

## CHAPTER 13

### SUMMARY AND CONCLUSIONS

#### 13.1 INTRODUCTION

Probably the biggest concern for South African policy makers is the high level of unemployment that persists in the economy. There is thus an urgent need for policies that could increase employment growth. There is a widely held view that a decrease in unemployment should also address the skew income distribution that characterises the South African economy. Any policy that would address these issues, would undoubtedly find favour with policy makers.

Despite of high levels of unemployment and social imbalances, there are also concerns about South Africa's environmental management. It seems as if the debate of sustainable development, that has held the attention of policy makers in developed regions of the world for the past decade, has finally caught up with South Africa. One of the concerns that needs to be addressed is the relatively high level of CO<sub>2</sub> emissions created by economic activity in South Africa.

Given the issues discussed above, the purpose of this study was to determine whether policy makers in South Africa could introduce environmental taxation in the form of an intermediate tax on coal, without aggravating the problems of unemployment and the skew welfare distribution. The literature pertaining to the "double dividend" and the "Porter Hypothesis" motivated the possibility of achieving this result.

The study was conducted in four stages:

- i. The first stage comprised a description of the use of coal and unemployment problems in South Africa. This description highlighted the need for an environmental policy that addresses high levels of carbon pollution. It indicated that such a policy should not aggravate the problem of unemployment. Apart from serving as a description of the labour market, the Chapter on the South African labour market provided valuable insights with regard to handling labour as an input within the modelling framework.
- ii. The second stage of the study served as a literature review. An overview of the "double dividend" literature and the "Porter Hypothesis" indicated that, under certain conditions, both environmental and welfare benefits could be achieved by introducing environmental policies. The "double dividend" literature emphasised the importance of efficient redistribution of revenue raised through the policy, while the "Porter Hypothesis"

emphasised the importance of technological innovation in the process of environmental management.

- iii. The third stage of the study involved the description of the CGE model that was used to analyse the effect of environmental policies on the South African economy. A model, based on the ORANI model for Australia was described. This model was applied to a South African database and elasticities for the model were either estimated or values were motivated from current economic literature.
- iv. The fourth stage of the study consisted of a description of the different policy proposals that were tested in the study. A distinction was made between short-run and long-run policy proposals. The short-run policy proposals tested whether it would be possible to achieve a “double dividend” for the South African economy, while the long-run policy proposals were concerned with the “Porter Hypothesis” and the benefits of technological improvements in the use of coal.

### **13.2 THE DUAL CHALLENGE OF REDUCING CO<sub>2</sub> EMISSIONS AND SOLVING THE UNEMPLOYMENT PROBLEM**

It was shown in Chapter 2 that the relatively high levels of CO<sub>2</sub> emissions in South Africa can be attributed to the intensive use of coal in providing for the country’s energy needs. The intensive use of coal can be attributed to the fact that South Africa enjoys an abundance of the resource, which has resulted in prices that are well below the marginal social cost of the resource. Previous governments that subsidised industries that make intensive use of coal further exaggerated dependence on the resource. These industries include the electricity and synthetic fuel industries, while the basic iron and steel industries are also dependant on coal for providing their energy needs.

It became evident in Chapter 2 that an environmental policy will have to include measures that motivate economic agents to reduce their use of coal. Although there are a number of measures available to policy makers, it was shown (Blackman *et al*, 1999) that indirect instruments, such as environmental taxes stand a better chance of being effective in developing nations (than command and control measures), because they are less demanding on regulators than direct measures of pollution control. An illustrative tax that would increase the price of coal in the production process by 50 percent was therefore implemented throughout the study in order to address the high demand for coal.

Due to the fact that the problems of unemployment and social inequity are foremost on the agenda of policy makers, a description of the South African labour market was necessary. An important conclusion from this description was that the unemployment problem in South Africa is not a labour supply-side problem, but rather a labour demand problem. While there seems to be a shortage of highly skilled and skilled labour, there seems to be an excess supply of unskilled and informal sector workers for which there is very little demand. It is therefore not surprising that the high level of unemployment emanates from the unskilled and informal sectors of the labour market. Based on this observation, the assumption was made that the supply of unskilled and informal sector labour is perfectly elastic, while that of highly skilled and skilled labour is perfectly inelastic.

### **13.3 THE THEORIES BEHIND ENVIRONMENTAL TAXATION AND UNEMPLOYMENT**

The above challenge of taxing coal while avoiding any damage to South African employment fits neatly within the “double dividend” literature. The “double dividend hypothesis” postulates that recycling tax-revenues that were obtained through environmental taxation can reap both environmental and socio-economic benefits. However, the review of the host of literature on this topic indicated that the achievement of a double dividend is ambiguous. It does seem, however, that there are certain economic conditions in which a double dividend could be achieved. One of the relevant conditions for the South African case is that the problem of unemployment should emanate from the demand side of the labour market and not its supply side. Concern is also raised in the literature that the tax base of an environmental tax could be too small to raise significant revenue to achieve significant “revenue–recycling” effects in an economy.

Although the “double dividend” literature seemed appealing, environmental problems are essentially long-term in nature and one should not ignore the possibilities that technological innovation offers. In this regard, the economic literature about the “Porter Hypothesis” was deemed to be relevant. The “Porter Hypothesis” postulates that the introduction of environmental incentives, such as environmental taxation, could induce and increase technological innovation, resulting in environmental and socio-economic benefits. Although the literature that examines the “Porter Hypothesis” indicates that the achievement of environmental and other economic benefits is unambiguous, in reality achievement of these benefits is uncertain.

Due to this uncertainty, a review of the levels of research and development in South Africa was done. This indicated that the South African government recognises the need for higher levels of

research and development that could increase the levels of technology in the country. It is also evident that those industries that contribute significantly towards CO<sub>2</sub> pollution have recognised the need for increasing investments aimed at increasing technological innovation. Despite the fact that both government and industry recognise the need for increased levels research and development, there seems to be a lack of funding for this type of investment.

Finally, it was evident from the literature review, that the achievement of a “double dividend” and the implications of the “Porter Hypothesis”, need to be tested within a general equilibrium framework.

#### **13.4 A GENERAL EQUILIBRIUM MODEL OF THE SOUTH AFRICAN ECONOMY**

In order to test:

- i. whether the South African economy could achieve a “double dividend”; and
- ii. the implications of the Porter Hypothesis for the South African economy;

a CGE model for the South African economy was developed. This model is based on the ORANI-G methodology, as explained in detail in Dixon *et al* (1980) and Horridge (2002). A 2001 SAM served as the primary database for the model. The model distinguishes between 45 different industries, while the final demand components consists of 14 households, a government sector, external sector, investments and change in inventories. A distinction is also made between highly skilled, skilled, unskilled and informal sector labour. Behavioural elasticities were either estimated in cases where data were available, or taken from existing literature.

#### **13.5 POLICY PROPOSALS AND RESULTS**

As mentioned above, the review of the labour market indicated that one could assume that the supply of unskilled and informal sector labour is perfectly elastic, while that of highly skilled and skilled labour is perfectly inelastic. This assumption was fixed across all policy proposals and time horizons.

Because the achievement of a double dividend could hold significant political consequences for policy makers with in the short-term, the attainment of the “double dividend” was tested within a short-run framework. A tax on coal was implemented and the revenue raised through this tax was subsequently returned to the economy by:

- i. lump-sum transfer to low-income households; and
- ii. a subsidy on food and agricultural products.

Although the results indicated that subsidising food and agricultural products could achieve some welfare benefits, it became evident that the environmental benefit was negligible. The lack of any real environmental benefit is the result of the fact that there are very little (if any) substitution possibilities for South African industries that do not want to make use of coal.

The short-run result served as further motivation to examine the possibilities that the “Porter Hypothesis” holds for the South African economy in the long-term. Because of the lack of alternative sources of energy, technology that increases the efficiency of the use of coal in the production process across all South African industries was introduced.

Due to the uncertainty that accompanies technological investment, a number of policy simulations were performed to determine the level of technological improvement that would hold simultaneous environmental and socio-economic benefits (along with a 50 percent tax rate on the use of coal). The results indicate that a (percentage) tax increase should be accompanied by a similar (or higher percentage) technological improvement in the efficient use of coal in order for the economy to reap simultaneous environmental and socio-economic benefits. Although technological investments are uncertain at the best of times, the revenue that would be raised through the environmental tax could be used to fund these investments. The increase in economic activity that would result from such a tax would also imply that policy makers would be able to increase their indirect tax receipts, despite the decrease in the demand for coal that would result from the efficiency improvement.

### **13.6 CONCLUSIONS AND SUGGESTIONS FOR FURTHER RESEARCH**

The results from this study indicate that South African policy makers should approach the problem of controlling the demand for coal with caution. It was shown that any policy that attempts to increase the price of coal would achieve very little environmental benefit. The main reason for this is the lack of any feasible alternative energy source in the South African economy. Although such a tax could serve as an attractive source of revenue for the government, the socio-economic benefits achieved through recycling of the tax would also be small and it is debatable whether they would warrant the administration and political debate that would accompany them.

It is therefore evident that policy makers will have to invest in research and development programs that will result in a reduction in the use of coal within the production process. Results from policy simulations have indicated that successful implementation of such an investment would not only reduce CO<sub>2</sub> emissions significantly, but could also increase economic growth, welfare and employment. These investments could be funded through raising a tax on the use of coal. This tax would also serve as additional incentive for industry to increase their levels of technological innovation in the use of coal.

Although these results hold important consequences for policy makers, the analysis could be extended. Such extensions would include an analysis of the “double dividend” hypothesis within a framework in which environmental tax revenue is used to reduce income or corporate taxes. It should also be interesting to determine whether the environmental tax revenue could be used to fund a labour subsidy for unskilled labour.

Another extension of this research would entail the calculation of the cost of technological innovation that would increase the efficient use of coal. If the cost could be linked to a certain level of efficiency, policy makers would be able to calculate the tax revenue that will be needed to fund investment in technological innovation. A further extension that would be closely linked to the aforementioned suggestion would be to incorporate coal within an energy nest in the CGE model. This would allow substitution possibilities between coal and other sources of energy. In the latter case, however, researchers would have to determine which sources of energy would serve as a feasible alternative to the use of coal in South Africa.