70 and 90.6 per cent of their group's wealth, depending on which of the two assumptions on non-reported wealth applied. It was true for each racial group that 20 per cent of the group held more than 70 per cent of the group's wealth. The distribution of wealth within racial groups is shown in Table 6. The percentages of wealth held is given for 1, 5, 10, and 20 per cent of each group, for each of the two assumptions for non-reported wealth.

**Table 6**

**Wealth Distribution within Racial Groups**

<table>
<thead>
<tr>
<th>Percentage of Group</th>
<th>Assumption: non-reported wealth</th>
<th>Blacks</th>
<th>Asians</th>
<th>Whites</th>
<th>Coloreds</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Prop</td>
<td>21.8</td>
<td>13.3</td>
<td>16.2</td>
<td>21.7</td>
</tr>
<tr>
<td></td>
<td>Zero</td>
<td>32.9</td>
<td>22.4</td>
<td>17.05</td>
<td>51.2</td>
</tr>
<tr>
<td>5</td>
<td>Prop</td>
<td>43.8</td>
<td>38.3</td>
<td>37.9</td>
<td>45.2</td>
</tr>
<tr>
<td></td>
<td>Zero</td>
<td>60.2</td>
<td>56.1</td>
<td>39.5</td>
<td>90.2</td>
</tr>
<tr>
<td>10</td>
<td>Prop</td>
<td>56</td>
<td>53.4</td>
<td>52.7</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>Zero</td>
<td>74.6</td>
<td>74.4</td>
<td>54.7</td>
<td>99.4</td>
</tr>
<tr>
<td>20</td>
<td>Prop</td>
<td>69.9</td>
<td>71.6</td>
<td>70.7</td>
<td>76.9</td>
</tr>
<tr>
<td></td>
<td>Zero</td>
<td>90.6</td>
<td>91.6</td>
<td>73.1</td>
<td>99</td>
</tr>
</tbody>
</table>
The Distribution of Wealth Across Age, Race and Gender

The wealth of 56 groups was estimated: for each of the four racial groups, seven age groups were distinguished, and each age group has two genders (4x7x2 = 56).

If the 56 groups are ranked by wealth per capita, it is found that white males take up the top six positions. An asian male group takes the seventh position, followed by three white female groups. Black and colored women are found at the bottom of the scale. The ranking of the 56 groups is shown in Figure 3. Women generally have much less wealth than their male counterparts.

Different age groups held the most wealth across the races. In the white group, men over 75 were the richest, while women between 55 and 64 held the most wealth of all white women. The 55 to 64 age group was also the richest group among asian men and
women, and colored women. An interesting finding is that somewhat younger groups held the most wealth among black men and women, as well as colored men. Black men between 45 and 54, and black women between 35 and 44 topped their respective lists, while colored men between 35 and 44 also were the richest of their race. This can be explained by the fact that the younger generation blacks and coloreds have moved to the industrial world of the cities, while the older generations were more inclined to follow a subsistence existence in the rural areas.

**The Composition of Total Wealth in South Africa**

One advantage of identifying all the 1985 documents on wealth by age, gender, race, and total net wealth, was that sub-samples of various groups could be drawn, and detail information could be gathered about the composition of their assets and liabilities. Detail information about seven different assets and six liabilities was gathered for the following persons: (1) The richest 300 persons who died in 1985 in the Transvaal. (2) Sixty randomly chosen persons from each age group in the white group. (3) The 135 blacks whose testate wealth was reported to the Master of the Supreme Court in the Transvaal.

**Super Rich Wealth versus Average White Wealth**

The largest component of the super rich is equity and shares in public or private

---

5 Since Whites own more than 80 per cent of all the wealth in South Africa, and is the group most likely to pay a tax on wealth, I concentrate on the composition of their wealth.
companies, namely, 28.62 per cent. The second largest component is real estate (25.15 per cent), with interest bearing financial assets in the third place (21.71 per cent). The composition of their assets is shown in Figure 4. Comparing the super rich group with the average of all whites, it immediately becomes apparent that the average person does not hold much equity or shares in corporate companies. Those assets comprise only 3.83 per cent of the average group’s total wealth. Real estate is the largest component and comprises 40.93 per cent of the average white household’s wealth. The composition of real estate also differs between the rich and the average groups. While the rich owns approximately 50 per cent of their real estate in the form of farms, only about 10 per cent of the average person’s real estate is held in this form.

The average white South African holds 22.15 per cent of his assets in the form of interest bearing assets, and 20.65 per cent in life insurance and retirement schemes. As in
other developing countries the rich do not invest a high proportion of their wealth in these forms.

The Composition of White Wealth by Age

If the different white age groups are compared with each other, three significant facts appear in Figure 5 when assets are grouped into real estate, financial assets (cash, interest bearing assets and stock), and life insurance and annuities. The amount of real estate owned increases gradually up to the age of about 65, and then decreases. Life insurance and annuities have a decreasing trend until retirement, and then fall sharply. At this stage of a person's life lump-sum pensions are realized, and are transferred into other

Figure 5
Assets of Whites by Age
types of financial assets. Most remaining life insurance policies also have matured. The
third trend is that the amount of financial assets gradually increases with age. Looking at
the various assets held by the different age groups, it is evident from Figure 6 that real
estate made up a large proportion of most age groups' wealth. Movable assets did not
constitute a significant proportion of any group's wealth; interest bearing assets increase
in importance with age, while life insurance and retirement funds decrease with age.

Figure 6
Ownership of Assets among Whites, by Age

A Comparison between the Compositions of White and Black Wealth

Real estate comprised more than 50 per cent of black wealth, as opposed to the 40
per cent for whites. However, blacks virtually did not own any farm land. They also kept
a much higher proportion of their wealth (11.72 per cent) in the form of cash and current
accounts than whites (0.93 per cent). This may be the result of the fact that the Stock
Market and even the Banking Sector in South Africa have not been very accessible to small investors. Blacks had a significant proportion (15 per cent) of their wealth in long term savings, such as life insurance and retirement plans. A comparison between the two groups is shown in Figure 7.

Figure 7

A Comparison between White and Black Wealth

The assets numbered from 1 to 8 are the same as in Figure 4.

Conclusion

The hypotheses tested in this Chapter were first that the wealth distribution in South Africa is abnormally skewed, relative to the rest of the world, and, second, that the distribution is highly unequal by racial groups. A surprising result of the study is that the overall distribution of wealth compares well with the large industrial countries in the world, and that the distribution of wealth is less unequal in South Africa than in some other countries.
However, the hypothesis that the distribution is highly unequal by racial groups, cannot be rejected by the 1985 data presented.
CHAPTER 3

THE POLITICAL ROLE PLAYERS AND THE CONSTITUTIONAL
NEGOTIATION PROCESS IN SOUTH AFRICA

In this chapter it will be shown that different political groups taking part in the
negotiation of a new constitution for South Africa have implicit economic motives for their
respective views. Each group wants to secure maximum wealth for itself, and is proposing
the suitable form of government and decision rules that will support its quest for wealth.
However, each group is also making concessions during the negotiation process, in a
predictable and economically rational way.

South Africa is on the brink of a new constitutional system, with different interest
groups negotiating a new constitution and political system. It is believed that economic
motives constitute an important driving force in the formation of different political groups.
These groups have different levels of actual and potential wealth, as well as different views
on the redistribution thereof, and these differences must weigh strongly in the formation
of their respective political proposals, albeit implicitly. It is assumed that all groups act
rationally, so that they are trying to maximize their own welfare.

I firstly establish the most rational proposals for each group. Their proposals during
the negotiation process are then analyzed, and an attempt made to explain significant
deviations between their actual proposals and what was considered to be first best policy.
The focus will be on the African National Congress-alliance, the National Party, and the
parties which eventually formed the Freedom Alliance.
The Interim Constitution that was negotiated for the first five years of government after the Apartheid system in South Africa makes room for a non-racial, multi-party democracy in a judiciary state, with a bill of individual rights as part of the Constitution. During these five years a final constitution is negotiated by an elected government. However, the features of the Interim Constitution are quite permanent since they can only be changed with a two-thirds majority in the government.

According to the Interim Constitution, South Africa has a federal structure with nine provinces, each of which is able to draw up its own constitution. However, as the national Constitution determines the limits of the provinces' powers, and only the central government can change the national Constitution, it has the ultimate control over the provinces.

The central government consists of two houses, the National Council and the Senate. The former consists of 400 members, half of whom are elected on a national basis and half proportionally on a provincial basis. The latter has ten members from each province, elected by each region according to the proportional representation of the different parties. The National Council and the Senate together form the Constitutional Council, which is drawing up the final constitution. It also acts as a government of "National Unity" that should try to take decisions on a consensus basis. No party has veto rights, however, and if no consensus is reached, the majority decides.

The Interim Constitution falls within the realm of a unitary state with majority rule. The decision rule is not pure majority rule since majorities of significantly more than 50 per cent are required on certain key issues, while the Bill of Rights and the right of appeal
to a Constitutional Court constitute further checks on the decision executing ability of the majority.

**Decision Rules - The Methods of Revealing Preference**

The three most general methods through which individuals or groups reveal their preferences are voice (the ballot box), voting-with-the-feet, and resistance, of which revolutionary action is an extreme form. These three methods are very relevant in the evolution of a new constitutional order in South Africa, and it is the choice between these three methods (or slight variations thereof) which is at stake for the various political groups. The decision rule by which South Africa will be governed in the future will influence the individual holding of wealth, as well as the potential redistribution of individual and group wealth.

**Voice**

Voice is the most common and best studied means of revealing preferences in modern societies. The issue is not only whether each individual has the vote, but which system of voting is adopted. The extreme case of non-democracy is complete or pure autocracy, where one person effectively rules. Unanimity rule may be considered as the most democratic system and the opposite of complete autocracy. It implies that each individual has to be satisfied with every decision taken on the community as a whole. Any change under unanimity rule will therefore necessarily be a Pareto move. Majority rule lies between these two extreme decision rules. It is more common and it implies that the majority of the people, or their representatives, are in favor of the decisions taken.
To illustrate the differences between unanimity rule and majority rule, assume that there are two voting groups in a country, namely, a rich minority and a poor majority, with a representative government whose task it is to provide public goods. Assume that the provision of public goods can make everybody better off, in other words, cause a Pareto improvement. Mueller (58) shows that unanimity rule will only allow movements from the no-government endowment point to points that represent Pareto improvements, since all other points imply a loss of utility for one of the groups, and can be vetoed by it.

Majority rule outcomes may well imply a loss of utility for one group. The poor majority may choose a point which increases their utility from what they have at the original endowment point, but decreases the rich minority's utility. Mueller (58) says that there is no reason to expect the outcome to be Pareto optimal under majority rule. Davis (63-74) makes a stronger statement: "One can accept with certainty that the outcome of the collective choice process will fall outside of the Pareto-preferred segment under majority rule."

The decision to provide public goods may under certain conditions be accepted by all, since all may benefit from it. Yet, the problem is that there are an infinite number of Pareto-efficient points on the utility frontier, and only one of them has to be chosen. The ruling party under majority rule can choose any of these points: they may choose a point which will not harm anybody, but they may also choose a point that will only benefit their own supporters.

While majority rule outcomes may be undesirable to some, unanimity rule also involves some problems. Under unanimity rule the process of decision making may come
to a halt, or an undesirable status quo may be maintained. "Any issue over which there is unavoidable conflict is defeated under a unanimity rule. Redistribution of income and wealth, and redefinitions of property rights are blocked by this rule" (Mueller 107). Majority rule, on the other hand, is one of the simplest voting rules used in modern society, and allows a collective decision to be made most of the time. There are the possible problems of cycling (intransitivity) and logrolling, but one of the potentially most serious problems is the absolute power bestowed upon the majority, enabling them to benefit one group to the disadvantage of another.

Voting-with-the-Feet

The second way of revealing one's preferences is through voting-with-the-feet (exit or departure). "In contrast to the disappointing promise of majority rule, the utopian quality of the unanimity rule, and the imposing complexity of the newer, more sophisticated procedures, Buchanan's (1965) clubs and Tiebout's (1956) voting-with-the-feet seem to accomplish the task of revealing individual preferences by the surprisingly simple device of allowing people to sort themselves out into groups of like tastes" (Mueller 154).

Buchanan and Tiebout derived conditions for the optimal provision of excludable public goods under the system of exit. A pure public good is not excludable: once it is provided, every member of society benefits from it. However, some public goods are not pure and possess characteristics of private goods. Locally supplied public goods, like the provision of electricity, is a well known example: it is indeed possible to exclude someone
from the service. Imagine two cities that provide different quantities and qualities of local public goods. One city may charge higher taxes and provide better services. Tiebout argues that citizens will move to the city where their utility is maximized, that is, they may exit or depart from their current environment and move to another. The final result will be a situation where different groups, with homogeneous tastes within each group, reside in different areas with different levels of public services, while everyone is maximizing utility.

A federalist system with different provinces providing different levels and qualities of local public goods, fits the Tiebout model. If all the assumptions of the model are satisfied, citizens will maximize their utilities if each one is allowed to move to his most preferred province. This voluntary association approach is likely to affect the distribution of income, however, since citizens with similar incomes will tend to prefer the same levels of public goods. The distribution of income after people have moved to their most preferred provinces may then be considered to be unfair by some groups. This problem may be solved by transferring income from one area to another.

**Resistance**

When neither the ballot nor the feet constitute adequate modes of expression, there is still the barrel of the gun (Mueller 173). The fiercest form of resistance is revolution, the theory of which can be summarized as follows: an individual has to decide whether or not to join a resistance movement against the current regime in his country. The individual expects to be rewarded by the movement when it gets into power, but also experiences
positive utility from participating in the resistance action. The cost of participating in the resistance action is the risk of being captured or killed on the one hand, and the loss in wages by not doing a regular job on the other. An individual will join the resistance action if it is the best thing for him to do, that is, if he maximizes his utility through participation. In the first place the benefits must be greater than the costs, and then the marginal benefits must equal marginal costs to achieve the maximum.

The Structures in which People make Decisions

- Different forms of Government

While voters may reveal preferences by any of the three methods discussed above, they will find themselves in either of two broad political systems, namely, the unitary state or the federal state. Each of these have many varieties. For present purposes the concern is not with the detailed characteristics and arguments for and against either system, but rather with their basic attributes, and especially the implications that each of the two broad categories of political systems has for the individual use of wealth, as well as for the potential redistribution of individual and group wealth.

The Unitary State

"A unitary state is one organized under a single central government; that is to say, whatever powers are possessed by the various districts within the area administered as a whole by the central government, are held at the discretion of that government, and the central power is supreme over the whole without any restrictions imposed by any law granting special powers to its parts (Strong 55).

Van Vuuren and Kriek (141) (hereafter V&K) say that the most common form of modern state is the unitary state, whose most important characteristic is that the central government
is supreme: the power enjoyed by local and regional authorities is delegated power.

Although unitary states tend to be more centralized than their federal counterparts, it should be stressed that centralization and decentralization are found in both unitary and federal states. The sovereign government of a unitary state can delegate powers to lower levels of government. It does not harm the central control exercised by the government, since a government that delegates can always intervene or curtail delegated powers (V&K 147). Decentralization, which amounts to a transfer of power, authority and methods, does not necessarily detract from the unitary character of the state. When sovereignty, that is, the final power to define jurisdictions, clearly resides in the center, we have what is commonly called a unitary system (Roche 301).

The unitary state is less complicated than the federal state. A high degree of uniformity can be reached, matters of jurisdiction are solved more readily, and administrative costs are lower (V&K 164).

A unitary state is, of course, an ideal system with a view to the redistribution of individual and group wealth. Whatever decision rule is applied, it pertains to the entire geographical area. If, in addition to a unitary state, we have majority rule, then redistribution of wealth in favor of the majority can easily be effected.

The Federal State

"Federation [from the Latin foedus, which means pact, contract, treaty, agreement] is a political organization in which the activities of government are divided between regional governments and a central government in such a way that each kind of government has some activities on which it makes final decisions" (Riker 101).

Federalism therefore means that the sovereign power of a state is divided, in direct contrast
to the unitary state (Proudhon 41).

Individual states have the right collectively to amend the federal constitution, but have sole rights in respect of their own constitutions - within the limits of federal sovereignty. They exercise all the rights which have not been delegated to the federal power (Proudhon 40). States may have equal or disproportionate representation in the federal parliament.

An advantage of federalism is that it could resolve the growing problem of overload in central government by shunting off purely local business to local assemblies and freeing the federal government to take care of the big business. Decentralization in a unitary state may also achieve this goal, but then the central government only acts as a supervisor, while it remains the responsible party. The difference lies in accountability. In the federal system the local government is fully accountable to their voters for what they do in the state or province. This should lead to a high degree of efficiency, with cost saving implications.

The federal option may pose some problems, however. All federations face the problem of imbalances between the states in terms of wealth, natural resources, size of territory, degree on industrialization, etc. "However impeccable in its logic the federal constitution may be, and whatever practical guarantees it may supply, it will not survive if economic factors tend persistently to dissolve it" (Proudhon 67). Federations may encounter problems with member states who are not willing to share their wealth with poorer states. However, viewed from a different angle, a federation safeguards the more wealthy member states, or member states with more wealthy residents, against the confiscation of their wealth by the poorer states through forced redistribution.
Rational Collective Choice

So far the basic decision rules as well as the main political systems in which these rules may operate have been described, and their economic implications in terms of wealth usage and redistribution analyzed. In this section the welfare maximizing political strategies which different rational groups should choose, are investigated. An underlying assumption in this section is that democracy is accepted by all. At first it will be assumed that each group is certain whether it constitutes a majority or not, and the analysis will be adapted to groups which are uncertain about their support. A group is either rich or poor. A minority in the country at large may constitute a majority in some province(s), or may be a minority within each province.

Rational Collective Choice with Certainty

A Poor Majority

A poor majority has a clear optimal choice for a political dispensation, namely, pure majority rule in a unitary state. The group would be the reigning power under this rule and would decide which public goods to provide (i.e. which point on the utility frontier to choose) as well as how to finance the provision of public goods. A unitary state with the power at the center will provide them with maximum control over the allocation and (re)distribution of resources.

The ruling majority may expect resistance from minorities under a system of majority rule. The resistance may be vocal, or lead to exit, or it may even lead to revolution. The members of the majority will maximize their utility within the constraint
that the total resistance against them is at, or below some critical level beyond which it becomes disruptive of the system and its benefits. This can be done either through allocating resources to crush the resistance (unfriendly allocation); or through finding a way to prevent or at least subdue the resistance (friendly allocation). Friendly allocation may take place, for example, if the ruling majority would not implement wealth redistribution policies which are severe enough to harm the rich minority seriously so that it leaves the country. The poor majority may also choose to allow a political dispensation which implies a movement away from majority rule and/or a unitary state, that is, a system closer to unanimity rule and/or a federalist state in which the minorities can air their resistance effectively through political channels.

**A Rich Majority**

A rich majority has the same optimal choice for a political dispensation as a poor majority, namely, a system of majority rule in a unitary state. While the poor majority would probably get control over the country's wealth through such a system, a rich majority will maintain control.

The rich majority should give the poor minority minimal yet sufficient power to be able to retain all the wealth they wish. As is the case with a poor majority, a rich majority should only digress from majority rule and/or the unitary state if the benefits of the digression exceed the cost of fighting resistance from minorities. A rich majority would probably be capable of dampening resistance by distributing welfare benefits within a unitary state with majority rule which will satisfy a poor minority, without materially hurting the majority.
A Rich or Poor Minority

A Minority who Forms a Majority in One Region

A minority in the country at large, but which constitutes a majority in one part of the country, should propose a strong federalist or confederalist system with autonomous regions in which majority rule will apply. (Confederalism is the extreme form of federalism, that is, the regions have complete sovereignty). A federal system will enable them to control the wealth and the allocation thereof in their region. They should favor unanimity rule in the central government, but the principle of majority rule should apply in the region, since that will enable the local majority to maximize their welfare by deciding how to allocate and redistribute wealth in the region. Sovereign regions imply that the central government, dominated by another group, will have no power over the local majority.

A Minority who forms a Minority in Every Region

A group who constitutes a minority in every region would not care whether a unitary state or a federalist state exists, if the majority in every region is from the same group. If each region has a different majority, however, this minority should propose a federalist system with autonomous regions. With such a system in place, their followers will be able to migrate (vote-with-the-feet) to the region that will maximize their utility.

They should, furthermore, insist on unanimity rule as decision rule in the central government as well as in the regions. Given the fact that they can dominate nowhere, they will want to see a dispensation in which they have the greatest possible say, and even a right to veto legislation in some cases.
Summary

Both types of majorities prefer majority rule in a unitary state to secure maximum control over economic resources. The only reason to deviate from this policy would be to minimize expected resistance from minorities. The way to avoid the resistance could be to move away from majority rule towards unanimity rule, to allow a degree of self-determination in a federalist state, or simply to crush all resistance. A minority that constitutes a local majority, should strive for maximum power by obtaining control over one region and its resources, that is, to get autonomy in a strong federalist system. If a minority is spread evenly throughout the country as a whole, its only means of securing more power is to insist on elements of unanimity rule, and general indifference to the form of government. The various choices are summarized in Table 7.

Table 7

Optimal Decision Rules and State Forms

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Rational Collective Choice with Uncertainty

Any political group's welfare should increase if they get more decision making power, because such power will represent more control over their country's wealth. The welfare function of a risk averse group would have a concave form since they should prefer a sure amount of political power to an election gamble with the same amount of expected political power.

Assume that before a general election Group A has the opportunity to negotiate about the decision rule that will be used in its country after the election. The decision rule decided upon will be used permanently, unless one group wins the election with a majority of, say, 67 per cent, in which case they may change the rule. Let W depict the position where Group A is the outright winner of an election, with more than 67 per cent of the votes. Let L, on the other hand, depict a position where Group A gets much less than 67 per cent, and where they can only change the decision rule with the approval of other groups, or worse, where another group has an outright win.

If the probability of winning the election is \( \pi \), the risk averse Group A will prefer a sure outcome \( S = \pi W + (1-\pi)L \), rather than taking a gamble between W and L. They should therefore try to negotiate a decision rule such as S before the election, rather than ending up worse off than at S without negotiating.

I have argued that with no uncertainty a majority should opt for majority rule in a unitary state, while a minority should opt for unanimity rule, usually in a federal state. If a risk averse group is uncertain whether it constitutes a majority, it will be better off settling for a decision rule weaker than majority rule. Similarly, it can also be argued that
an uncertain majority should allow for features of a federal state when they negotiate about a state form.

**The Proposals of the Major Negotiators for a New Constitution in South Africa and the Interim Outcome**

Now that a hypothesis about a rational approach to collective choice for each of a number of possible groupings in the constitutional negotiation process has been formulated, it can be determined whether the actual proposals of the main negotiators in South Africa conformed to this hypothesis and to what extent the outcome of the negotiation process differed from the hypothesis. Since the final form of the new South African Constitution is still being debated, the Interim Constitution which was drawn up for the first five years after the Apartheid government, will be used in the comparison here.

**The ANC-SACP-Cosatu-Alliance**

The ANC (short for the ANC-SACP-COSATU-Alliance) called their proposed system a mixture of the unitary and the federal system. They proposed a political system with different regions, based primarily on the nine economic development regions which were adopted by the Development Bank of Southern Africa. There should, however, only be the national Constitution, and regional diversity would need to be provided for within that Constitution. The Constitution would not vitiate the principle of a single united

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1ANC is the abbreviation for African National Congress of which Mr Nelson Mandela is the head, while SACP is the abbreviation for the South African Communist Party. COSATU is the Congress of South African Trade Unions. These groups entered the negotiation process together.
country (Botha 8-9).

Regions should have democratically elected governments. Their boundaries, powers and functions should be defined in the national constitution, and the regions should have representatives in the central government. Botha, former head of the ANC Commission on Local Government, said: "It is agreed that different tiers of government need political, economic and developmental powers to levy taxes. However, a certain degree of authority for the center should be kept to ensure the maintenance of stability and standards throughout the country" (8). Botha furthermore maintained: "The center retains the right to override the regions on issues of national interest" (10).

The regions, according to this description, will have original authority, which is different from autonomous authority. Original authority means that the regions' authority is written into the national Constitution and can only be altered by means of an agreed-upon majority in the central government - just like any other change in the Constitution. With original authority the central government is able to change the functions of the regions without their consent. In the case of autonomous authority, the regions themselves have to approve of any changes in the Constitution that concern them.

The ANC, representing a poor majority, acted rationally by opting for majority rule in a unitary state at the outset, somewhat mitigated by introducing elements smacking of federalism, as a way of preventing serious resistance.

The National Party (NP)

The NP of which F W de Klerk is the current leader, ruled under the Apartheid
system from 1948 until 1994. They entered the negotiation process claiming to stand for a federal structure with autonomous regions in the new era. Each region should have its own constitution, drafted within an entrenched framework provided for in the national Constitution (CDS 8).

The NP wanted a "sensible and practical vertical distribution of powers" and claimed that "functions should be performed at the lowest level at which it can be carried out most effectively" (CDS 5). This is called the subsidiarity principle. One of their strongest (federal) demands with regard to fiscal considerations, was that "regions should have control over the level of taxation of their own sources of income" (7).

The NP set out to represent a likely rich minority in respect of the country as a whole, with the possibility of being a local majority in the Western as well as the Northern Cape. They started negotiating by calling for "power sharing" between the parties, which is a form of unanimity rule. These proposals were rational and in accordance with the hypothesis about rational collective choice in these circumstances.

The Freedom Alliance

The Inkatha Freedom Party (IFP) of Mr. Buthelezi proposed a strong federalist system where "regional government is the rule and central government the exception", from the very beginning (IFP 1992). Within each federal state, they wanted majority rule or a stronger form of autocracy.

The different white right-wing groups, as well as the Ciskei and Bophuthatswana (former independent black Reserves), now belonging to the Freedom Alliance, insisted on
own regions under a strong confederalist system. They all had asked for various forms of "self-government", or strong confederalism, and some even threatened to secede from the Republic of South Africa if they would not get autonomy. They also wanted majority rule within at least their own confederalist states. Their choices were clearly rational, since the IFP, the Ciskei and Bophuthatswana, as well as the various right-wing groups, constitute minorities with wealth they do not wish to be distributed away from them.

Conclusion

None of the major negotiating parties have achieved the goals with which they entered into the negotiation process. Why were all of them willing to deviate from their ideal options which would have maximized their welfare?

The Interim Constitution is the closest to the ANC's initial proposals of a unitary state with majority rule. Yet they were prepared to adopt a federal type system with nine provinces that have some autocratic power. Majorities of much more than 50 per cent will also be needed for determining most policy issues during the first five years of rule after the Apartheid Era.

The ANC were probably willing to deviate from their initial proposals for two reasons. The first is the expected resistance from right wing whites and the Inkatha Freedom Party of the Zulus. Inkatha boycotted most of the negotiation process and posed a real threat of a civil war if the ANC would come to power under pure majority rule. To get Inkatha back at the negotiation table and to dampen their resistance, the ANC were prepared to move towards unanimity rule as well as a federal state. The second reason why
the ANC deviated from their ideal proposals, is that they were uncertain about their support. They acted as a resistance movement from outside South Africa until 1992, and never had the opportunity to test their support at the polls. They would therefore, according to the analysis above, rather have a sure outcome different from their ideal, than to take the gamble of not negotiating a solution. The ANC knew that the probability was large that they would win a general election, and did not have to deviate from their ideal too much.

The NP, on the other hand, were prepared to negotiate a political structure that was quite different from their ideal one. They would have wanted to see a system with stronger federal features and greater majorities that would be able to decide critical issues.

The NP also acted in the first place to dampen the resistance from their main opposition, the ANC, who withdrew from the negotiation process for a year while the NP had been insisting on a 75 per cent majority to decide critical issues. The NP was the ruling party during the negotiation process, but were pressured by the international community to succeed with a peaceful negotiation of a new political dispensation. The second reason why the NP moved far away from their own optimal scenario as a rich minority, was that they probably overestimated their own support. They entered the general election thinking that they could win a majority of the votes, and acted like a majority at the negotiating table. A third reason could be that the NP realized that they were a minority, but that they could attract ANC supporters by moving towards the ANC's proposals, and possibly win the election.

The Freedom Alliance stuck to their initial proposals and left the negotiating
process before the Interim Constitution was drawn up.

It is clear that the political parties in South Africa had strong economic motives behind their respective proposals with which they entered the process of negotiating a new constitution for the country. Even the eventual deviations from the optimal choices of various parties can be explained by economic theory. The ANC ended up winning the general election with a landslide victory in which they obtained 65 per cent of the total votes. They are very close to being able to change the Constitution, and to control South Africa's wealth completely, subject to various supply constraints.
CHAPTER 4

A GENERAL EQUILIBRIUM MODEL WITH OVERLAPPING GENERATIONS FOR SOUTH AFRICA

In this chapter a general equilibrium model with eleven overlapping generations in each period is developed for three consumer groups. Each group consumes one commodity which is produced competitively using two factors of production. A simple three-period model is used to derive the basic structure of all functions; in the simulations, the model is expanded to a multi-period model using South African data.

In the first section a general background is given regarding the type of model that is used. The second section is more specific and gives a verbal description of the model. It covers consumer and producer behavior, comments on the role of government in the model, and gives an overview of the simulation results obtained. In the third section all the features of the greater model are explained more rigorously using the three-period model, which is derived with complete commodity demand functions, factor demand and supply functions, and a description of government behavior. The conditions for obtaining a general equilibrium and steady state growth are also discussed. In section four, the full model is described, followed by simulation results and a conclusion.

Introduction

Most tax incidence studies fall in one of two categories (Fullerton and Rogers 3). The first is annual incidence studies which sort individuals into groups according to their annual
income, and then study the redistributional effects of taxes among the income groups. The second is life-cycle studies that group people together in different age groups, and then calculate redistributions among the age groups. Figure 8 is taken from Fullerton and Rogers (3). It can be used to demonstrate the problems one may encounter by using only one of the two methods.

**Figure 8**

*Two Lifetime Earnings Profiles*

Suppose that only two types of individuals are included in the economy, one more affluent than the other. One group advances with age through points A, B, C, and D, while the more affluent group advances through points E, F, G, and H. Annual Income is depicted on the vertical axis in Figure 8, and Age on the horizontal.
An annual income study would typically take individuals from the four income levels, I, II, III, and IV, depicted in the figure, group them together, and study redistribution among the groups. They clearly might come from various stages in their lifetime: a rich young person (F) might be grouped together with a poor middle aged person (C) reaching his peak income.

"The typical life-cycle study would lump together individuals at points A and E as the youngest group, those at B and F as another group, C and G as a third group, and D and H as the oldest group. The model could then calculate redistributions among the old, the young and middle generations, but not between rich and poor. Neither of these approaches captures the fundamental distinction between the two types of individuals in this economy" (Fullerton and Rogers 4).

The distribution of wealth in South Africa is such that three distinct groups of wealth owners can be identified, namely, a rich business class that owns most of the capital in the economy; a middle group employed by the capital owners and who earns good salaries; and a large poor group that lives on or below the poverty line. The three groups in the model will be defined according to ownership of capital from Chapter 2.

The distribution of wealth in South Africa has furthermore probably been stationary for a century or more, and some long run policy measures might be necessary to alter the distribution. It is therefore necessary to study the three groups in a life-cycle setting, and I combine the two approaches mentioned by Fullerton and Rogers '…to capture the fundamental distinction between rich and poor individuals classified on the basis of lifetime income' (4).
The model is a general equilibrium simulation model that encompasses all major South African taxes. Consumers are identified by both age and lifetime income and wealth. There is one industry with a constant returns to scale technology and two inputs, labor and capital. It is a life-cycle model in which each individual from each of the three groups receives a particular inheritance, works in every period to receive a wage, earns income from capital which is made available to the production sector, and makes a bequest at the end of his life. Each individual pays taxes, and the poor group receives a government transfer in each period. Each individual plans an entire lifetime of commodity demands, savings, and bequests in the beginning of his life. The effects of tax changes on each economic decision through time are simulated in the model, while new savings, capital stocks, outputs, and prices are calculated. Since the effects on consumers from all age groups and for all periods are derived in the simulation process, the change in economic welfare for groups ranging from the lowest lifetime income to the highest can also be calculated.

A Description of the Model

This section provides an overview of the entire general equilibrium simulation model. Specific equations, data and other detail follow later.

Utility-maximizing behavior is assumed in order to solve for commodity demand and saving as functions of income and prices. Second, a production function is specified and cost-minimizing behavior in a competitive market is assumed to solve for each factor demand as a function of factor prices. Third, the net impact of taxes when these behaviors
are considered simultaneously is sought. To capture all these features in one model, use is made of a general equilibrium model.

The model is an overlapping generations model, in which each generation lives for 55 years - eleven periods of five years each. At any point in time therefore, there exist eleven generations: one young, one old, and nine in between. Auerbach and Kotlikoff (1987) also developed a 55-year life cycle model to study dynamic fiscal policy, but they had 55 periods of one year each - a much larger model, although they only have one representative group. I am introducing three groups differing with respect to affluence, following Fullerton and Rogers, who model groups from twelve different income categories.

The eleven generations come from three groups: a rich group, a middle class group, and a poor group. The rich group consists of the top 5% of each generation, the middle class of the next 30%, and the poor make up the rest. In each period there are 33 consumer units operating in the model: eleven generations for each of the three groups.

**Consumer Behavior**

It is assumed that consumers have perfect foresight with respect to prices and interest rates in all future periods. After calculating the present value of potential lifetime earnings, consumers make intertemporal decisions about present and future consumption and saving. Their endowment consists of an initial inheritance received and periodical income from labor and capital. It is supplemented by government transfers (for the poor group), discounted at the after-tax interest rate and reduced by taxes, and a bequest made
at the end of their lives. It has been argued that life-cycle saving by itself may only explain about half of the observed capital stock (Kotlikoff and Summers). This is probably especially true in South Africa where the wealth distribution has been maintained for prolonged periods of time through large bequests being passed on from generation to generation. In the model the bequest given by an individual is assumed to be a predetermined multiple of his inheritance, in order to achieve a steady state growth rate.

Part of the capital stock is therefore attributable to the fact that individuals receive exogenous inheritances and are required to leave comparable bequests at the end of life. Incidence results depend on the differences in these inheritances among groups.

**Producer Behavior**

On the production side only one commodity is produced according to a constant returns to scale technology, using two factors of production: capital, and labor. One could have a third factor, namely, entrepreneurship, to distinguish between the type of labor income that the rich gets, and that of the other groups. Entrepreneurship would serve as "educated labor", and earn a higher income. By giving individuals from the various groups different amounts of labor, however, each of the three groups has its own level of labor supply, instead of only having two types of labor by distinguishing between the rich and the rest. This approach was also followed by both Auerbach and Kotlikoff (11), and Fullerton and Rogers (71), who gave different age groups different amounts of labor.

The production function has the simple Cobb-Douglas form. In each period competitive firms determine the factor prices of labor and capital from the respective
marginal products. Indirect factor demand functions are the results of this process, which give factor prices in each period as a function of capital and labor demanded.

**Government Behavior**

The government in the model has as its primary concern the redistribution of wealth from the richer groups to the poor, and uses fiscal policy to accomplish this goal. The government starts with a tax structure similar to the current South African situation and then applies some policy changes. The changes modeled are (1) an increase in the tax on capital income to the two affluent groups, (2) an implementation of an estate tax, and (3) an increase in the sales tax rate. All the policy changes are modeled with and without an accompanying proportional decrease in the tax on the labor income of all three groups. The adjustment in the wage tax is done to capture the pure effect of the tax change, i.e., to keep government revenues constant. The government gives their receipts back to the poor group in the form of transfer payments. Two main scenarios are modeled: one where the consumers do not know of the government's policy change in advance, and the other where the consumers know about the planned change, one period in advance.

**An Overview of Simulation Results**

An increase in the tax on capital income improves the current distribution of wealth among the three groups, since the poor group's share of the total consumption increases, while the rich group's share decreases. It also changes the pattern of

---

1The tax rates on labor income are decreased by the same amount for all three groups until government revenues reach the steady state levels.
consumption among generations: the elderly consumes much less than before the tax change, while the younger generations consume more; capital is modeled to grow at a certain rate, so that the elderly have more capital than the young, and their income is affected much more by an increase in the capital income tax. Finally, an increase in the tax on capital income is harmful to the economy’s total levels of production - although the distribution improves, the overall levels of production fall below the steady state levels.

The intuition behind the decrease in total production is as follows: an increase in the tax on income from capital decreases the return from capital in all periods. Total saving and hence the total capital stock fall below the steady state levels. Since labor supply remains unaltered, total production in this constant returns to scale economy falls.

The implementation of an estate tax has the opposite effect on the levels of total consumption and the total capital stock in the new steady state. Both levels end up higher than in the initial steady state. The reason for the higher capital stock is higher savings in all periods to reach the same target bequest, and the estate tax to be paid. However, the distribution of wealth is not unambiguously better. Although the richer groups are worse off after the policy change, all the generations in the poor group do not benefit from the change. Those alive close to the policy change are harmed, while later generations reap the benefits of an improved distribution. If some individual knows from his youth that he will pay an estate tax at the end of his life, he has a lifetime to save for the tax, and he will be receiving transfers from the government (from older persons’ estate taxes) for ten periods before his old age. An individual who is close to retirement when the government implements an estate tax, has only a few periods left to save an additional amount for the
tax, while he also receives the transfers from the government for a smaller number of periods.

An increase in the sales tax rate increases the total levels of consumption in the short run, but leaves consumption slightly above the initial steady state levels in the longer run. The welfare effects of this policy change is very sensitive to whether the government adjusts the wage tax rates to keep government revenues the same. If the government does adjust the rates downward, the poor become worse off than before the policy change, but if they get the full benefit of higher government transfers, they become much better off.

Many of the key features of the eleven-period life cycle model can be illustrated with a simple three-period model.

**A Three-Period Model with Overlapping Generations**

In this model three generations exist at any point in time - one young, one intermediate, and one old generation. Individuals from all ages work full time, i.e., labor supply in the model is inelastic. Both factors of production are growing over time at the steady state growth rate. The young generation receives an inheritance in the beginning of its first period, and leaves a bequest at the end of the third. Each generation chooses its current consumption and anticipated future consumption on the basis of its preferences and lifetime resources.

If one adopts the convention that output is produced, income is received, and consumption occurs at the end of each period, the tangible wealth of the economy at the beginning of any period consists of savings held by the elderly and the intermediate
generation, plus the inheritances of the young. This total is also the capital stock available to the economy in each period.

The Demand Side

Without a government, a representative consumer, say from generation $i$, has the following constraints in the three periods that he is alive:

period $t$:
$$C_{it} + S_{it} = (1 + r_t) I_i + w_t L_{it}$$ (1)

period $t+1$:
$$C_{it+1} + S_{it+1} = (1 + r_{t+1}) S_{it} + w_{t+1} L_{it+1}$$ (2)

period $t+2$:
$$C_{it+2} + B_i = (1 + r_{t+2}) S_{it+1} + w_{t+2} L_{it+2}$$ (3)

where

$C_{it}$ is consumption in period $t$,

$S_{it}$ is saving in period $t$,

$I_i$ is inheritances received at the beginning of period $t$,

$B_i$ is the bequest given by generation $i$,

$r_t$ is the interest rate for period $t$,

$w_t$ is the wage rate for period $t$, and

$L_{it}$ is labor supplied during period $t$.

The consumer is the owner of all the factors of production and the returns to these factors are his basic sources of income. Saving or borrowing is possible in the model, so that a consumer can decide when to consume the income that he receives over the three periods. The consumer from generation $i$ receives an inheritance $I_i$ at the beginning of his life which he invests in the production sector, and he earns a return of $r_i I_i$ on it in period
t. He also earns labor income \( w_t \) during period \( t \) which brings the total amount available for consumption and saving (at the end of period \( t \)) to the expression on the right hand side of equation (1). The consumer carries over to the second period his savings \( S_t \) from the first. At the end of period \( t + 1 \) these savings, plus the return on it, plus labor income give the total amount available for consumption in period \( t + 1 \) and savings to be carried over to the last period (equation 2). At the end of the third and last period the consumer leaves a bequest for the new young generation (equation 3).

Substituting (3) into (2) and (2) into (1) renders the following lifetime budget constraint for the representative consumer:

\[
C_{t+2} b_t C_{t+1} (1 + r_{t+2}) C_{t+1} (1 + r_{t+1}) (1 + r_{t+2})
\]
\[
\times (1 + r_t) (1 + r_{t+1}) (1 + r_{t+2}) I_1 w_{t+2} L_{t+2} + w_{t+1} L_{t+1} (1 + r_{t+2})
\]
\[
+ w_t L_{t+1} (1 + r_{t+1}) (1 + r_{t+2})
\]

(4)

The budget constraint in (4) states that the third-period value of all the expenditure on consumption is equal to the value of all the income from factor services that the consumer receives over three periods, plus the third-period value of inheritances received, minus the gross value of bequests given. This budget constraint can be written in a simpler form:

\[
P_c C_c + P_{t-1} C_{t-1} + P_{t-2} C_{t-2} = Y
\]

(5)

with \( P_c = (1 + r_{t-1}) (1 + r_{t-2}) \), \( P_{t-1} = (1 + r_{t-2}) \), \( P_{t-2} = 1 \),

and \( Y = (1 + r_t) (1 + r_{t-1}) (1 + r_{t-2}) I_1 \cdot w_{t+2} L_{t+2} + w_{t+1} L_{t+1} (1 + r_{t+2})
\]
\[
+ w_t L_{t+1} (1 + r_{t+1}) (1 + r_{t+2}) - B_1
\].

If the consumer maximizes an intertemporal utility function
\begin{equation}
U = (a_t^{1.5}C_t^{5} + a_{t+1}^{1.5}C_{t+1}^{5} + a_{t+2}^{1.5}C_{t+2}^{5})^{-1/5} \tag{6}
\end{equation}

of CES type, subject to (5), his commodity demand functions will be

\begin{equation}
C_t = \frac{a_t Y}{\sum_{i=t}^{\infty} a_i P_i \left(\frac{P_t}{P_i}\right)^{1/5}} \tag{7}
\end{equation}

and

\begin{equation}
C_i = \frac{a_i}{a_t} \left(\frac{P_t}{P_i}\right)^{1/5} C_t \quad i=t+1, t+2. \tag{8}
\end{equation}

The elasticity of intertemporal substitution of the utility function in (6) is \(\frac{1}{1.5}\). It is the same utility function used by Fullerton and Rogers (45), with weighting parameters \(a_t\), \(a_{t+1}\), and \(a_{t+2}\) reflecting the consumer's subjective discount rate.

**Producer Behavior**

A single commodity \(X_t\) is produced at the end of each year \(t\) by competitive firms using a Cobb-Douglas production function with constant returns to scale:

\begin{equation}
X_t = AK_t^c L_t^d, \text{ with } c+d=1. \tag{9}
\end{equation}

The firms use capital, \(K_t\), and labor, \(L_t\), in production.

"These assumptions are typical in this literature, because they guarantee that sales revenue is exhausted by payments for inputs, with no excess profits for the firms" (Fullerton and Rogers 31). Although there is a single homogeneous labor input, workers from different groups are assumed to differ in their skill levels; that is, some workers provide more of the homogeneous labor input per unit of time than do others.

The representative consumer's contribution to the capital stock is \(I_t\) in period \(t\), \(S_t\) in period \(t+1\), and \(S_{t+1}\) in period \(t+2\). In a three period model there are three generations
alive in each period. If generation g is old in the first, h is the intermediate generation, while generation i is young, then h will be old in the second, while a new generation, e.g. j, is young. Generation i will be old in the third:

Table 8

<table>
<thead>
<tr>
<th>Period t</th>
<th>Gen g</th>
<th>Gen h</th>
<th>Gen i</th>
<th>Gen j</th>
<th>Gen k</th>
</tr>
</thead>
<tbody>
<tr>
<td>Period t+1</td>
<td>old</td>
<td>middle</td>
<td>young</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Period t+2</td>
<td></td>
<td>old</td>
<td>middle</td>
<td>young</td>
<td></td>
</tr>
</tbody>
</table>

The total capital stock ($K_s$) in the economy in period t is the sum of the inheritance received by generation i, and savings by generations g and h from period t-1:

$$K_{s_t} = I_i + S_{ht-1} + S_{gt-1}$$

Similarly, in period t+1, the capital stock is

$$K_{s_{t+1}} = I_j + S_{it} + S_{ht}, \text{ and in } t+2$$

$$K_{s_{t+2}} = I_k + S_{jt+1} + S_{ht+1}, \text{ with}$$

$$S_{it} = (1+r_i)I_i + w_iL_{it} - C_{it}, \text{ from (1)}$$

and

$$S_{jt+1} = (1+r_{t+1})S_{it} + w_{t+1}L_{jt+1} - C_{jt+1}$$

In a three-period model with three consumer groups, the capital stock in each period will have nine contributors: three generations from each of the three groups.

Cost minimizing by representative firms in the economy implies the following
expressions relating factor demands to factor returns:

\[ r_t = cA(L_t/K_t)^d, \text{ and} \]

\[ w_t = dA(K_t/L_t)^c. \]  \hspace{1cm} (11)

**Equilibrium**

There are a total of three markets in each period: the commodity market, the capital market and the labor market. The conditions for equilibrium in the three-period model are that the factor demands for capital and labor equal factor supplies. Since there is only one commodity in this economy, its price serves as the numeraire, and by Walras' Law the commodity market will automatically clear if both the factor markets clear.

These conditions must hold for each period \( t \) if the economy is to be in dynamic equilibrium. The assets supplied by some generation at time \( t \) depend on its consumption-saving decisions made when the generation was young at time \( t-1 \) or \( t-2 \). These decisions are based on perceptions of \( r_t \) and \( w_t \) which enter the generation’s lifetime budget constraint. Therefore, the dynamic equilibrium, if it occurs, depends on the expectations of successive young generations about economic conditions in their future. Since this is a certainty model, the assumption of rational expectations reduces to that of perfect foresight. The condition of dynamic perfect foresight equilibrium can now be described as a time path of wage rates \( (w_t) \) and returns to capital \( (r_t) \) that is correctly foreseen by the household sector, and induces time paths of supply of capital and labor that equals the time paths of demand for capital and labor forthcoming at these factor prices.
The Steady State

Steady state growth in this constant returns to scale economy implies that the capital stock, labor supply, and therefore total production, grow at the same constant rate. If capital and labor supply grow at the same rate, it follows from (11) that factor prices will remain constant over time. Let the steady state factor prices be denoted by \( w_i \) and \( r_s \). If we expand the expressions for the supply of capital from (10) above, and write them in terms of the steady state factor prices, they become

\[
K_{st} = I_i + S_{ht-1} + S_{gt-1} \\
= I_i + (1+r_i)I_{ht} + w_tL_{xt} - k_1Y_h \\
+ (1+r_i)^3I_{gt} + (1+r_i)w_tL_{gt} + w_tL_{gt+1} - k_2Y_g
\]

where

\[
Y_x = I_x(1+r_i)(1+r_i) + w_tL_{xt+1} + w_tL_{xt}(1+r_s) - B_x, \text{ for any generation } x. \]  The values of \( k_1 \) and \( k_2 \) are constant in the steady state.

Assume that each individual supplies a constant amount of labor in all three periods, then the capital stock in period \( t \) becomes a simple function of seven variables, namely, the inheritances of three generations, the labor supplied by the two older generations, and the bequests left by the two older generations:

\[
K_{st} = K(I_i, I_h, L_n, B_h, I_g, L_g, B_g). \tag{12}
\]

Similarly, the capital stock function in the next period, \( t+1 \), has the same form, but with different variables; it is dependent upon variables belonging to one generation younger than \( K_s \):

\[
K_{s_{t+1}} = K(I_j, I_i, L_t, B_i, I_h, L_n, B_h). \tag{13}
\]

The capital stock will therefore grow at a constant rate \( i \) from period \( t \) to period
t+1 if (i) inheritances annually grow at rate i, (ii) labor supply grows at rate i, and (iii) bequests grow at rate i. Because the bequests made by an old generation are the inheritance of the young generation in the next period, it follows from (iii) that $B_{x_{t+3}} = I_x(1+i)^3$ for any generation x.

These assumptions will be made in the multi-period model below, in order to start off with steady state growth in the factors of production and production itself. Government policy changes will then be implemented and the effects of the changes studied on (i) the growth rates of the variables above, as well as (ii) the levels of these variables.

The Inclusion of a Government

The inclusion of fiscal policy alters the model in such a way that lifetime budget constraints are changed, with after-tax prices and after-tax lifetime resources substituted for their pre-tax values (Auerbach and Kotlikoff 19). In the model the government is assumed to have a balanced budget in each period, and it does not hold any net wealth to be added to that of the private sector.

To be able to distinguish between the types of taxes in the multi-period model below, definitions of an income tax and a consumption tax are given in the next few paragraphs. Bradford calls the US income tax "...a blend, or hybrid, of an accrual-income concept and a consumption concept" (7). The South African tax system is not less of a hybrid.

The Budget Constraint with an Income Tax

According to the 'Haig-Simons', or 'uses' view of income, the definition of income is total
consumption plus the change in net wealth. In the three-period model income is the total amount spent on consumption plus net saving in each period. Another view of income is the 'factor payment' view, which defines income as the sum of all factor payments from production (Bradford 7). The two definitions of income are not equivalent in this model, since inheritances and bequests are treated differently under the two. The intertemporal budget constraints for both cases are briefly shown. The consumer starts with zero wealth, and then inherits an amount $I$ in the beginning of the first period. He also earns a return on this inheritance during the first period, as well as labor income. At the end of the first period, the government taxes income. Under the 'accrual' definition, the accretion to his zero wealth, or his accrued income, is $Y_1^u = (1+r_1)I + w_1L_1$. This is equal to $C_1 + S_1$ from equation (1) and also satisfies the 'uses' definition of income. In the second period income would be: $Y_2^u = r_2S_1 + w_2L_2$, and in the third: $Y_3^u = r_3S_2 + w_3L_3$. The consumer leaves a bequest, which is not deductible from the tax base under the lifetime endowment view of tax equity, the view adopted in the model below. "The alternative view (dynastic view of tax equity) is that a deduction should in fact be allowed to the donor for the making of gifts and bequests to other individuals. (McLure, Mutti, Thuronyi & Zodrow 313)."

The third period tax base with this view would have been $Y_3^u = r_3S_3 + w_3L_3 - B$.

Taxing income at rate $t_\gamma$ will give the following three budget constraints in the three periods of the model, given that the lifetime endowment view is adopted:

$$C_1 + S_1 - (1-t_\gamma) Y_1^u - (1-t_\gamma) (1+r_1) I\times w_1L_1) - (1-t_\gamma r_1') I\times w_1'L_1$$

$$C_2 + S_2 - S_1 - (1-t_\gamma) Y_2^u - (1-t_\gamma) (r_2S_1 + w_2L_2) = r_2'S_1 + w_2'L_2$$

(14)
\[ C_3 \cdot B \cdot S_2 \cdot (1-t_e) \cdot Y_t^u = (1-t_e) (r_3 \cdot S_2 \cdot w_3 \cdot L_3) - r_3 \cdot S_2 \cdot w'_3 \cdot L_3 \]

with \( Y_t^u \) the 'uses' definition of income from above; \( r'_e = (1-t_e) \cdot r_e \), and, \( w'_e = (1-t_e) \cdot w_e \). By substituting two of the equations into the third, and with a little more manipulation, the following intertemporal budget constraint can be derived:

\[
C_1 \cdot \frac{C_2}{[1+r'_2]} \cdot \frac{C_3 \cdot B}{[1+r'_2][1+r'_3]} \\
- (1-t_e \cdot r'_e) \cdot I + w'_1 \cdot L_1 \cdot \frac{w'_2 \cdot L_2}{[1+r'_2]} + \frac{w'_3 \cdot L_3}{[1+r'_3][1+r'_4]} \tag{15}
\]

According to the 'factor payment' view of income, income is .."what is received in payment for services rendered" (Bradford 15). Transfers received are not payments for services rendered and are not included in a factor payment definition of income. In the simple model here, the only difference between the two definitions is the treatment of inheritances and bequests. Inheritances would not be included, and bequests not deductible, since it is not a cost of earning factor payments (18). "Therefore the factor payment view would ignore gift transactions, neither including amounts received in the income of the recipient nor allowing a deduction on the accounts of the donor" (21). The factor payments in the three-period model are:

\[ Y_1^f = r_1 \cdot I + w_1 \cdot L_1; \ Y_2^f = r_2 \cdot S_1 + w_2 \cdot L_2, \text{ and } Y_3^f = r_3 \cdot S_2 + w_3 \cdot L_3. \]

The intertemporal budget constraint with an income tax, given the factor payments definition of income, would look as follows:

\[
C_1 \cdot \frac{C_2}{[1+r'_2]} \cdot \frac{C_3 \cdot B}{[1+r'_2][1+r'_3]} \cdot (1-t'_e) \cdot I + w'_1 \cdot L_1 \cdot \frac{w'_2 \cdot L_2}{[1+r'_2]} + \frac{w'_3 \cdot L_3}{[1+r'_3][1+r'_4]} \tag{16}
\]
This intertemporal budget constraint is similar to the basic constraint in (5), but not quite the same. The discount rate has changed, and each income term on the right hand side has been multiplied by (1-t_r).

According to Bradford the present law in the US does not allow a deduction for gifts or bequests given, but it also does not regard gifts and inheritances received as taxable (37). This is also the case in South Africa, but the Katz commission on tax reform has recommended the implementation of gifts and bequest taxes.

Instead of taxing income from capital and labor at the same rate \( t_r \), provision will be made for two different tax rates, namely \( t_k \) for a tax on capital income, and \( t_c \) for a tax on wage income. Since a general sales tax is levied on all goods and services in South Africa, the budget constraint with a consumption tax is briefly treated in the next paragraph. It is compared with the budget constraints with an income tax and a general sales tax. The implementation of a cash flow tax does not alter the basic intertemporal budget constraint as much as an income tax.

**The Budget Constraint with a Personal Cash Flow Tax**

"The difference between a consumption-based tax and an income-based tax is entirely in the treatment of saving" (Bradford 17). The underlying idea of a personal cash flow tax is to measure individual consumption by subtracting savings from the individual's income (82). All amounts received by the consumer would therefore be included in the tax base, while all amounts saved, would be subtracted from the base (96). According to this definition any amount withdrawn from savings is also taxable. A cash flow tax at rate \( t_c \).
in the absence of inheritances and bequests, will influence the basic budget constraints in
the three periods as follows:

\[ C_1 \cdot (1 - t_c) \left( \frac{C_2}{S_1} \cdot \frac{C_3}{S_2} \right) \]

\[ C_2 \cdot (1 - t_c) \left( \frac{C_3}{S_1} \cdot \frac{C_3}{S_2} \right) \]  \( (17) \)

\[ C_3 \cdot (1 - t_c) \left( \frac{C_3}{S_1} \cdot \frac{C_3}{S_2} \right) \]

The consumer receives income from labor in the first period, but savings, \( S_1 \), is deducted
from his taxable income. In the second period \( S_1 \) is available for consumption, as well as
income from it, and therefore \( S_1(1 + r_3) \) is included in the tax base. Second period savings
must be deducted, however. The following intertemporal budget constraint results from
consecutive substitution:

\[ C_1 \cdot \frac{C_2}{[1 + r_2]} \cdot \frac{C_3}{[1 + r_2][1 + r_3]} \]

\[ - (1 - t_c) \left( \frac{C_2}{[1 + r_2]} \cdot \frac{C_3}{[1 + r_2][1 + r_3]} \right) \]  \( (18) \)

**A Retail Sales Tax and the Comparison with a Personal Cash Flow Tax**

In a simple model like the three-period model under consideration, a sales tax is
very similar to a personal cash flow tax. The intertemporal budget constraint with only a
sales tax and no other taxes would look almost the same as the budget constraint in \( (18) \),
namely

\[ (1 + t_s) \left[ C_1 \cdot \frac{C_2}{[1 + r_2]} \cdot \frac{C_3}{[1 + r_2][1 + r_3]} \right] - \frac{w_1}{L_1} \cdot \frac{w_2}{L_2} - \frac{w_3}{L_3} \)  \( (19) \)
The two expressions in (18) and (19) only differ with regards to the terms containing the two tax rates $t_c$ and $t_s$. They will be the same if

$$
(1-t_c) \cdot \frac{1}{(1-t_s)} = (1-t_c) (1+t_s) - 1 = t_s \cdot \frac{t_c}{1-t_c}
$$

(20)

The personal cash flow tax will therefore be exactly the same as the retail sales tax if the relationship in (20) between $t_s$ and $t_c$ holds.

A Wealth Tax and an Estate Tax

The wealth held by the consumer in the first period is his inheritance. In the second and third periods it would be his savings carried over from the respective previous periods. Imposing a wealth tax at rate $t_w$ would render $t_w I$, $t_w S_1$, and $t_w S_2$ as government revenues in the three periods of the model. No wealth taxes are levied in South Africa, except for property taxes by local governments and an almost voluntary estate tax. I will therefore only tax the income from inheritances and savings by imposing a capital income tax on them.

An estate tax at rate $t_e$ on the bequest made, would change the no-tax budget constraint in the third period as follows:

$$
C_3 \cdot B (1+t_x) - S_2 (1+t_x) \cdot w_3 L_3 .
$$

Neither the budget constraints developed for the income taxes above, nor the one for the consumption tax had a similar expression in it. According to Smith the choice between an estate tax and an inheritance tax depends on whether the application of wealth transfer taxes are to be applied to the donor or the donee. "If the objective is to collect, at the time
of death, a tax that has been deferred during the lifetime of the donor, the estate tax may be appropriate." (Smith 110). McLure, et.al. recommend with regard to Columbia, that gifts and bequests constitute realization events. "When a taxpayer disposes of appreciated property by gifts or bequests, the gain accrued up to the time of disposition will escape tax in the taxpayer's hands unless it is taxed at that point." (McLure, Mutti, Thuronyi and Zodrow 138).

According to Smith an inheritance tax will be more appropriate "if...the objectives of wealth transfer taxes are (1) to tax according to the taxpaying ability of the living, (2) to tax windfalls more heavily than other forms of income, (3) to encourage wealth dispersal through the wider distribution of bequests, and (4) to relate taxes to gifts and bequests over a lifetime." (Smith 111).

South Africa does not have a capital gains tax in place and should theoretically rather have an inheritance tax than an estate tax. I am modeling an estate tax, however, because the country has one in place currently, and it is about to be reformed. The important issue in my view, is that individual wealth should be taxed at least once during each generation. The estate tax is therefore used as a proxy for the lifetime endowment view of tax equity, where inheritances received is normally taxed, while no deduction is allowed for bequests given. Rather than taxing inheritances at the beginning of a period in the model, I tax bequests at the end of the previous period, with little difference.

An estate tax should also be easier to enforce than an inheritance tax. "Bequests are easier to deal with because they are found only on returns of decedents, and such returns are limited in number and easily identified." (McLure, Mutti, Thuronyi and
Evasion is a problem with inheritance taxes, "as it is extremely difficult for
tax administrators to uncover unreported transfers, especially between family members." (138).

The Intertemporal Budget Constraint with All the Possible Taxes

The budget constraints in equations (1) through (3) above will change as follows
if a sales tax \( t_c \), a wage tax \( t_l \), a capital income tax \( t_k \), and an estate tax \( t_e \) are levied in
each period:

\[
\begin{align*}
C_{lt} (1-t_c) & \cdot S_{lt} - (1-r_c (1-t_k)) \cdot I_t + w_c (1-t_c) \cdot L_{lt} \\
C_{lt-1} (1-t_c) & \cdot S_{lt-1} - (1-r_{c-1} (1-t_k)) \cdot S_{lt} + w_{c-1} (1-t_c) \cdot L_{lt-1} \\
C_{lt-2} (1-t_c) & \cdot B_{l} (1-t_e) - (1-r_{c-2} (1-t_k)) \cdot S_{lt-1} + w_{c-2} (1-t_c) \cdot L_{lt-2}
\end{align*}
\]

The resulting lifetime budget constraint is

\[
\begin{align*}
C'_{lt-2} & \cdot B'_{l} \cdot C'_{lt-1} (1-r'_{c-1}) \cdot C'_{lt} (1-r'_{c}) \\
& \cdot (1-r'_{c}) (1-r'_{c-1}) (1-r'_{c-2}) \cdot I_t + w'_{c-2} L_{lt-2} \cdot w'_{c-1} L_{lt-1} (1+r'_{c-2}) + w'_{c} L_{lt} (1+r'_{c-1}) (1+r'_{c})
\end{align*}
\]

\[
(22)
\]

with \( C' = C (1-t_c) \), \( B' = B (1-t_e) \), \( r' = r (1-t_k) \),
and \( w' = w (1-t_c) \) for \( t, t+1 \) and \( t+2 \).

The presence of government transfers and taxes in the model changes the conditions for
reaching a steady state slightly. The inclusion of transfers alters the annual income of

\[
^2\text{ Although I am quoting McLure, et. al. here to give an argument for an estate tax, I}
\]

should add that despite the disadvantages of an inheritance tax, they recommended such
a tax for Columbia, with strict enforcement by the government.
consumers, and therefore their saving behavior and contributions to the capital stock. For a steady state growth rate of \( i \) to be maintained, it turns out that government transfers also need to grow annually at rate \( i \).

In the full model below, two scenarios with respect to government policy changes are modeled. First, it is simulated how steady state growth would change in the presence of an anticipated policy change, and second, what would happen if there is a surprise policy change.

**An Unexpected Policy Change by Government**

Suppose that the government plans to change some tax rates in the second period of the representative consumer’s life in the 3-period model. Since the consumer doesn’t know about this policy change, he consumes and saves in the first period in exactly the same way as was described above for the perfect foresight case. His perceived lifetime income is the same as in equation (4) and his consumer demand function is that in equation (7). He has, however, miscalculated his lifetime endowment, because one or more of the tax rates change from the second period onward. With the new tax rates, the second and third period budget constraints look as follows:

\[
(1+\tau_c^o) C_2^o - S_2 - S_1 (1+\tau_2^o) - w_2^o L - g_2
\]

\[
(1+\tau_c^o) C_3^o - B (1+\tau_h^o) - S_2 (1+\tau_3^o) - w_3^o L - g_3
\]

(23)

with \( \tau^o \) the new tax rates, and \( x^o \) and \( w^o \) the resulting new factor prices. The true lifetime budget constraint becomes

\[
C_3^o - C_2^o (1+\tau_2^o) - C_1 (1+\tau_3^o) (1+\tau_3^o) = Y^o
\]
\[ I_1 (1 + r_1^o) (1 + r_2^o) (1 + r_3^o) - B (1 + r^o) \cdot w^o L \cdot g_3 \]
\[ + (w_2^o L \cdot g_2) (1 + r_1^o) + (w_1 L \cdot g_1) (1 + r_2^o) (1 + r_3^o) \]

(24)

Consumption in the first period, \( C_1 \), has already taken place. If its value from equation (7) is substituted into (24), the budget constraint becomes:

\[ C_3^o + C_2^o (1 + r_3^o) = Y^o - C_1 (1 + r_2^o) (1 + r_3^o) - Y^o. \]

(25)

To find the optimal values for \( C_3^o \) and \( C_2^o \), the consumer has to maximize a new utility function \( U = (a_2^{1-\delta}C_2^{\delta} + a_3^{1-\delta}C_3^{\delta})^{-1/\delta} \) subject to the constraint in (25). He therefore remaximizes utility for the remainder of his lifetime once he has taken the surprise policy changes by the government into consideration. The optimal values for \( C_3^o \) and \( C_2^o \) are:

\[ C_3^o = \frac{a_2^\delta Y}{a_2 (1 + r_3^o)^{1/\delta} + a_3}, \quad \text{and} \]
\[ C_2^o = \frac{a_2}{a_3} \left( \frac{1}{1 + r_3^o} \right)^{1/\delta} C_3^o. \]

(26)

The contributions to the economy's capital stock by the representative consumer do not change in the first two periods, since the inheritances of the consumer have then already been made available to the production sector in the first period. First period saving, which serves as production capital in the second period, has also taken place when the surprise policy change is implemented at the end of the second period. (All activities in this economy take place at the end of each period). The changes in the consumer's second and
third period consumption that are discussed above, imply that second period saving is altered. From (23) the accompanying altered saving function and the resulting contribution to the capital stock in period 3 can be determined.

In the next section the full 51-period model is described. The principles of this model are exactly the same as those of the three-period model.

A 51-Period General Equilibrium Model with Eleven Overlapping Generations and Three Consumer Groups

The Demand Side

At any given point in time, there are eleven generations of individuals alive in each group. In Table 9 below 15 generations are shown in 25 periods to give an indication of which overlapping generations are alive in each period. An individual from generation 12 is young (y) in period 12, and old (o) in period 22. Any generation i is young in period i, and old in period i+10. In a specific period, e.g. period 14, generations 4 through 14 are alive; generation 14 is young and generation 4 old. In any period t, for t greater than 10, the generations alive are generations t-10 through t. Generation 1 only becomes old in period 11, so that the first ten periods contain generations older than generation 1. They are defined to be "unknown." The model below covers 51 generations and 51 periods, with periods 11 through 41 forming the core of the model, covering generations from the time that they are young until they are old.

A representative consumer from generation i (i=11,12,\ldots,41) and group j (j=1,2,3) maximizes his lifetime utility

$$\nu_{ij} = \left( \sum_{k=1}^{14} a_{ij}^{1.5} c_{ij}^{5} \right)^{1/8}$$

(27)
Table 9

Overlapping Generations for 25 Periods

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subject to a lifetime budget constraint. This is a CES-type intertemporal utility function
where the weighting parameter, $a_i$, reflects the consumer's subjective discount rate
(Fullerton & Rogers 145).

In the model the same utility function is used for all three groups, that is, for
everyone in the model. It was indicated in the introduction that there are three groups in
the economy which differ according to the amount of wealth that they hold: a rich business
class, a middle class, and a poor group. The reason for using the same utility function for
all is that it seems arbitrary to assume that even if the poor were to receive additional
wealth, they would still consume as if they were poor (Fullerton and Rogers 30).

The lifetime budget constraint is derived from eleven annual budget constraints:

$$
C_{ij1} - S_{ij1} = (1 + r_1^i) I_{ij} - w_1' L_{ij} + g_1 - (1 + r_1^i) I_{ij} + Y_{ij1}
$$

$$
C_{ij2} - S_{ij2} = (1 + r_2^i) S_{ij1} + w_2' L_{ij} + g_2 - (1 + r_2^i) S_{ij1} + Y_{ij2}
$$

$$
C_{ij3} - S_{ij3} = (1 + r_3^i) S_{ij2} + Y_{ij3}
$$

$$
C_{ij10} - S_{ij10} = (1 + r_{10}^i) S_{ij9} + Y_{ij10}
$$

$$
C_{ij11} - B_{ij} (1 + t_c) = (1 + r_{11}^i) S_{ij10} + Y_{ij11}
$$

with $C_{ijc} = C_{ijc} (1 + t_c)$, and $C_{ijt}$ the amount of the single commodity in the economy
consumed by a consumer from generation i and group j in period t;

$w'$, the after-tax price of labor in period t ($=w_i(1-t_t)$);

$L_{ij}$ the labor supplied by a consumer from generation i and group j;

$I_{ij}$ the amount inherited by consumer ij;
$S_{ij}$, the amount saved by him in period $t$;

$B_{ij}$ the bequest made by consumer $ij$ at the end of his life;

$r_{i}^\prime$, the after-tax rate of return on savings in period $t$ ($=r_{i}(1-t_{c})$);

$g_{i}$, the government transfers received by each poor individual during period $t$;

$t_{c}$, $t_{w}$, $t_{k}$ and $t_{e}$ the consumption, wage, capital income, and estate tax rates respectively, and $Y_{ij} = w_{i}L_{ij} + g_{i}$.

A consumer from generation $i$ and group $j$ receives an inheritance $I_{ij}$ at the beginning of his life which he makes available to the production sector, and he earns a return of $r_{i}I_{ij}$ on it. During all the periods after his first he also earns returns on his savings from the respective previous periods; savings which are also made available to the production sector. He furthermore earns labor income $w_{i}L_{ij}$ during each period $t$ that he is alive, which is added to his income from capital. At the end of the eleventh and last period the consumer leaves a bequest for the new young generation. This bequest will only become available as part of the capital stock when the new generation makes it available as their inheritance.

The eleven annual budget constraints above can be substituted into one equation, which serves as the lifetime budget constraint:

$$C_{ij}^{t_{i}} + \sum_{t=1}^{10} C_{ij}^{t_{i}}(\prod_{s=t-1}^{t-1} (1+r_{s}^{t_{i}})) - Y_{ij} - I_{ij}(\prod_{s=1}^{t} (1+r_{s}^{t_{i}})) - B_{ij} (1-t_{c})$$

- $Y_{ij}$ the lifetime resources available to consumer $ij$. 

with $Y_{ij}$ the lifetime resources available to consumer $ij$. 

The outcomes of the utility maximization process are the individual commodity demand equations for eleven periods:

\[
C'_{i,j,t} = \frac{a_1 Y_{i,j}}{\sum_{t=1}^{10} a_t p_t \left( \frac{p_{i,t}}{p_t} \right)^{1/\delta}} \quad \text{for } t=1, \ldots, 10
\]

\[
C'_{i,j,t} = \frac{a_t p_t^{-1/\delta} C'_i}{a_1 p_t^{-1/\delta}}
\]

with \( p_t = \prod_{s=1}^{11} (1-r'_s) \).

Each consumer may spend his lifetime income over the period of his life as he chooses. He can, therefore, save or borrow in every period. "Saving" in the last period is nothing but leaving a bequest to the next generation. The representative consumer has the following ten saving (or borrowing) functions in his first ten periods:

\[
S_{i,j,t} = (1-r'_1) I_{i,j} + Y_{i,j,t} - C'_{i,j,t}
\]

\[
S_{i,j,t} = (1-r'_s) S_{i,j,t-1} + Y_{i,j,t} - C'_{i,j,t}, \quad t=2, \ldots, 10.
\]

The contribution to the capital stock of the economy by the consumer during any period \( t \), is his savings from the previous period, except for the first period, when he makes his inheritance available for production purposes. Since there are eleven generations alive for each of three groups in the economy, there are 33 consumer groups contributing to the capital stock in each period. The capital stock in a period \( t \) is the sum of inheritances by the young from all groups of generation \( t \), plus the savings of the ten older generations.
from all three groups: \[ KS_t = \sum_{j=1}^{3} T_{c_j} + \sum_{j=1}^{3} \sum_{i=1}^{10} S_{ijt} \] (32)

**The Supply Side**

The supply side of the South African model is almost identical to the three-period model that was developed above, with the exception that this model has production in 51 periods instead of three - 41 overlapping generations are modeled, each alive for eleven periods. There is one commodity, \( X \), that is produced by competitive firms. Two factors of production are used: capital, \( K \), and labor, \( L \). The two factor prices are \( r \) and \( w \) respectively.

Although there is a single homogeneous labor input, workers from different groups are assumed to differ in their skill levels; that is, some workers provide more of the homogeneous labor input per unit of time than do others. The situation in South Africa is such that the affluent whites mainly constitute the skilled labor force while the poor black majority constitute the unskilled labor force. The model is constructed in such a way that each individual owns the same quality of labor services, but that the quantities vary between the three groups.

A single commodity \( X_t \) is produced at the end of each period \( t \) by competitive firms using capital, \( K_t \) and labor \( L_t \) in production. Firms produce according to a Cobb-Douglas production function with constant returns to scale:

\[ X_t = AK_t^{c}L_t^{d}, \text{ with } c+d=1. \] (33)

Cost minimizing by representative firms in the economy implies the following expressions relating factor demands to factor returns for all periods in the model:
\[ r_t = cA(L_t/K_t)^d, \text{ and} \]
\[ w_t = dA(K_t/L_t)^e. \]  

(34)

**The Role of Government in the Overlapping Generations Model**

Five different taxes have already been introduced above, namely, a sales tax, a wage tax, a capital income tax, a wealth tax, and an estate tax. All of these taxes are not levied simultaneously during the simulations of the model below, but it is convenient to construct the model in such a way that it would provide for all possible taxes from the outset. If a certain tax is not levied with some combination of policy measures by the government, then the particular tax rates are set equal to zero.

The costless government in this model simply returns its tax revenue in the form of equal transfers to all the consumers from the poor group, and does not use its receipts to buy factors of production nor final goods.

The total revenues collected by the government from the three groups in any period \( t \) are the sum of revenues from (1) the tax on capital income from generation \( t \)'s inheritance and the ten older generations' savings: 
\[ \sum_{j=1}^{3} (r \cdot C_{j}) (T_{t,j} + \sum_{j=10}^{3} S_{j,t}) \];

(2) the sales tax on eleven generations' consumption: 
\[ \sum_{j=1}^{3} \sum_{j=10}^{3} t \cdot C_{j,t} \];

(3) the wage tax from eleven generations' labor supply: 
\[ \sum_{j=1}^{3} \sum_{j=10}^{3} w \cdot t \cdot L_{j,t} \] and

(4) the estate tax from the bequests left by generation \( t-10 \): 
\[ \sum_{j=1}^{3} t \cdot B_{j,t-10} \]. The sum of government revenues are shown in this order here:
\[ G_c = \sum_{j=1}^{3} \left( (r_c y_{c}^j) + (r_c y_{c} + \sum_{i=1}^{10} S_{ij}^c) + \sum_{i=1}^{10} (t_c C_{ij}^c + w_c t_c L_{ij}^c) + c_t B_{c=10} \right) \]

**Equilibrium**

As with the three-period model above, there are a total of three markets in each period: the commodity market, the capital market and the labor market. The conditions for equilibrium here are also that the factor demands for capital and labor equal factor supplies in each period. Since there is only one commodity in this economy, its price serves as the numeraire, and by Walras' Law the commodity market will automatically clear if both the factor markets clear. The indirect factor demand functions from equation (34) are

\[ r_t = cA(L_t/K_t)^d \] and \[ w_t = dA(K_t/L_t)^e. \]

The capital supply function from equation (32) is

\[ K_{S_t} = \sum_{j=1}^{3} r_{ij} + \sum_{i=1}^{10} \sum_{j=1}^{10} S_{ij}^c \]

while the total labor supplied in any period \( t \) is the sum of labor supplied by the three groups and eleven generations alive in period \( t \):

\[ L_{S_t} = \sum_{j=1}^{3} \sum_{i=1}^{10} L_{ij}^t. \]

Equilibrium in the factor markets can now be modeled by setting demand equal to supply in each period, i.e., by changing the indirect factor demand functions to the following:

\[ r_t = cA(L_s/K_s)^d , \] and \[ w_t = dA(K_s/L_s)^e. \]

The commodity demand functions for some generation \( i \), and group \( j \), who are alive from period \( s \) to \( s + 10 \), were given in equation (30):

\[ C_{ijs} = \frac{a_{ijs} y_{ij}}{\sum_{i=1}^{10} a_{ij} p_{ij} \left( p_{ij} / p_{c} \right)^{1-\delta}} \] for \( j = 1, \ldots, 3 \)
\[ \frac{C_{i,j,t}}{\alpha} = \frac{P_s}{P_c} \frac{1}{s^2} C_{i,j,s} \quad \text{for } t = s+1, \ldots, s+10 \]

with \( Y_{i,j} = I_{i,j} \left( \prod_{s=1}^{11} (1 + r_s') \right) - B_{i,j} (1 + e_p) + Y_{i,j,11} + \sum_{t=1}^{10} Y_{i,j,t} \left( \prod_{s=t+1}^{11} (1 + r_s') \right) \).

\( Y_{i,j} \) consists of wage income and government transfers. Total commodity demand in any period \( t \) will be \( C_e = \sum_{j=1}^{3} \sum_{t=1}^{10} C_{i,j,t} \). Since the production function exhibits constant returns to scale, firms produce exactly the quantity demanded by the consumers. In any period, \( t \), the total quantity supplied, \( X_t \), will be equal to quantity demanded:

\[ X_t = \sum_{j=1}^{3} \sum_{t=1}^{10} C_{i,j,t} + \sum_{j=1}^{3} \sum_{t=1}^{10} \left( \sum_{s=1}^{11} S_{i,j,t} \cdot B_{i,j-t-1} - \sum_{i=1}^{10} S_{i,j,t-1} \right) \]

Since there is no money in this model saving is in terms of the single commodity produced here. Production is therefore a sum of consumption and saving demand in any period, minus savings brought over from previous periods.

The government's budget is balanced in each period. Total revenues are equal to total taxes in each period:

\[ G_t = \sum_{j=1}^{3} \left( (x_t \cdot c_t + I_t) \right) \cdot \sum_{i=1}^{3} \left( \sum_{s=1}^{11} S_{i,j,t} \cdot B_{i,j-t-1} \right) + \sum_{i=1}^{10} \left( \sum_{s=1}^{11} S_{i,j,t} \cdot E_{i,j,t} \right) \cdot c_{i,j,t} \cdot (e_p + e_b_{i,j,t}) \cdot e_{i,j,t} \]

The Steady State

Steady state growth in this model takes place under similar conditions as in the three-period model described above. If the capital stock and labor supply grow at the same rate, it follows from equations (34) that factor prices will remain constant over time, since factor prices are functions of the ratio of capital to labor in each period. If capital and labor grow at the same rate, then the assumption of constant returns to scale in the Cobb-
Douglas production function in equation (33) results in production growth at the same rate as the factors.

Consumption by generation i in group j is a simple function of their lifetime resources, which in turn is a linear function of (i) the inheritance they received, (ii) transfers they receive from the government, (iii) their fixed labor supply in each period, and (iv) the bequest that they leave behind. Consumption by the next generation in group j will be five per cent larger than that of generation i, if their inheritance, labor supply, and the bequest they make all are five per cent larger.

Since the South African economy has grown at an average rate of one per cent per annum for the last 20 years, a steady state growth rate of five per cent per period is modeled. Sufficient assumptions for a steady state growth rate of five per cent to be obtained in the model, are that (i) the inheritances which generations receive grow at five per cent from generation to generation, (ii) the labor supplied grow at five per cent from generation to generation, and (iii) the bequests made grow at five per cent from generation to generation. If these conditions hold, the capital stock will also grow at the same rate.

**The Welfare Effects of a Policy Change**

The government in the general equilibrium model has as a final goal the redistribution of wealth. It is necessary to calculate the differences in welfare between the before-tax and after-tax steady states in order to make conclusions about the effectiveness of the redistribution policies. The measure of welfare differences that I use is the equivalent percentage increase in lifetime resources needed in the original steady state to
produce an individual’s realized level of utility under the various redistribution policies.

According to Fullerton and Rogers, "computing lifetime tax incidence is a straightforward task….within the lifetime model." (66). They use a simple CES lifetime utility function, and find the equivalent variation to be

\[ EV = (U^n - U^o)P^o_u, \]

where \( U^n \) is the new lifetime utility level, \( U^o \) is the old utility level, and \( P^o_u \) the "lifetime price index" for utility (Fullerton and Rogers 67). Since the expenditure function takes on the form, \( E = P_u U \), the equivalent percentage change in lifetime resources must be

\[
\frac{EV}{E^o} = \frac{(U^n - U^o)P^o_u}{E^o} \\
= \frac{(U^n - U^o)P^o_u}{P^o_u U^o} \\
= \frac{(U^n - U^o)}{U^o},
\]

which is merely the percentage change in lifetime utility.

**Calibrating the Model**

The parameters of the multi-period general equilibrium model are chosen to resemble the South African situation in 1985, as the study of the wealth distribution in Chapter 2 was done for 1985. The ratios of wealth ownership from that study are used for the three groups in this model. To model the effects of a government policy change in 1995, or period 21, the capital stock and labor force values for South Africa in 1985 are used in period 19. (Each period is five years long).

The factor elasticities for the Cobb-Douglas production function, \( X = AK^aL^b \), were obtained from econometric estimation. The estimated values for \( A, a, \) and \( b \) are \( A=272.6 \).
a=0.427 and b=0.573. These values are very close to those found by the South African Reserve Bank in 1984, who found a=0.42 and b=0.58. (South African Reserve Bank, 1984).

The total capital stock is divided between the three groups according to the actual wealth distribution as it was described in Chapter 2. The top 5% of the population (the rich group in the model) own 27% of all wealth, the next 30% of the population (the middle class in the model) own 63%, and the bottom 65% of the population (the poor group in the model) 10%.

The number of employed persons in the South African labor force are used as the labor input in the production function of the model. The average wages for 1985 are used to determine the amount of labor owned by each group. The average wage of the poor group, for example, was 25% of the middle class wage, and less than 10% of the rich group's wages. For each unit of labor that the poor provides, the middle class provides 4 units and the rich 10. The labor force is divided between the three groups according to these ratios, such that the total gives the 1985 employment figures for South Africa.

The initial steady state growth rate is assumed to be 5% per period, or 1% per annum. Although the South African economy has grown at a rate of between 2 and 3 per cent during the past 100 years, the last 20 years have only seen an average growth of 1% per annum.

On the demand side I followed Fullerton and Rogers, as well as Auerbach and Kotlikoff with the calibration of the parameters. I set the rate of time preference equal to 0.005, after Fullerton and Rogers (145), since I am using the same lifetime utility function
that they use. They determine the intertemporal share parameters, \( a_t \), from the CES utility function in (27) above, according to

\[
a_t = \left[ \frac{1}{(1 + \delta)} \right]^{t-1} / \sum_{s=1}^{T} \left[ \frac{1}{(1 + \delta)} \right]^{s-1},
\]

where \( T = 11 \), and \( \delta \) is the rate of time preference.

The intertemporal elasticity of substitution was set to 0.25, which is the value estimated by Auerbach and Kotlikoff to be the average value found from various estimations of the intertemporal elasticity of substitution (51).

A progressive income tax system is modeled by imposing the average South African income tax rates on the three groups which are imposed by the South African Receiver of Revenue. The lowest income tax bracket is used for the poor, i.e., an average income tax of 17%. The average rates for the other two groups are 25% and 35%. (Cronjé and Stack 534). A sales tax of 14% is also modeled to capture the South African situation. Government revenues in this model are given back to the poor consumers in each period.

The Katz commission of inquiry into the South African tax system recommended an increase in the tax on capital income, as well as an increase in the estate tax rate, and a reduction in the wage tax rates. (RSA). I modeled a 10% increase in the tax on income from capital for the two richer groups, as well as an introduction of a 10% estate tax. Although the Katz commission did not recommend an increase in the sales tax rate, I model an increase to 20% to compare such a policy measure with the other two measures.
Simulation Results

Three policy changes have been simulated; an increase in the tax rate on capital income for the Rich and Middle Class; the implementation of an estate tax, and an increase in the general sales tax. First, with a proportional adjustment in the wage tax such that total government revenues (and hence government transfers) do not change, and second, without an effort to keep government revenues the same - revenues and therefore transfers will increase. I will refer to the adjusted and the unadjusted cases.

The adjusted simulations are done so that the effects of a tax change are not mixed up with the effects of the change in government revenues and transfers. A similar "differential" incidence analysis was done by Fullerton and Rogers (35), where the effects of various taxes were compared with those of a proportional tax that raised the same revenue. This approach is also relevant for redistribution policy, since it shows how tax reform can result in an improved distribution of wealth, without increasing the total tax burden on individuals.

An Increase in the Capital Income Tax

An increase in the tax on capital income without an adjustment in other tax rates raises the total revenues collected by the government. In Figure 9 both the steady state levels of government revenues and the after-tax levels are shown. Since all revenues are given back to the consumers, their annual and lifetime incomes are affected, and therefore also consumption levels and saving. If the wage tax rates are adjusted proportionally until government revenues equal the steady state values, it becomes possible to isolate the
effects of the increase in the capital income tax. (The results of the adjusted and unadjusted simulations are generally similar, and differ only in magnitude). The outcomes of an increase in the capital income tax are the following:

Figure 9

Government Revenues

(1) The growth rate in the total capital stock drops dramatically in the period after the policy change. (The reason for not dropping in the period of change is that the capital stock in any period is made up of savings from the previous period). The growth rates of the total capital stock is given in Figure 10 which shows the growth rates for an unexpected policy change. Since the growth rates are always below the steady state growth rate of 5% per period, the levels of the capital stock also drop below the steady state levels
in each period after the policy change.

(2) The total level of consumption increases for a number of periods and then drops below the steady state levels. When the economy returns to the steady state growth rates, the level of total consumption is lower than what it would be without the policy change.

(3) The decomposition of total consumption into three parts according to the groups modeled renders interesting results. The most dramatic results are obtained when the policy change is unexpected, and unadjusted; i.e., when government revenues and transfers are allowed to increase with the implementation of a capital income tax. The rich group unambiguously consumes less after an increase in the tax on their capital income.

Figure 10
Growth in the Total Capital Stock
This is shown in Table 10, where the steady state values of consumption are given in Table 10a, and the altered values in Table 10b. The numbers given are millions of Rands, in 1985 prices.

The effects of the tax change can be best seen in Table 10c, where the ratios of after tax to before tax consumption are portrayed, for the unexpected increase in the capital income tax rates. A certain period’s consumption ratios are given in each row in the Table. The oldest generation is on the left-hand side and the youngest generation on the right. In most periods the consumption of the older generations decrease more than that of the younger generations. In period 22, for example, the oldest generation in the rich group consumes 86.8 per cent of its steady state consumption level, while the youngest generation consumes 90.2 per cent. For each generation, consumption declines more in its old age than when the generation is young. Generation 23 in Table 10c consumes 90.2 per cent of its steady state level of consumption in its first period, but only 87.5 per cent in its last. This result is to be expected, since older persons have acquired more capital and are more affected by an increase in the capital income tax.

The consumption of the poor group is given in Table 10d. There is an unambiguous increase in the consumption levels of the poor group, with the younger members benefiting more than the older ones. In period 22, for example, the oldest generation in the poor group consumes 8.6 per cent more than its steady state consumption level, while the youngest generation consumes 7.3 per cent more. Looking at a specific generation, consumption increases a little more in its old age than when a generation is young. In its first period, generation 23 consumes 7.34 per cent more than its steady state level of
### Table 10a
#### Steady State Consumption
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### Table 10b
#### Consumption with Unexpected and Unadjusted Capital Income Tax

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### Table 10c
#### Ratio of Consumption: After-tax/Before-tax

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The numbers in Tables 10a and 10b are given in millions of South African Rand - 1985 prices.
Table 10d
Ratio of Consumption: Poor Group
Unadjusted Capital Income Tax

| Period | 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 | 140 | 150 | 160 | 170 | 180 | 190 | 200 | 210 | 220 | 230 | 240 | 250 | 260 | 270 | 280 | 290 | 300 |
|--------|---|----|----|----|----|----|----|----|----|----|-----|-----|-----|-----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
|        |   |    |    |    |    |    |    |    |    |    |     |     |     |     |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Poor   |   |    |    |    |    |    |    |    |    |    |     |     |     |     |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Generation |   |    |    |    |    |    |    |    |    |    |     |     |     |     |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |

consumption, and 7.37 per cent more in its last period. The increase in the capital income tax does not apply to this group and the increase in its consumption levels is not surprising. Total government transfers increase, and therefore also their levels of income and consumption.

When government revenues are adjusted to remain the same as in the steady state (through a decrease in wage taxes), the rich group’s consumption generally decreases, but not as markedly as without the adjustment. In period 22, the period after the policy change, the oldest generation in the rich group consumes 93.9 per cent of its steady state level, while the youngest generation consumes 97.8 per cent. Generation 23 consumes 97.9 per cent of their initial steady state level when they are young, but only 95 per cent of their steady state level in their last period. The poor group’s consumption still increases unambiguously in all periods for all generations, but the increases are smaller than with the unadjusted policy change.
The equivalent percentage increase in lifetime resources needed in the initial steady state to produce each group's realized level of utility under an increased capital income tax, is given in Figures 11a and b. The equivalent variations for the rich and poor groups are -3.2 per cent and 2 per cent in the adjusted cases, and -11 per cent and 7.4 per cent if the government does not adjust the wage tax rates in order to keep its revenues constant.

Figure 11a

Welfare Effects of Increased Capital Income Tax on Rich

The rich are made unambiguously worse off with an increase in the capital income tax, and the poor better off, whether the government adjusts other taxes or not. Total savings and hence the total capital stock decreases, and with it, total production. The rich
gets a smaller share of (the smaller) total production and hence their drop in welfare.

**The Implementation of an Estate Tax**

The implementation of an estate tax has opposite effects on the final levels of the total capital stock and total consumption, than an increase in the capital income tax. Both the levels of the capital stock and consumption end up higher than what it would have been without the policy change. Consumption decreases initially for a number of periods, and then rises above the steady state levels where it remains. Figure 12 shows that the capital stock shoots up and remains above the steady state levels during all the periods after the policy change. The reason is that the model is constructed with the assumption that consumers leave a bequest which is a fixed multiple of their inheritance. If consumers get
a one period in advance warning of the government's intention to implement an estate tax, the capital stock starts growing faster one period earlier, but returns to the steady state sooner, as shown in the Figure.

Figure 12
Growth in Total Capital Stock

The distribution of wealth does not improve unambiguously as with a capital income tax. While the richer two groups generally consume less after the implementation of an estate tax, all the generations in the poor group do not consume more than without the policy change. Since they are also subject to the estate tax, a few generations consume less soon after the policy change, while other generations' consumption decreases towards the end of their lives. The proportions of consumption are shown in Tables 11a and 11b for the adjusted, but unexpected policy change. The rich group's consumption decreases
### Table 11a

**Ratio of Consumption - Rich Group**  
**(Estate Tax)**

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### Table 11b

**Ratio of Consumption - Poor Group**  
**(Estate Tax)**

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### Table 11c

**Ratio of Consumption - Rich Group**  
**(Estate Tax-one period warning)**

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quite dramatically for the first few periods after the implementation of the estate tax, but the situation steadily improves as the groups have more time to prepare for the tax in their last period. From generation 19 onward the rich group reaches more than 90 per cent of their pre-tax steady state levels of consumption. From Table 11a it is clear that in period 21, the period in which the estate tax is implemented, the consumption of the old generation would have to be negative if they were to leave their planned bequest, while the next generation's consumption would decrease by 52.6 per cent. The youngest generation's consumption in period 21 would decline by 7.3 per cent. The effect of the estate tax would be very severe shortly after the implementation, but not very significant once the generations know from their youth that they are going to pay the tax. If the consumers are warned about the intended tax change one period in advance, the situation becomes more acceptable. The rich consumers who are old in the period of the implementation have a 46.9 per cent decrease in consumption, while the next generation's decrease shrinks to 28.3 per cent. This is shown in Table 11c.

The poor group, who also pays the estate tax, has a general increase in consumption after the policy change, except for the group that is old at the time of the implementation of the tax, who has a 2.5 per cent decrease in consumption. The situation concerning the poor group would be worse if the government were to adjust the wage tax rate downwards until government revenues reaches the pre-tax levels. The oldest four generations would experience a drop in consumption due to the implementation of the estate tax, and only the fifth generation and beyond would experience increased consumption levels. This is shown in Table 11b.
Figure 13a

Welfare Effects of a New Estate Tax (Rich)

Figure 13b

Welfare Effects of a New Estate Tax (Poor)
With the implementation of an estate tax, the equivalent variations for the rich and poor groups in the new steady state are zero and 2 per cent in the adjusted cases, and -8.1 per cent and 7 per cent if the government does not adjust the wage tax rates in order to keep its revenues constant. This is shown in Figures 13a and 13b.

If consumers get a one period warning about the estate tax, the decline in welfare becomes less severe for both rich and poor. The unadjusted cases are shown in Figures 13c and 13d, where the top lines show the equivalent variations for the one period warning cases, and the bottom lines those of the unexpected policy changes.

Figure 13c

Welfare Effects of Estate Tax: One Period Warning vs Surprise (Rich)
An Increase in the General Sales Tax

This redistribution policy is effective if the government does not adjust other taxes to bring government revenues in line with pre-tax levels. With an increase in the general sales tax, the equivalent variations for the rich and poor groups in the new steady state are 4.1 per cent and -2.5 per cent in the adjusted cases, and -5 per cent and 4 per cent if the government does not adjust the wage tax rates in order to keep its revenues constant. The equivalent percentage changes in lifetime resources are given in Figures 14a and 14b. The rich group's equivalent variations are given in 14a, and the poor group's in 14b. With an adjustment in the wage tax rates (downward), the rich group will be much better off
Figure 14a

Welfare Effects of an Increased Sales Tax (Rich)

Figure 14b

Welfare Effects of an Increased Sales Tax (Poor)
Figure 14c

Welfare Effects of an Increased Sales Tax:
One Period Warning vs Surprise (Rich)

than with no adjustment. In the latter case they pay an increased amount of sales tax
together with the same income taxes as before. The poor group would like to see no
adjustment in wage taxes, since they are the sole beneficiaries of a higher level of
government transfers in that case. This position is shown by the top line in Figure 14b.
Although their wage taxes are also adjusted downward in the case of the adjusted policy
change, the effect of smaller transfers are much stronger here, and the poor group will in
fact be worse off than without the policy change, as shown by the line on the right. A one
period in advance warning would again soften the blow of the policy change. In Figures
14c and 14d it is shown that the warning would result in higher welfare for older persons
among both the rich and poor, and slightly lower welfare for younger persons, while both
scenarios converge to the same levels in the long run.

With no adjustment in other taxes, both the total capital stock and total consumption in the economy decrease. With an increase in the sales tax rate, total consumption shoots up immediately after the policy change, but decreases to a new steady state level just below the old level. The poor class group's consumption increases, but is offset by decreases in the other two groups' consumption.

With the adjustment in the wage tax to keep government revenues unchanged, total consumption and the total capital stock increase in the new steady state, but at the expense of the poor group, whose consumption decreases quite dramatically. This policy change therefore either harms the poor group, or the economy as a whole.
CHAPTER 5
CONCLUSION

The Apartheid system which marked institutionalized privileges for the white minority in South Africa came to a close with multiracial elections in April of 1994. Massive political pressure has already been put on the new (black) government to find quick solutions to the problem of poverty. The government is restricted by the fact, however, that taxpayers are already paying high income as well as indirect taxes. They may therefore borrow funds to be used in development programmes to uplift the poor, or find new sources that can be taxed.

It was found in Chapter 2 that the distribution of personal wealth in South Africa is skewed, but not more so than in other countries in the world. The distribution does clearly lie along racial lines, however, and white South Africans own approximately 90 per cent of all personal wealth, while they only constitute 16 per cent of the population.

Chapter 3 showed that the new South African government, who represents the poor black majority, should act in the interest of their supporters by redistributing the South African wealth. Since they have an outright majority in both Houses of Parliament, they have the authority to redistribute as much as they want. One option is to merely redistribute in the familiar way, namely through a progressive tax system. Another option would be to supplement the present progressive tax by a wealth tax to expedite wealth redistribution. A third option could be to borrow funds from abroad. This would imply that
all future tax payers pay for repairing the damage done under Apartheid, whether they have suffered under the system or not. This does not seem to be a fair solution. Using the current progressive tax system as a source of income to the government, as well as a method of redistributing wealth, would tax whites more since they are the main holders of wealth. An element of unfairness would still exist in this method because a black person and a white person earning the same income would pay the same tax, irrespective of their wealth holdings. Another method that seems to provide the opportunity for those who benefited under the system of Apartheid to carry part of the responsibility to rebuild the country, is to implement a special levy on wealth along with reforming the general progressive tax system in South Africa. Three such scenarios were tested in the thesis, using a general equilibrium model with overlapping generations.

An increase in the tax on income from capital has an unambiguously positive effect on the distribution of personal wealth between rich and poor. The welfare of the poor increases with this policy change, while the rich group ends up worse off than before. The measure of welfare change used in the thesis, is the percentage change in equivalent variation. The total levels of consumption and the capital stock of the economy end up lower than in the no-policy case. These results were obtained using a closed economy model. With the great mobility of capital in the modern world the option of increasing the capital income tax should not be considered seriously by policy makers in South Africa.

The implementation of an estate tax also improves upon the distribution of wealth, with much more efficient results. With the assumption that consumers have a specific target bequest to make, it is found that the implementation of an estate tax results in an
increase in total consumption as well as in the total capital stock. The least disturbing results are obtained when the government announces the policy change in advance. The rich group ends up at more or less the same long run position of welfare, while the poor group's situation improves.

In 1985 a very few estates in South Africa were taxed due to generous deductions provided for in the Estate Tax Law. A basic deduction of R50,000 ($22,500 US) was granted on each estate. Further deductions were granted according to the number of members left behind in the family of the deceased: R50,000 for the spouse and R40,000 for each child in the family, notwithstanding the age of the child. The spouse of a deceased person got a full deduction on the part of the estate that was put under his or her control.

The generous provisions written into the Estate Tax Law in South Africa resulted in an insignificant contribution to the State coffers by the estate tax. This situation worsened after 1985 when the general exemptions were made much larger, so that the estate tax in South Africa is considered to be a voluntary tax. Out of the first 4,000 estates examined, only 212 (5.3 per cent) paid any estate tax at all, and the total amount collected by the State amounted to 1.59 per cent of the total net worth of the estates. These figures are surprising if one thinks that the primary tax is 10 per cent. The tax is therefore almost completely eroded by the generous deductions allowed.

There is a strong case to be made for estate tax reform in South Africa. Huge estates are bequeathed without any taxation. Even if the government would tax all estates at a very low flat rate, they would be capable of raising quite a sum of money from bequests. Wealth in South Africa is passed on to future generations with little wealth
redistribution taking place. The tendency in most developed countries has in fact been that family wealth would stay in the family for generations. A proper estate tax would serve as an instrument of wealth redistribution.

An increase in the general sales tax has ambiguous results. If the government adjusts wage taxes downward until government revenues remain at the steady state levels, the poor group's welfare decreases. With no such adjustment the poor group's welfare increases, but total levels of consumption and the total capital stock in the economy decrease. I would also not recommend this policy option.

Studying the assets and liabilities in the estate accounts of whites and blacks in South Africa clearly shows that the skewed distribution of wealth is no random process. The Apartheid laws that were in place officially since 1948, but had been practiced long before then had a definite effect on blacks' ability to acquire wealth. Wealth has been accumulated by whites at the expense of others as a direct consequence of the Apartheid system, and this wealth could be taxed and redistributed in the form of public services such as education and health care.
BIBLIOGRAPHY


