

**ADVERSE WELFARE EFFECTS OF REGULATIONS ON SMALL TOBACCO
EXPORTERS: THE CASE OF ZIMBABWE**

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**A mini-thesis submitted in partial fulfilment of the requirements for the degree of
Magister Commercii in the Department of Economics, University of the Western
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- 10 VAR framework



ABSTRACT

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Regulations to reduce the consumption of tobacco products have dual effects on economies. Economies that are net consumers of tobacco products experience welfare enhancing effects as a result of these regulations. However, these regulations can have adverse welfare effects among net producing economies. Many studies have explored these welfare effects on net consuming economies, whereas the impacts among net producing economies have been neglected.

This research paper examines the adverse welfare effects of smoking regulations on small tobacco exporting economies with, a comparative advantage in tobacco production. These adverse effects of consumption regulations on small net producing economies are consistent with the predictions of theories of revealed comparative advantage and terms of trade. These theories form the basis of the conceptual model constructed to examine the adverse welfare effects of tobacco regulations on small tobacco exporting economies.

As an empirical exercise, this paper used the Balassa-Samuelson method and the reduced VAR framework to estimate the extent of comparative advantage in the production of tobacco and the relationship between social welfare and tobacco exports, respectively. This study uses data from Zimbabwe, for the period 1980 to 2003 and controlling for various factors, to test these propositions. Zimbabwe has comparative advantage in the production of the tobacco crop. Another important finding is that about 23 percent of social expenditure is attributed to tobacco exports, using public educational expenditure as a proxy for social welfare. Given the importance of tobacco export revenue to cover social welfare costs and the decline in output as a result of the anti-smoking regulations, it is important to adopt policies to diversify Zimbabwe's agricultural production and its industrial structure.

April 2005

DECLARATION

I declare that *adverse welfare effects of regulations on small tobacco exporters: the case of Zimbabwe* is my own work, that it has not been submitted before for any degree or examination in any other university, and that all sources I have used or quoted have been indicated and acknowledged as complete references.

Matemba Edward

April 2005

Signed:.....



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Chapter 1: Introduction

1. Introduction

The public health effects of cigarette consumption are well documented and have led to the adoption of various smoking regulations across the world. Smoking can be regulated through various price and non-prices measures, which have production and consumption effects on economies. Consumption effects in the form of reduced health care costs, among others, improve consumers' health and wellbeing (Saffer, 1998). These welfare-enhancing effects are more likely to be experienced among net consuming economies, which are mainly the highly industrialized economies.

World tobacco consumption fell by 2.7 % in the four years from 1996 to 1999, and estimates show a continual decline until 2002 (FAO, 2004). Most tobacco literature focuses on the demand side of the market, and mainly on the effectiveness of price measures, especially the use of tobacco excise taxes in reducing tobacco consumption. Evans and Farrelly (1998), Sung et al (1994) and Keeler et al (1993), among others, found that increases in excise taxes reduce cigarette smoking worldwide, especially among the youth.

To date, most of the evidence on the micro and macro effects of tobacco consumption are concerned with consuming economies, except for a few studies that have focused on net tobacco producing economies (Kabra, 1998). This study addresses some of the concerns of the latter with regard to tobacco smoking regulations.

Tobacco production is labour intensive and requires less fertile soils than other traditional crops (Maravanyika, 1998). Land and labour, moreover, are relatively abundant in developing economies. This suggests that developing economies have a comparative advantage in the production of the tobacco crop. According to Ricardo, an economy enjoys a comparative advantage in the production of the tobacco crop, if it uses productive factors that are relatively abundant (cited in Smit and McCarthy, 1998). Ricardo did not explicitly explain, however, why there are differences in autarky prices

giving rise to the so-called Heckscher-Ohlin theory (Yoffie and Gomes-Casseres, 1994). According to this theory, relatively abundant factors of production are also relatively cheap which means that it will be a low cost producer.

The Heckscher-Ohlin theory has, however, been challenged on the empirical front. Empirical estimates based on the Heckscher-Ohlin theory tend to be biased when dealing with outliers, and inferences about relative factor abundance depend on stringent assumptions (Balassa and Bauwens, 1985). Due to these inherent problems, estimation based on revealed comparative advantage is deemed more reliable.

Small net tobacco producing economies, such as Zimbabwe and Malawi, have a comparative advantage in the production of the tobacco crop. These exceptional economies export more than 75 % of their tobacco leaf harvest due to comparative advantage and low demand in the domestic market. These economies are agrarian, and other traditional crops rarely provide financially viable options. Furthermore, their industrial structures are dormant or still in the infancy stage.



More importantly, comparative advantage theorems show that trade improves welfare levels among trading economies, mainly through specialisation. However, exogenous adverse demand shocks on small open economies may reverse the gains from trade. Deteriorating welfare levels are variably attributed to deteriorating terms of trade. Furthermore the relatively high demand elasticity of cigarettes contributes negatively to the plight of developing economies, which rely on the production of the tobacco leaf. An increase in the supply of tobacco, *ceteris paribus*, will lead to a decrease in price and subsequently in deterioration of terms of trade (Black, 2002).

Small net tobacco producing economies will thus experience welfare losses due to a decrease in tobacco production, because the demand for the tobacco leaf is derived from cigarette consumption (Van Liemt, 2002). Welfare losses occur mainly but not exclusively in the form of reduced foreign revenue, high unemployment, deteriorating

terms of trade and lost government revenue. Although this view is controversial it is supported by the World Bank (1999), Mattas et al (1999) and Van Liemt (2002).

1.1 Problem Statement

Regulations aimed at curbing smoking will lead to a reduction in tobacco production. Net tobacco exporting economies will experience welfare losses due to a decrease in production, because tobacco leaf production is derived from cigarette consumption. Welfare losses occur in the form of reduced foreign revenue, high unemployment, deteriorating terms of trade and lost government revenue. Furthermore, high poverty levels among small tobacco exporting economies have been a problem, and a reduction in social expenditure due to a decrease in tobacco “government revenue” would be disastrous for these countries.

1.2 Research Questions

This paper seeks to address the following main research questions:

- ❑ Does Zimbabwe, as a small net tobacco producing economy, have a comparative advantage in tobacco cultivation?
- ❑ How do anti-smoking regulations affect welfare in a small tobacco exporting economy like Zimbabwe?

1.3 Purpose

The primary objective of this research paper is to establish whether smoking regulations lead to a decrease in tobacco production. The second objective is to show the relationship between trade and welfare in a small tobacco exporting economy with the aid of the Heckscher-Ohlin theorem. The relationship between welfare and the revenue generated from tobacco production and exports is thus the main thrust of this research paper. This relationship is determined through the use of the vector auto regression (VAR) framework.

Moreover, economically viable options need to be created for these small tobacco-exporting economies, which are negatively affected by smoking regulations. Hence, this

paper seeks to provide the platform for policy formulation, generating a continual increase in welfare of the small tobacco-exporting economies.

1.4 Methodology

This research paper uses annual data from the Food and Agricultural Organisation (FAO), the Central Statistics Office of Zimbabwe and the World Bank for the period 1980 to 2003. The statistical data is constant at 1995 prices. This data is used to calculate the Balassa-Samuelson estimates for the Zimbabwean economy as an example of a small net tobacco producing economy. These estimates show that the Zimbabwean economy has a comparative advantage in the production of the tobacco crop. The data is also used to determine the relationship between tobacco exports and social welfare through the reduced VAR framework. Furthermore, public educational expenditure is used as a proxy for social welfare, and tobacco exports are used as an independent variable. The results show that tobacco exports are responsible for about 25 % of public educational expenditure in the Zimbabwean economy.



1.5 Organisation of the study

In order to achieve these research objectives in a coherent way, this paper is divided into five chapters. Chapter Two deals with the theoretical overview and the industry background in an attempt to determine the effects of smoking regulations on social welfare. The first part of the chapter examines the relationship between tobacco production and consumption. Tobacco production is labour intensive, which suggests that small net tobacco producing economies have a comparative advantage in the production of the tobacco crop, since they have relatively abundant supplies of labour. This chapter further provides an overview of the likely welfare effects of tobacco regulations, whereas the last section sets out the theoretical framework.

Chapter Three starts with a brief overview of the world tobacco industry. In this section, the emphasis is on the production, consumption, and trade of tobacco. In general, tobacco production has been decreasing significantly, and in most economies production has gone back to the 1985 levels. Tobacco consumption, too, has been decreasing since 1995.

Although worldwide tobacco trade totals have not been affected, small net tobacco producing economies like Zimbabwe and Malawi are losing their market share to the large producers, Brazil and India. The last part of this chapter deals with the Zimbabwe economy. Zimbabwe is the fifth largest tobacco producer in the world, and the highest tobacco producer in Africa. Tobacco production contributes on average 60 % percent to the agricultural sector, and the economy is predominantly agricultural.

Chapter Four presents the answers to the two research questions set out above. This chapter shows that Zimbabwe has a comparative advantage in the production of the tobacco crop by using the Balassa-Samuelson estimates of “revealed comparative advantage.” The chapter further discusses the relationship between tobacco exports in a small tobacco exporting economy and social welfare, and concludes that there is a positive relationship between tobacco exports and social welfare.

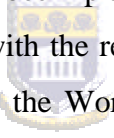
Chapter Five presents the concluding comments and makes suitable recommendations. Most importantly, it emphasizes, that policies to counter the welfare reducing effects of smoking regulations on small tobacco exporters like Zimbabwe must include local and international assistance to diversify crop production and the industrial structure of the country.

Chapter 2: Theoretical Framework

2.1 Introduction

Tobacco regulations aimed at curbing smoking have production and consumption effects on economies. Reduced consumption improves consumers' health and wellbeing, which in turn leads to reduced healthcare bills. These welfare-enhancing effects are more likely to be experienced among net consuming economies, which are mainly the highly industrialized economies.

Net producers, on the other hand, especially small tobacco exporters, are more likely to experience welfare losses due to decreases in production. Such losses come mainly, though not exclusively, in the form of reduced foreign revenue, high unemployment, deteriorating terms of trade and foregone government revenue.

Much emphasis in the literature has been placed on the consumption effects, and particularly on the benefits associated with the reduction of the health bill. This is partly due to the influence of institutions like the  World Health Organisation (WHO), which advocates, a reduction in tobacco use across the globe. Most of the theoretical and empirical evidence presented in the literature is concerned with the welfare effects of anti-smoking regulations among net consuming economies and less so with issues peculiar to small net producing economies. This study seeks to address this gap in the literature by focusing on the latter.

The following section of this chapter (Section 2.2) presents a brief overview of world tobacco consumption and production. Thereafter, Section 2.3 explores the comparative advantage theory with reference to net producing economies. Section 2.4 outlines the adverse welfare effects experienced among net producing economies, and the final part, Section 2.5, develops the model specification.

2.2 Tobacco Consumption and Production

According to the WHO, smoking can be regulated through various price and non-price measures. Non-price measures consist primarily of bans on tobacco advertising and sponsorship. Excise taxes¹ on cigarettes, so-called sin taxes, are the main pricing restriction (WHO, 2000).

Tobacco consumption is price sensitive according to price elasticity of demand measures. Average price elasticity of demand is estimated to be -0.4 for developed economies and between -0.4 and -0.8 for developing countries (Van Walbeek, 2000). This means that a 10 % price increase in tobacco products will lead to a demand decrease of between 4 and 8 %. In theory, price increases of tobacco products, mainly by means of cigarette regulations, will increase the opportunity costs of tobacco consumption relative to other goods in the consumer's basket. Continual price increases, irrespective of the addictiveness of tobacco products, should thus theoretically decrease the prevalence of smoking.



Chaloupka (1999), Townsend (1987) and DeCicca et al (1998), among others, found that increases in excise taxes did indeed lead to a reduction in smoking prevalence among all age groups, but especially among youthful smokers throughout the world. Sayginsoy et al (2002), using data from Bulgaria, further found that a 28 % increase in the price of a cigarette pack² would on average lead to a 26.5 % decrease in smoking. Consequently, health care costs and mortality rates associated with cigarette consumption tend to fall among net consuming economies if prices are increased. Another study, using monthly data for California for the period 1980-1990, found a price elasticity of demand for smoking of -0.55 (Keeler et al, 1993).

Although regulations on tobacco products are responsible for the fall in cigarette consumption in developed economies, the number of smokers in developing economies has been rising (Meier and Licari, 1997). This demand expansion has been observed

¹ Excise taxes are the most effective of all tobacco regulations due to their direct influence on the price of the product.

² Each pack contains 20 cigarettes.

among all age groups and is largely attributed to the rising incomes in these countries (Saygnisoy et al, 2002). In other words, higher personal incomes, measured in per capita terms, seem to account for the rise in the number of smokers and the rate of smoking in developing countries (Saygnisoy et al, 2002; Meier and Licari, 1997).

This suggests that the rise in smoking stems from the income effect and not directly from the number of adults among higher income groups that receive a higher income. Economic theory universally acknowledges that increases in national incomes are translated into welfare gains for all citizens. Economic theory further show that an increase in national income in developing countries leads to an increase in the number of smokers or smoking prevalence across all age groups, and is dependent on the rate of income transfer across income groups.

Higher levels of smoking prevalence can also be attributed to vigorous activity among multinational tobacco companies, especially in developing economies in recent times (Chaloupka and Corbett, 1998). Chaloupka and Corbett (1998) further argue that these activities of multinational tobacco companies account for about 50 % of the increase in cigarette consumption worldwide for the period between 1975 and 1996. Theoretically and empirically there is a positive relationship between tobacco consumption on the one hand, and demand and supply factors counter to these consumption regulations on the other.

Tobacco is essentially, though not exclusively, used for cigarette manufacturing. Eighty percent of the world's tobacco harvest goes into cigarette manufacturing, whereas a smaller fraction of the output serves as an ingredient to snuff and smokeless tobacco, pipe tobacco and cigars (Maravanyika, 1998). It thus follows that the demand for the tobacco crop is derived primarily from cigarette consumption (Van Liemt, 2002). On the other hand, tobacco cultivation occurs largely in developing countries, who supply 80 % of the world's tobacco output (Van Liemt, 2002).

Given that tobacco demand is thus derived largely from cigarette consumption, regulations aimed at reducing smoking will also affect raw tobacco demand and production. It is therefore crucial to examine the welfare effects that such regulations will have on small tobacco exporting economies.

In addition, tobacco cultivation is highly labour intensive and requires less fertile soils than other crops (Maravanyika, 1998). Land and labour are furthermore both relatively abundant in developing economies. These production conditions, especially the factor endowments, give developing economies a comparative advantage in the production of tobacco. It is highly surprising, however, that economists have neglected to examine the effects of a decrease in cigarette consumption on small tobacco exporting economies, given their reliance on tobacco exports.

2.3 Comparative Advantage and Net Producing Economies

Small tobacco producers and exporters will experience adverse welfare effects due to a decrease in production deriving from anti-smoking regulations. Welfare losses come mainly in the form of, among other things, reduced foreign revenue, high unemployment, deteriorating terms of trade and foregone government revenue. The theory of comparative advantage can thus be used to determine the adverse welfare effects associated with demand shocks.

A country enjoys comparative advantage in the production of a commodity, according to the classical comparative advantage theory, if it uses its abundant productive factors. Ricardo argued, for instance, that multiple benefits could be experienced if a country specializes in the production and export of such commodities. There may also be gains in economic efficiency for a developing economy because these goods require the least amount of the abundant factor of production relative to other countries (Smit and McCarthy, 1998). To illustrate this, Ricardo considered one factor of production, viz. labour, arguing that differences in labour productivity are the main factor leading to trade among economies (Smit and McCarthy, 1998).

Ricardo did not explicitly explain why there should be differences in autarky prices among economies (Yoffie and Gomes-Casseres, 1994), but the Heckscher-Ohlin theory provides an answer to this question. According to this theory, a country enjoys comparative advantage in the production of goods that utilize the relatively abundant factors of production. These factors of production tend to be relatively cheap and are considered immobile between regions in the short term (Johnson, 1981). For example, a developing economy that produces tobacco by using the relatively abundant factors of production enjoys a comparative advantage and hence become a relatively low cost producer. Exporting tobacco to high cost producers should, *ceteris paribus*, enhance global welfare (Kannapiran and Fleming, 1999).

Kannapiran and Fleming (1999) argue that economists have been applying the theory of comparative advantage in determining ‘economic projects,’ that raise welfare levels and should be granted institutional support within an economy. The comparative advantage doctrine has been powerful in influencing the direction of trade and trade policy development among economies. Furthermore, the idea of outward orientation is based on factor endowments, leading to small economies like Malawi into production of the tobacco crop.

Although the comparative advantage theory has formed part of trade strategies, it is worth noting that in some instances trade has gone against this theory. A classical example concerns trade behaviour of the US, as observed by Leontief in 1966, which is known as the Leontief-paradox. Leontief revealed that the US, contrary to the theory of comparative advantage, exported products that were largely labour intensive to India (Kannapiran and Fleming, 1999). This could be explained by distortions in world trade, the relative service intensity of exports from the US, and the fact that the US exports acquire a competitive edge from the efficiently supplied intermediate services. Broadening the factor intensity base to include the concept of human capital development may also produce results that diverge from the comparative advantage theory, due to economic efficiencies created by such developments.

Yeats (1999) argues that the empirical estimation of comparative advantage is generally similar to the labour intensity indices derived by Larry in 1968. These indices have also been used to identify products that are either labour or capital intensive in the US and other world economies. There are other empirical problems inherent in the use of the Heckscher-Ohlin theory. The results obtained tend to be biased when dealing with data from a single country that is an outlier. Secondly, as argued by Leamer and Bowen (1981), inference made about factor endowments on factor intensities from a cross sectional regression may be incorrect, because inferences about relative factor abundance depend on stringent assumptions³ (Balassa and Bauwens, 1985).

Due to these problems inherent in the Heckscher-Ohlin approach, Balassa (1965) developed the concept of *revealed comparative advantage* (Balassa, 1986). Revealed comparative advantage is measured by the share of the specific export (tobacco crop) in a country's total exports, relative to the particular export item's share in the total world exports.



Revealed comparative advantage (RCA) is then represented as:

$$RCA = \left(\frac{X_{ij}}{X_{it}} \right) \left(\frac{X_{jw}}{X_{tw}} \right)$$

where x_{ij} are the exports of good j for country i , and x_{it} are the country's total exports, with w subscript representing world trade totals. The RCA index will fall within the range between 0 and infinity. Values above unity indicate that the country has a comparative advantage in the production of the product. The Balassa theory of revealed comparative advantage complements both the Heckscher-Ohlin theory and Ricardo's work on comparative advantage.

The theorems of revealed comparative advantage and standard comparative advantage yield similar results. . Balassa and Bauwens (1985) used data from 38 countries to study

³ These include, among others: linearity of all production functions, perfect competition in all markets, no transport costs or trade barriers, and full employment of all factors of production, see also Aw (1983).

trade patterns among economies, and included in the group were 20 developing countries for the period 1954-1970. Accordingly, developing economies are found to export goods that are labour intensive, whereas developed economies export goods that are capital intensive. Results obtained from these studies support the Heckscher-Ohlin theory on comparative advantage.

Trade theory suggests that regulations distort the direction and volumes of trade. Empirical evidence on the effects of environmental regulations from other industries, other than tobacco has produced mixed results. For example Busse (2004) found that, although environmental regulations relatively increase production costs, they do not lead to a loss in competitiveness. This argument stems mainly from the assumption that the rate of return will have built-in environmental mechanisms.⁴ Furthermore, the iron and steel industry is found to produce diverging empirical evidence, higher compliance with international treaties and conventions lead to a decrease in exports and hence production, after taking into consideration country-specific characteristics (Busse, 2004).

The issue of product standards in import markets is particularly relevant for smoking regulations. Product standards, for example, shrink demand for products that do not comply with these regulations, especially health and environmental requirements. An example is of the Jordanian phosphate and potash industry. The phosphate and potash industry is the single most important sector in the Jordanian economy, accounting for about 30 % of total exports in 1996 (Larson et al, 2002). Jordan exports fertilizer to the EU, and this fertilizer contains high levels of cadmium⁵. The removal of cadmium from potash/phosphate would increase marginal costs by a margin of between 2.5 and 10% and is thus considered uneconomical and technically impractical (Larson et al, 2002). Jordanian importers would not only lose their competitiveness in the European markets, but higher production costs in future would lower output.

⁴ Investment decisions take the environment compliance costs as part of initial set-up costs and hence are recoverable given the expected rate of return

⁵ Cadmium is acidic, hence high cadmium levels will increase the soil-acid levels.

Similarly, Henson and Loader (2001) found that Sanitary and Phytosanitary regulations hamper developing economies from exploiting export opportunities for agricultural and food products in developed country markets. Indeed, weaker competitiveness may be due to the lack of resources, including a lack of expertise and capacity that are necessary to exploit the opportunities in the world market.

Although most researchers found that smoking regulations are welfare enhancing, Mattas et al (1999), Van Liemt (2002) and the World Bank (1999) acknowledge that regulations can have negative production effects. Exceptional economies, economies that export more than 75 % of their tobacco crop, and that include among others Malawi and Zimbabwe, are negatively affected by regulations. The Greek tobacco sector is used to illustrate the importance of the tobacco crop in countries and regions dependent on the crop. Input and output tables show that eliminating the tobacco industry will decrease national income by 3.2 % and income of the Macedonia region by 6.7 % (Mattas et al, 1999).



The negative welfare effects associated with regulations are the main reason behind developing governments' reluctance to increase the excise tax rates and other tobacco control measures (Sayginsoy et al, 2002). Excise taxes are low among developing economies that produce the tobacco crop (Abedian and Jacobs, 2001). These regulations have the potential of decreasing the growth rates and employment opportunities among economies that heavily rely on the production of the crop.

2.4 Negative Welfare Effects on Small Exporters

Sayginsoy et al (2002), among others, argue that fears among developing economies that smoking regulations have adverse welfare effects, are unfounded based on studies carried out among developed economies. These studies reveal that smoking regulations in developed economies do not in fact lead to job losses, increase government revenue and “improve health” without incurring higher medical costs.

However, smoking regulations have adverse welfare effects among net producing economies. This section constructs an analytical argument, outlining the adverse welfare effects of exogenous regulations on small tobacco exporters. These adverse welfare effects include losses in government revenue, losses in foreign earnings, deteriorating terms of trade and rising unemployment.

Exogenous regulations to reduce smoking should directly reduce tobacco consumption, and indirectly reduce tobacco production. Economies that consume less than 25 % of their tobacco output should have a relatively small health bill in relation to government revenue and foreign earnings from the tobacco industry. Empirical evidence suggests that economies that consume less than 25 % of their tobacco produce and that rely heavily on the export of the crop to the world market have not been considered as exceptional cases⁶ in the existing literature (Mattas et al, 1999).

On the other hand, agriculture commodity markets are volatile and output variability is high because production is derived from the output demand (Moledina, 2002). Economic theory further suggests that prices decrease as the production levels rise above the consumption levels and hence as the regulations become more binding.

In a world characterized by incomplete specialization, an increase in production relative to demand will lead to deteriorating terms of trade (Bhagwati, 1958; Black, 2002). In addition, an increase in supply, *ceteris paribus*, will most likely lead to falling prices and deteriorating terms of trade (Black, 2002). Small tobacco exporters may find it difficult to compete in the world market, and may therefore have to cut back on output, in turn reducing employment and government revenue, among other negative welfare consequences. These negative welfare effects are experienced largely due to the inability of small tobacco exporters to absorb these production resources in other industries.

Alternatively, when elasticity of demand is less than unity, as is the case for tobacco, total revenue from the tobacco crop tends to fall with rising sales (Hill and Ingersent, 1982).

⁶ were the cost benefits of producing the tobacco leaf are higher than the negative health effects

Government revenue is likely to fall, especially in small tobacco exporting economies, where tobacco contributes significantly to public income. Small tobacco exporting economies hardly have cigarette-manufacturing plants due to a low demand for cigarettes. Hence, they rely on raw tobacco taxes as compared to net consuming economies, which obtain income from indirect taxes on tobacco products.

On the other hand, agriculture taxation has a negative impact on agriculture production and the growth rate, because tobacco-manufacturing companies are unable to shift the whole regulation (tax) burden to the consumer (Cleaver and Donovan, 1995). These scholars found that a 10 % decrease in agricultural price on average leads to a 1 to 5 % loss in agricultural output and agriculture value added. Agricultural taxes increase the output price, but negatively affect the profitability rates due to the inability of the producer in shifting the whole tax burden.

Steep rises in unemployment rates in small tobacco exporting economies are attributed to the relatively high demand elasticity of labour in the agricultural sector, which ranges between 0.30 and 0.75 (Cleaver and Donovan, 1995). This suggests that a 10 % decrease in production will lead to on average a 5.25 % decrease in tobacco growing industry employment.

The agriculture industry uses both permanent and temporary wage employment, the latter of which depends on the level of activity in the industry and can lead to instant layoffs. In addition, the level of unemployment in the economy will be more pronounced and more likely to increase, depending on the multiplier effect. In these small economies, the tobacco industry acts as an anchoring activity due to the relatively high degree of intersectoral dependence (Mattas et al, 1999).

In addition to direct unemployment arising from the tobacco-farming sector, a decrease in tobacco production will significantly affect related industries that include, among others, chemical and fertilizer, trade and marketing. Besides job losses in these industries, a decrease in tobacco production will more likely lead to an endless process of negative

economic activities, which are dependent on intersectoral-dependence. This leads to low growth rates and a fall in national income.

Black (2002), Grossman and Helpman (1989) and Ethier (1982) theoretically separate the effects of environmental regulations from the effects of technological advancement on production. Consequently industries closely linked to the affected industries experience a decrease in production, and the economy suffers from negative growth.

Such negative economic growth rates will decrease the levels of national income. This will create a vicious circle of negative economic activities, including low national savings that directly affect financial costs (Friend and Lieberman, 1997). Apart from an increase in the risk factor associated with uncertainty in the tobacco industry, a decrease in national income and national savings due to a decrease in export goods will also lead to an increase in financial costs (Friend and Lieberman, 1997). These negative developments further limit foreign investments and the influx of foreign financial capital into the economy. This suggests an increase in marginal costs.



Viewing the static and dynamic effects, regulations lead to higher marginal costs due to the deteriorating terms of trade and will subsequently lead to a reduction in output from the low cost producing economies, when factors like transport costs which are outside the scope of this paper are included in the study. It is safe to say that regulations will most likely lead to production according to the proximity to the market rather than according to comparative advantage. The implication is that production will decrease in countries where there is limited demand in favour of high demand economies (cigarettes).

There are a number of theoretical grounds to suggest that negative welfare effects will be experienced among small tobacco exporting economies. The special role of tobacco farming rests strongly on its anchoring role in the economy. These economies tend to be poor and income distribution skewed, and thus the likely outcome will be rising poverty. Poverty will mainly result from negative growth rates, decreasing per capita income,

displacement of largely unskilled labour, and loss of income to the tobacco farmers (Keyser, 2002).

2.5 Model Specification

Controversies surrounding the tobacco industry warrant a model specification, against which these presumptions can be tested. However, in a world characterized by asymmetric information, the model needs various stringent assumptions.

This model is thus based on the following assumptions: Firstly, the country has a comparative advantage in a single agricultural crop; secondly, there is perfect competition (a large number of producers); thirdly, exogenous consumption regulations are imposed on the consumption of this output/good. Although there are various other sectors in the economy, the tobacco crop makes a significant contribution to export revenue. Fifthly, households (farmers) are able to freely allocate their labour endowments and can thus hire fulltime or part-time workers to meet the labour shortfall. For the sake of simplicity, this paper does not distinguish between the different types of labour and hence the wage rate will be assumed to be the average wage rate.

Given the above assumptions, output (Y_i) is measured with the following production technology for crop $-i$

$$Y_i = f(K_i, L_i, N_i) \quad (1)$$

where

$\frac{Y_i}{Y}$ is significantly large

K_i are fixed and variable capital inputs

N_i is the land size planted with crop $-i$, and

L_i is the labour employed in the cultivation of crop $-i$

Given the above production function, an increase in land and labour will raise the farmer's level of technical efficiency, and thus collectively the country's efficiency, because there is a positive relationship between tobacco production and capital, land and

labour. The tobacco crop is highly labour intensive and to a large extent capital intensive, as compared to other traditional crops. Labour is mainly required for tobacco seeding and seedling transplantation, which takes at least three weeks, frequent watering and applications of fertilizers and pesticides. After transplanting the tobacco plants, the farmer makes use of more labour for applying pesticides and fertilizers and for weeding. Furthermore, the crop requires additional labour for harvesting and curing. This process is usually done in so-called curing bans, that use coal and to a lesser extent wood.

The cost function (C_i) is represented by

$$C_i = g(B_i, w_i, r_i) \quad (2)$$

$B = b(\mathbf{a}, \mathbf{r})$ is the net cost of financial capital, depending on risk factor of financial institutions (\mathbf{a}) and the borrowing cost (\mathbf{r})

w is the wage rate, and

r is the land rental rate



A country with a comparative advantage crop $-i$ and exporting it, maximizes the following net revenue function (Π_i)

$$\Pi_i = \mathbf{p} \{ p_i f(\cdot), g(\cdot) \} \quad (3)$$

where p_i is the output price that crop $-i$ fetches on the world markets measured at PPP exchange rates (FX_i^{PPP}).

$$\frac{\partial \Pi_i}{\partial \mathbf{t}} = \frac{\partial p_i f(\cdot)}{\partial Y_i} \left(\frac{\partial Y_i}{\partial \mathbf{t}} \right) \Rightarrow p_i f'_t(\cdot) < 0 \quad (4)$$

where τ is the excise tax on cigarettes. Thus, from the perspective of the farmer or the country as a whole, net revenue will fall as (\mathbf{t}) rises or becomes more binding.

$$\mathbf{e} = \frac{\% \Delta Y_i}{\% \Delta \mathbf{t}} \Rightarrow \frac{\frac{\partial Y_i}{Y_i}}{\frac{\partial \mathbf{t}}{\mathbf{t}}} \Leftrightarrow \frac{\partial Y_i}{\partial \mathbf{t}} \left(\frac{\mathbf{t}}{Y_i} \right) \quad (5)$$

where $\mathbf{e} = g(Y, \mathbf{t})$ and is referred to as the elasticity of regulations

But input demands depend upon input revenue, and thus if input revenue decreases, input demands will fall too.

$$\hat{L}_i = h(\hat{w}, \hat{\Pi}_i(p_i, \mathbf{t})) \quad (6)$$

More specifically, the net revenue function will fall as the excise taxes rise. In other words,



$$\uparrow \mathbf{t} \Rightarrow \downarrow \Pi_i \Rightarrow \downarrow \hat{L}_i \quad (7)$$

Land stock is fixed and therefore land allocated to tobacco production will decrease with a decrease in production, and risk-averse farmers will diversify by producing other crops provided they are more economically viable. Positively, though, a decrease in land allocated to tobacco production in conjunction with technological advancement has led to improvement in total factor productivity, as shown by the worldwide increase in tobacco yield.

However, welfare losses come in different forms. Equation 7 derives two forms of welfare loss arising from an increase in tobacco taxes. These two forms of welfare loss are a decrease in input requirements and a decrease in tobacco profitability. Other forms of welfare loss include deteriorating terms of trade, and a fall in foreign and government

revenue, especially when this revenue funds social welfare spending (World Bank, 1999; Mattas et al, 1999; and Van Liemt, 2002).

An increase in tobacco taxes will lead to a decrease in revenue generated by tobacco exports. This is likely to depress the economic growth rate for economies that heavily depend on the crop. Sudden and enormous falls in such an important revenue source might force economies to cut back on government expenditure, which includes social expenditure among other things.

The assumption of tobacco net exporters means tax revenue from this source is relatively small on the consumption side, but relatively important on the production side. Tobacco taxes combined with the multiplier effects of raw tobacco export revenue contribute significantly to public spending on social services such as, health, education and public pensions.

There is a positive relationship between government social expenditure and tobacco export revenue. Government social expenditure, G_i , depends upon export revenue which is itself a function of the regulations, and income from various taxes.

$$G_i = G_i(\Pi_i(t), T, \dots) \quad (8)$$

where Π_i is defined as taxation.

Furthermore, Π_i is affected by the level of taxes, which includes both local and international taxes. More specifically, export revenue depends on the elasticity of regulations.

Equation 8 above extends the basic idea behind this model and can be used to analyze specific social welfare services. For example, a decrease in tobacco production will decrease educational expenditure. This presumption can be tested empirically, by substituting these variables into the model framework. Hence, a proxy for social welfare

can be used to determine the extent of the effect of smoking regulations in a small net tobacco exporting economy. However before testing this presumption it is important to review the performance of the world tobacco industry, and the Zimbabwean tobacco industry.



Chapter 3: The Tobacco Industry in Zimbabwe and the World

3.1 Introduction

The world tobacco industry has undergone a series of changes especially in the late 1990s. Changes in the tobacco consumption regulations are primarily responsible for the decrease in tobacco consumption, especially among developed economies. The period before 1985/1990 was characterized by improvement in the tobacco leaf production sector, as is evident from the continual growth in the world tobacco yield per hectare reflected in Appendix A, Graph C. Productivity growth is essential for economic growth and more specifically rural poverty alleviation among developing economies (Hazarika and Alwang, 2003).

The first part of this chapter presents a brief overview of the world tobacco industry. The next part (Section 3.2) analyses the statistics of this industry, with reference to consumption, trade and production. Part three (Section 3.3) draws attention to the background of the Zimbabwean agriculture sector, specifically with regard to tobacco production, and discusses the economic significance of the tobacco crop.

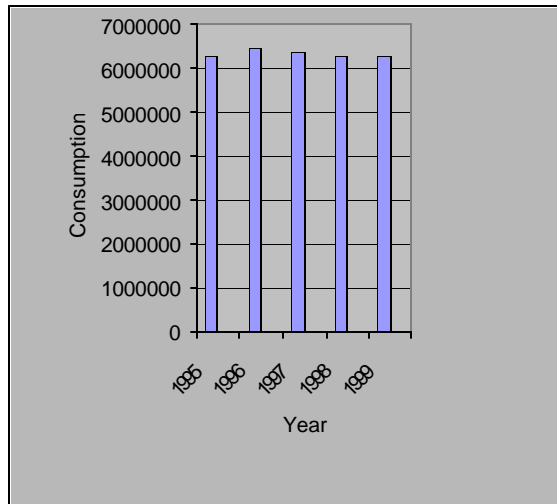
3.2 World Tobacco Industry: Consumption, Trade and Production

Tobacco products are consumed in almost all countries worldwide, although tobacco consumption volumes are highly uneven, across time and space. While tobacco consumption was steadily climbing in the pre-1990's during the second half of the 1990's it fell steadily, as illustrated in Graph 1. World consumption, moreover, fell by 2.7 % in the four years from 1996 to 1999. This downward trend was also observable in the US, a leading net-consuming economy where consumption had fallen by more than 5 % in the years after 1995.

The single most important market of tobacco products would be the developed world and China. The developed economies are estimated to consume about 40 % of the world tobacco produce and China a third of the world tobacco leaf. China serves as an exceptional case among developing economies, which tend to be net producing

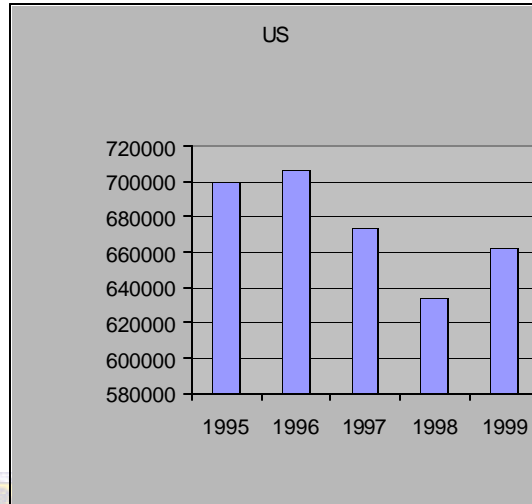
economies (Van Liemt 2002). Although China may seem to consume the majority of the tobacco leaf, the population size relative to that of the developed economies clearly illustrates that the latter are indeed the major tobacco consumers.

Graph 1: World Tobacco Consumption (MT), 1995 – 1999



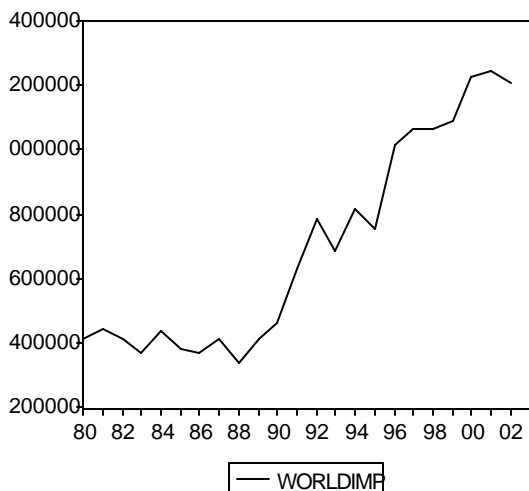
Source: Van Liemt, 2002

Graph 2: US Tobacco Consumption (MT), 1995 – 1999



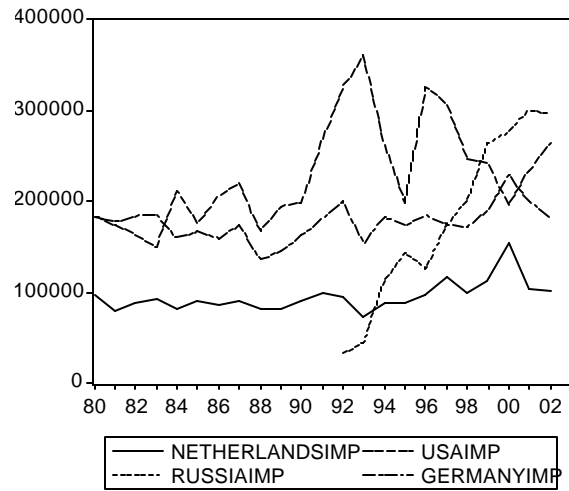
Source: Van Liemt, 2002

Graph 3: World Imports (MT) 1980 – 2003



Source: FAO, 2004

Graph 4: World Leading Importers (MT) 1980 – 2003



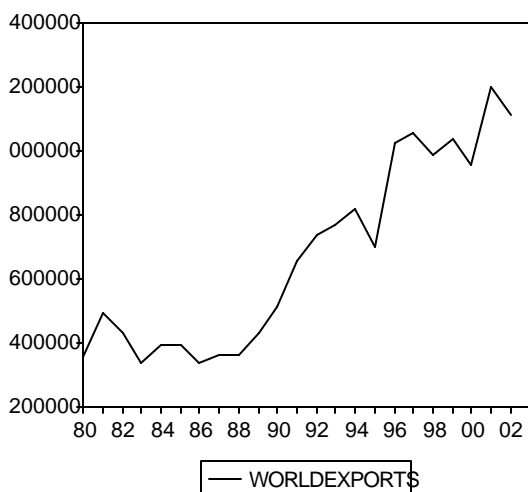
Source: FAO, 2004

Developed economies tend to be net tobacco consuming economies, thereby giving rise to the world tobacco trade. Most of these economies rely on tobacco leaf from the developing economies. World tobacco imports have generally been growing, except for a 1.5 % decrease in 2002. This collective increase in imports can be attributed to the continuous rise in Russian imports of more than 800 % and the increase in the prevalence of smoking in some developing economies.

However, the individual imports of net consuming nations have been decreasing since the mid-1990's with the US, Germany and the Netherlands all showing a negative trend in imports. This fall in imports corresponds to the decrease in tobacco consumption in the world and more particularly in these economies.

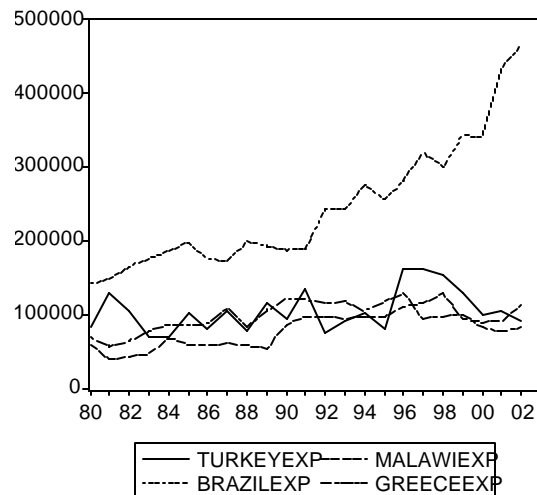
World tobacco imports and exports are manifesting the same trend. As shown below, world tobacco exports grew by 57 % between 1980 and 2002. Developing economies, with the exception of China, are net producing economies and export the tobacco leaf to the developed economies. Increases in world exports are partly explained by a surge in exports from Brazil, which managed to offset the decrease in exports from small producers like Turkey. Malawi's exports have grown by about 50 % within the twenty-two year period between 1980 and 2002. Malawi is among the ten largest tobacco-exporting economies, exporting more than 75 % of her tobacco leaf.

Graph 5: World Exports of Tobacco (MT) 1980 – 2003



Source: FAO, 2004

Graph 6: Leading Exporters of Tobacco (MT) 1980 - 2003



Source: FAO, 2004

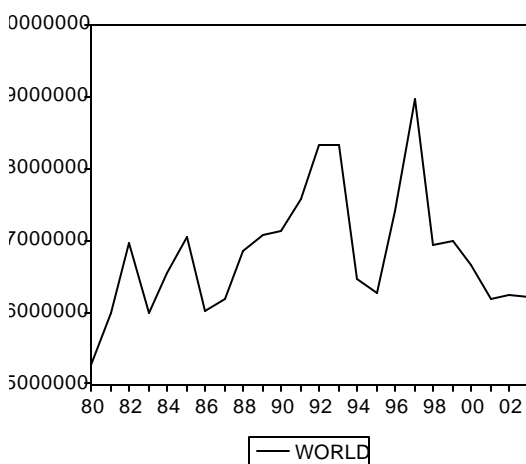
As explained earlier, tobacco trade is mainly due to factor endowments and the lack of tobacco demand in developing economies. The demand for tobacco products in the world and in individual countries is the impetus behind world tobacco production and trade. World tobacco imports are partly a result of supply mismatches and partly a result of corporate strategies⁷ (Van Liemt, 2002). Supply mismatches stem from capacity constraints, resulting from the inability of some countries to grow the tobacco crop. Some countries, however, have a comparative advantage in the production of the crop, and are able to produce it at low cost. Other countries experience weather that is not conducive to the production of the tobacco leaf, whereas others cannot produce enough to cater for their tobacco consumers.

The Netherlands does not cultivate any tobacco leaf, as illustrated in Graph 4, is among the world's leading tobacco importers. However, the Netherlands is also among world's leading cigarette exporters, due to economies of scale in cigarette manufacturing.

⁷ Corporate strategies require cigarette factories to be located close to the market (see also Van Liemt, 2002)

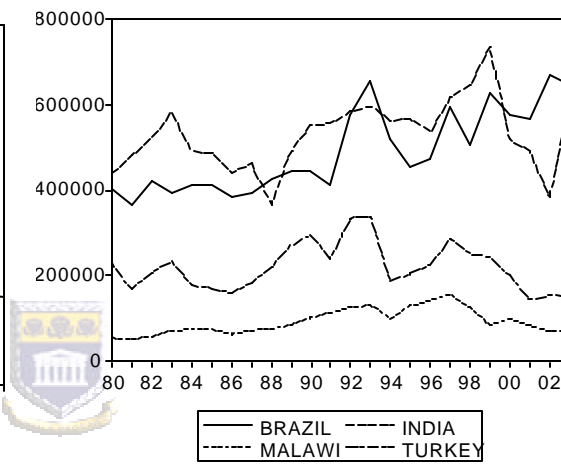
Conversely, there is a positive relationship between tobacco consumption and tobacco production. World tobacco production is estimated to be 6.2 million metric tonnes (FAO, 2004). China accounts for a third of the world tobacco leaf production, whereas the other two thirds are produced by just more than 100 economies, thus reflecting huge inequalities in the industry (Van Liemt, 2002; FAO, 2004). Graphs 7 and 8 illustrate the statistics of world tobacco production and world leading tobacco producers respectively.

Graph 7: World Production (MT), 1980 – 2003



Source: FAO, 2004

Graph 8: Selected Leading Tobacco Producers (MT), 1980 – 2003



Source: FAO, 2004

Tobacco production depends among other things on prevailing weather conditions and on demand. Irrespective of the fluctuations from year to year due to unfavourable weather conditions among individual economies, world tobacco production has increased significantly from 1980 to 1997. Although 1997 saw the highest tobacco leaf production, production levels subsequently collapsed and have not matched 1982 output levels. A negative 10.85 % growth rate was recorded between 1982 and 2003. Furthermore, 2003 raw tobacco production levels were 31 % less than the 1997 production levels of 8.98 million metric tonnes. Bumper harvests in 1997 were the collective result of steady increases in tobacco leaf supplies from small tobacco producing nations.

The negative trend after 1997 suggests that tobacco production has been adversely affected by, among other things, the decrease in demand. Since 1994, tobacco production has been decreasing, although it did increase slightly between 1997 and 1998. This trend is also found in China and the USA, which are among the top four world tobacco producers.

Malawi experienced a 4% decrease in the tobacco leaf production between 1983 and 2003, whereas India posted a positive 2.3 % in the production levels during the same period. Turkey's tobacco leaf production, which is currently 152 metric tonnes, was 33.49 % less than that produced during 1983 production, whereas Brazil's 2003 production was no higher than the 1993 levels.

Clearly, tobacco leaf production is highly uneven, with about 80 % of the world's tobacco crop being produced in developing economies. Table 1 presents tobacco production statistics by regions for selected years from 1985 to 1998. 1998 statistics show that the contributions made by developing economies have increased; most notably, Africa's contribution has increased from 4.4 % to 7.5 %, in contrast to a negative growth in Europe's share. China produced 36 % of the world tobacco crop, which is equivalent to 60 % of Asia's tobacco production. Similarly, Zimbabwe is the leading tobacco producer in Africa, producing a mere 3 % of the world tobacco crop but as much as 40 % of Africa's tobacco leaf production. Together with Malawi, Zimbabwe produces about 67 % of the continent's raw tobacco. However, Table 1 also shows that small tobacco producing nations have been negatively affected by demand shocks. Malawi and Zimbabwe, for instance, have collectively have lost 0.4 percentage points in the world market.

Table 1: Tobacco Production: Percentage Volume by Regions and Selected Countries, Selected years 1985 – 1998

	1985	1990	1995	1998
ASIA	56.9	61	62.8	59.8
(China)	(31.6)	(37.2)	(36.5)	(36.1)
(India)	(6.9)	(8)	(8.9)	(9.1)
(Turkey)	(2.6)	(4.3)	(3.6)	(3.8)
AFRICA	4.4	5.2	7.5	7.5
(Zimbabwe)	(1.6)	(1.9)	(3.3)	(3)
(Malawi)	(1.1)	(1.4)	(2.1)	(2)
SOUTH AMERICA	7.7	8.2	8.8	9.2
(Brazil)	(5.7)	(6.2)	(6.3)	(6.2)
NORTH AMERICA	13.5	13.1	12.4	14.1
(United States)	(10)	(10.4)	(9)	(10.4)
EUROPE, including former USSR	17.1	12.7	9	10
Total	100	100	100	100

Source: Van Liemt (2002)

3.3 Background to the Zimbabwean economy

Zimbabwe is a landlocked country in Southern Africa, and mainly imports and exports through ports in South Africa and Mozambique. The country's total land mass is 39 million hectares, 30 % of which is suitable for agricultural cultivation. The road, rail and air networks have been effective in linking the economy to international markets, although the local rural transport network is relatively poor and the recent fuel shortages have made the situation worse (Sakume et al, 2000).

Zimbabwe enjoyed steady economic growth until the 1999-2000 fiscal year. The GDP at 1990 prices during the period 1996-1998 was 38 % higher than during the same interval between 1985 and 1987 (ABC, 2004). Agricultural contribution to the GDP averaged 17 % for the 1985-1998 period (Keyser, 2002). The Zimbabwean economy depends on

agriculture, more specifically on tobacco, but agricultural production has not been constant due to variable weather conditions. Nevertheless, the rate of agricultural growth was more or less equivalent to that of the economy (Keyser, 2002).

3.3.1 Background to the Agriculture Sector

The agricultural lands in Zimbabwe are divided into commercial and communal lands. This is arguably a legacy of colonialism, which divided farmlands into communal lands and commercial lands. The economy is predominantly agricultural, due to a relatively large rural population, although exports are mainly from the large-scale farming sector. This suggests that the agriculture industry and the economy are characterized by multiple dualism. Agricultural exports mainly comprise tobacco, sugar, cotton and coffee, the latter of which recently joined the ranks.

Share cropping of commercial crops among communal farmers is largely negligible. This is due to their desire for self-sufficiency in the staple crop, maize. Moreover, the lack of commercial share cropping among communal farmers is attributed to poor rural maize markets and inadequate transport infrastructure (Hazarika and Alwang, 2003). This suggests that most rural farmers do not take their produce to the market.

Commercial farmers are also divided into two categories, namely Small Scale Commercial farmers (SSC) and Large Scale Commercial farmers (LSC). The former group comprises farmers with less than 200 hectares of land and owned by indigenous black commercial farmers. The Government of Zimbabwe (then Southern Rhodesia) created these SSC farms in 1931, in an effort to reduce congestion and unrest in communal lands, which were reserved for the indigenous population (ABC, 2004). There were about 9 000 SSC farms before the fast track land redistribution scheme of 2001-2004, and these totalled 1,2 million hectares. Half of these SSC farms were under conditional freehold title, while the other 50 % were under long-term lease with an option to buy (Keyser, 2002). Although some are advanced, making use of machinery and irrigation, the majority are still backward, using ox-ploughs, but they do all enjoy good harvests.

Furthermore, smallholder farmers produce about 55 % of total production for maize, 70 % of cotton, and 80 % of sunflower (Keyser, 2002; ABC, 2004). In contrast, LSC farmers produce between 90 and 99 % of tobacco, soya beans, sugar, coffee and horticultural products.

LSC farmers dominate Zimbabwe's agricultural sector, although there are only about 4 000 LSC farmers. They operate efficiently and are characterised by their use of modern machinery, overhead and drip-line irrigation and both permanent and temporary wage labour. LSC farms can be very large, and it is estimated that they occupy 21 % of Zimbabwe's total agricultural land area of 8.2 million hectares, including 3.7 million in the so-called Natural Region 2 (ABC, 2004; Keyser, 2002). It is further estimated that about 20 % of the LSC farms are smaller than 200 hectares, whereas about 50 % are larger than 1 000 hectares, although not all land area is suitable for crop growing (Sakeme et al, 2000). Most LSC farmers cultivate on average between 100 and 500 hectares per year (Sakume et al, 2000).



3.3.2 Background to Tobacco Production

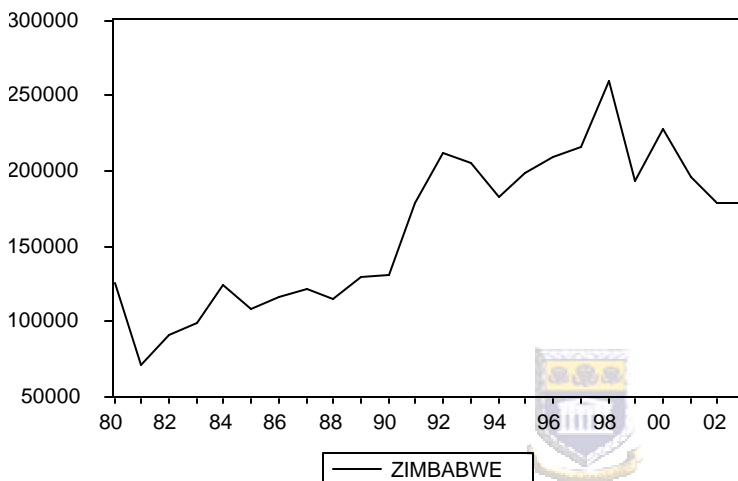
Oriental tobacco was first grown commercially in Matebeleland in 1885, and it took 18 years for the fully-fledged tobacco industry to come into being (Maravanyika, 1998). Zimbabwe produced almost 1 000 metric tonnes of flue cured Virginia tobacco in 1903, and production increased by an impressive 1030 % to 11 300 metric tonnes by 1938. Ever since 1938, the tobacco crop has been sold under the auction system. Zimbabwean tobacco has always been of high quality, and as a visiting British tobacco agent in 1938 famously said, "Southern Rhodesia has found something as valuable as gold and diamonds, enough to make it a country in itself" (Maravanyika, 1938: pg 272).

3.3.3 The Economic Significance of Tobacco Production

Zimbabwe is ranked the fifth largest tobacco producer in the world, after China, USA, Brazil and India, and hence the largest producer of tobacco leaf in Africa. Cigarette production in Zimbabwe is on a small scale due to low demand, and hence between

90 and 98 % of all tobacco produced is exported, making Zimbabwe the third largest tobacco exporter in the world. This suggest that the main activities in the tobacco industry are growing, curing and subsequent handling and distribution of the leaf. Hence, the adverse welfare effects of regulations on small net tobacco producing and exporting economies like Zimbabwe, **remain a mystery**, due to concentration on negative health effects of the tobacco products.

Graph 9: Zimbabwe Tobacco Production (MT), 1980 – 2003



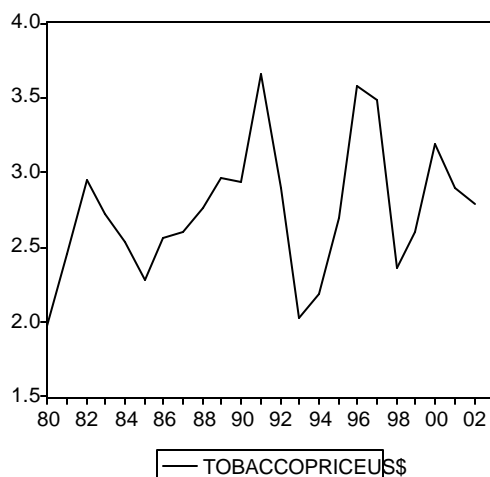
Source: FAO, 2004

Zimbabwe tobacco production grew significantly between 1980 and 2003. Although tobacco leaf production increased by 42 % during this period, 2003 production levels were the same as those of 1991. Furthermore, after experiencing bumper harvests in 1998, production has again fallen dramatically. 2003 tobacco leaf production was 46 % less than the 1998 production levels of 260,000 metric tonnes.

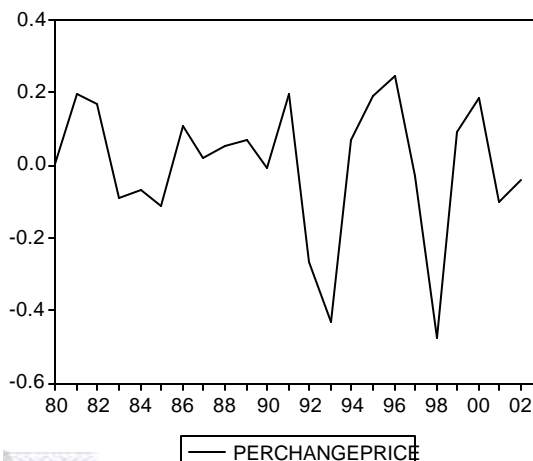
Total annual sales for the period 1990-2000 ranged between US\$270 million and US\$593 million. Annual sales depend strongly on the auction price. Graph 10 presents the auction prices for the period 1980-2002. Graph 11 goes further to show the percentage change of the tobacco price from year to year for the same period. Price fluctuations are largely due to demand and supply factors. For example, in 1998 tobacco prices were low because of high world tobacco production levels. Although tobacco prices increased significantly

before Zimbabwean independence in 1980, the post independence period has experienced highly unstable prices. For example, 2003 tobacco prices were the same as those of 1983, although the highest prices had been recorded in 1991.

Graph 10: Tobacco Prices in US\$ (1000/MT), 1980 – 2003



Graph 11: Percentage Change in Prices 1980 – 2003



Source: FAO, 2004



Source: FAO, 2004

All tobacco sold at the auction undergoes processing by merchants to remove stems and tips from the leaf before exporting. This process adds between 30 and 50 % of value added. Tobacco exports depend on the production levels and the price. Tobacco exports had a positive trend between 1960 and 1996, but since then, tobacco exports have shown negative trend. Although the 2001 exports were higher than the 1997-1999 exports, export value was 12 % less than that of 1996 exports. Furthermore, the 2002 exports were 60 % less than the 1996 exports. From a positive perspective, the Zimbabwean economy and the farmers benefit strongly from the auction system, because the farmers receive foreign currency on the day of the sale.

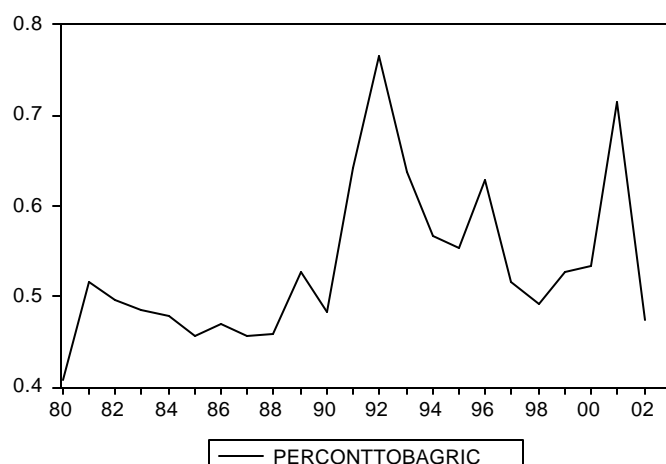
Graph 12: Tobacco Exports (US\$), 1980-2002



Source: FAO, 2004

The tobacco crop contributes significantly to the GDP of the economy. Between 1991 and 1998, it contributed about 10 % to the GDP, 30 % of total exports and 65 % to the agricultural sector exports per year (FAO, 2004). Furthermore, the tobacco crop contributed 24 % to Zimbabwe's total export earnings in 1995, and the second largest foreign currency earner during that same year was gold, which contributed 13 % (Maravanyika, 1998). Tobacco contributions have decreased by 42 % from 1960 to 2002 and increased by 17 % between 1980 and 2002 as in graph 13 below. However, the contribution of tobacco to the agricultural sector has been highly unstable, reaching its maximum in 1992 during the post independence period, with 76.53 % contribution.

Graph 13: Tobacco Contribution to the Agricultural Sector (%), 1980-2003



Source: FAO, 2004

The economic significance of the tobacco crop can be clearly illustrated by its contribution to government revenue. Zimbabwe as a tobacco producing economy obtains tax revenue from both farmers and buyers, who pay a fixed percentage on the value of the crop (ABC, 2004). Table 2 below summarizes this tobacco tax revenue. Tax revenue has been decreasing, since 1997. The 2000 tax revenue from tobacco sales is equivalent to 42 % of the 1996 tax revenue. This can be attributed to falling production and prices of raw tobacco.

Table 2: Government Tax Revenue

Auction Year	Tax Rate %		Total Revenue US\$
	Farmers	Merchants	
1996	5	5	43 553 989
1997	5	5	43 236 859
1998	5	5	37 248 464
1999	5	5	33 455 822
2000	2.5	2.5	18 400 000

Source: ABC (2004)

Furthermore, tobacco is an important source of income for commercial farmers. For example, in 1999 the average gross profit rate was about 37 % as compared to other crops, which yielded very low or negative gross profit rates, depending on the soil quality as shown below. Soil quality is represented by the words ‘low’, ‘medium’ and ‘high’ in Table 3 below. The gross income from tobacco for large-scale farmers was about Z\$2.2million and about Z\$44 000 for small-scale farmers in 1999 (ABC, 2004).

Table 3: Profit Margins

	Dryland Crops			Irrigated Crops		
	Low	Medium	High	Low	Medium	High
Gross Profit (Z\$/Ha)						
Flue Cured Tobacco	73827	101964	126681	104103	136354	172183
Maize	-836	2200	3968	417	2501	5455
Cotton	2805	7907	12225	10551	19089	26096
Groundnuts	21518	6774	11909	1498	13708	26054
Soybeans	-1554	2640	7466	913	5107	9933
Wheat	...	...	...	19130	26621	31508
Net Profit (Z\$/Ha)						
Flue Cured Tobacco	61641	89778	114495	87412	119663	155492
Maize	6677	-3641	-1873	-90929	-7845	4891
Cotton	-3036	2066	6384	205	8743	15750
Groundnuts	-3323	933	6063	-8848	3362	15708
Soybeans	-7395	-3201	1625	-9433	5239	-413
Wheat	...	...	...	8784	-6275	21162

Source: Keyser 2002

Like many other anchoring economic activities, the importance of the tobacco crop can be encapsulated in a broader framework, accounting for sectoral interdependence. Input-output analysis is the best method of assessing the economic importance of the controversial crop. Although there are no input-output tables for the economy, tobacco farming plays a central role in many farm systems in Zimbabwe. Most traditional crops grown on commercial farms revolve around the cultivation of the tobacco crop. As a

method of soil conservation, traditional crops are grown in rotation with the tobacco crop, to generate cash, to produce food for consumption on the farm, or to employ permanent employees in productive on-farm activities (Hazarika and Alwang, 2002; Keyser, 2002). Furthermore, some of these crops' marketing activities and growing are financed from cash or profits generated from the tobacco crop (Keyser 2002). Considering the profitability of the tobacco crop, it is justified to conclude that the tobacco crop is in fact responsible for the continual existence of commercial farms.

Tobacco farming is thus considered an anchor, around which all commercial agriculture revolves. In an overall assessment, tobacco farming is a growth stimulator for the economy due to its ability to generate both direct and indirect employment, both income and output effects. It was estimated that in 1998, approximately 170 000 workers were directly involved in tobacco production (ABC, 2004; Keyser, 2002). About 117 000 were directly involved in large-scale tobacco farming and almost 55 000 were involved in small-scale tobacco farming. This latter group consisted mainly of family labour. Furthermore, about 100 000 workers were hired on a short-term basis by both large and smallholder farmers. In addition, 30 000 workers were involved in tobacco marketing, research and service. Hence between 250 000 and 320 000 workers were directly or indirectly employed in the tobacco sector. Of these, about 230 000 were directly involved in tobacco crop production. This value represents 5 % of Zimbabwe's total labour force, and more precisely 25 % of formal employment (Keyser, 2002).

The importance of the tobacco crop can best be illustrated by comparing employment in tobacco farming to that in other traditional crops. Tobacco requires an average of 446 labour days per hectare, as compared to maize (33) and cotton (208). However, although cotton requires far more labour than other traditional crops, production of cotton occurs on a small scale. This suggests that cotton production cannot offer alternative employment to workers involved in tobacco production. As shown in Table 4 above, the tobacco wage bill is far higher than that of other traditional crops and hence is important for poverty reduction, given that remittances are sent to families in rural areas.

Table 4: Labour Requirements

	Dryland Crops			Irrigated Crops		
	Low	Medium	High	Low	Medium	High
<u>Hired Labour (days/Ha)</u>						
Flue-Cured Tobacco	382	415	437	462	482	497
Maize	19	23	27	30	45	50
Cotton	145	172	198	212	245	278
Groundnuts	57	68	83	90	110	135
Soybeans	12	13	14	22	23	24
Wheat	...	...	...	19	20	21
<u>Total Wage Bill Z\$/Ha)</u>						
Flue-cured Tobacco	30 182	31 976	33 208	35 308	36 428	37 268
Maize	1 596	1 932	2 268	2 520	3 780	4 200
Cotton	9 380	10 873	12 367	13 113	14 980	16 847
Groundnuts	3 847	4 463	5 499	5 964	7 112	8 680
Soybeans	1 008	1 092	1 176	1 848	1 932	2 016
Wheat		...	...	1 596	1 680	1 764

Source: Keyser 2002



It is important to note that tobacco production is essential for developing economies. In the Chinese economy, for example, tobacco production generated more than US\$11 billion profits in 1998, and the industry employed millions of unskilled labour, although production was no higher than that of 1993 (Van Liemt, 2002). Moreover, tobacco is a foreign currency earner and, through the multiplier effect, can lead to high growth rates among these economies. Chinese statistics show that tobacco production is essential in generating revenue for both the farmers and the government.

Chapter 4: Results – Presentation and Discussion

4.1 Introduction

In this chapter, Zimbabwe is viewed as an economy dependent on production of the tobacco crop. Firstly, the available data is used to support the theoretical framework that the economy has a comparative advantage in the production of the tobacco leaf. In determining whether this is the case, the Balassa-Samuelson estimates are used. The results obtained supplement the studies of Sakume et al (2000). In the latter study, they found that the Zimbabwean economy has a competitive advantage in the production of all agricultural crops, with the aid of cost benefit analysis.

In addition, the data is used to show the importance of the tobacco crop to welfare levels in Zimbabwe. These tests are performed using the VAR approach. The results from the regression analysis support the analytical framework that the tobacco crop is essential for welfare improvement in Zimbabwe and other small tobacco exporters. Public educational spending is used as a proxy for social spending, in order to establish the relationship between social welfare and tobacco exports.

The second part of the chapter (Section 2.2) will describe the data used in this research paper. The third part (Section 2.3) will explain the methodology used, whereas the fourth part (Section 2.4) will determine whether the Zimbabwean economy has a comparative advantage in the production of the tobacco crop and will also determine the relationship between tobacco exports and public educational spending.

4.2 The Data

The sample covers 24 annual observations for the total world and of the Zimbabwe economy with regard to agriculture and tobacco production for the period 1980 to 2003. All the data with the exception of gross domestic expenditure (GDP), per capita income, and public education expenditure was obtained from the Food and Agriculture Organisation's agriculture database, available online at <http://www.fao.org/>; GDP and per capita income was obtained from the World Bank's World Development indicators, and

is available online at <http://www.wdi.org>. The central statistics office of Zimbabwe made public educational spending available for the period 1980 to 1999. All the values are constant at 1995 prices.

4.3 Methodology

This examination is divided into two parts. In the first, we determine whether the Zimbabwean economy has a comparative advantage in the production of the tobacco crop, and in the second, whether there is a relationship between welfare growth and tobacco exports. The Balassa-Samuelson method was explained earlier in Chapter Two. This method has been used extensively in determining comparative advantage estimates and whether these estimates are reliable. The VAR approach is used to determine the relationship between welfare and tobacco exports. This analysis makes use of Equation 8 derived in Chapter 2.

$$G_i = G_i(\Pi_i(t), T, \dots)$$



Education is used as a proxy for welfare and is the dependent variable. Tobacco export revenue is one of the independent variables. All the variables are in their natural logarithmic form, i.e.

$$D(\log educ, 2) = f\{(D(\log pcap), D(\log exp ov), Re sid 04)\}$$

where *educ* represents public education expenditure, *pcap* represents per capita income, *expov* represents tobacco export revenue, and *resid04* represents the residual series.

Welfare is difficult to measure. Although education is used as a proxy, it is still susceptible to irregularities. These irregularities and bias may result from a lack of sufficient data and a failure to control for variables like the number of schools. However, the omission of these important variables will not render the regression useless, and will highly unlikely influence the relationship or direction thereof between welfare and tobacco exports. The inclusion of per capita income in the regressions is particularly

valuable, as it is a measure of economic performance, although it does not show the distribution of income on welfare (Rousseau and Sylla, 2001). As argued by Rousseau and Sylla (2001), the data is readily available and it summarizes the economic performance of an economy. Per capita income in this regression series is thus used to capture the effects of growth in income on education.

4.4 Results and Discussions

4.4.1 Comparative Advantage

The first set of results in Table 5 presents the revealed comparative advantage estimates. All estimates from 1980 to 2003 are above 1, which suggests that Zimbabwe does indeed have a comparative advantage in the production of the tobacco crop. Arguably, this may be caused by a combination of different economic facets that include, among others, strong dependence on the tobacco crop by the Zimbabwean economy, as shown in high tobacco contribution to agriculture (Graph 13), and the continual decline in tobacco contribution to the total world agriculture sector relative to the Zimbabwean agricultural sector as shown in Appendix A, table A.



Table 5: Revealed Comparative Advantage Estimates, 1980 – 2002

Year	Revealed Comp Estimates
1980	25.03288311
1981	27.38291742
1982	22.88013662
1983	24.28086342
1984	25.61802168
1985	23.58647813
1986	27.67651858
1987	29.28887282
1988	32.24249324
1989	36.34533822
1990	32.23424722
1991	36.75612097
1992	46.52195823
1993	43.22537318
1994	43.65026541
1995	48.02034921
1996	44.77841915
1997	34.18630484
1998	34.11312855
1999	35.78399889
2000	38.56751852
2001	50.19409403
2002	38.5343371



Source: FAO, 2004

4.4.2 Relationship Between Tobacco Exports and Welfare

This section uses regression analysis to analyse the relationship between tobacco exports and welfare in the Zimbabwean economy. The reduced VAR framework is used to illustrate the relationship between public educational expenditure and tobacco exports.

A long run regression with results in Table B, Appendix B is used to create a residual series, residual04. Furthermore, it is required to first ascertain that all variables are stationary⁸, and that they have the same order of integration (Engle and Granger, 1987). The ADF test is used to prove that all variables are indeed stationary, and the results thereof are presented in Appendix B. All variables are stationary at second difference.

Table 6: Regression Results

Dependent Variable: Public Educational Expenditure

Sample 1982-1999

Variable	Estimate	T-stat
Constant	-0.001335	-0.046213
D(Log Per capita income,2)	0.527325	0.944669
D(log Exports Value,2)	0.230462	2.493004
Residual(-1)	-1.378193	-5.387068
Adjusted R-squared	0.730334	
Durbin Watson stat	2.280154	
F-statistic	16.34699	
Prob(F-statistic)	0.000075	

Table 6 above presents the regression results, with 18 observations. Although some variables were not included due to data constraints, the results do prove the theoretical framework and the assumption that there is a positive relationship between welfare and tobacco exports in small tobacco exporting economies.⁹

This paper focuses particularly on the relationship between welfare and tobacco exports. A 10 % increase in tobacco exports will lead to a 2.3 % increase in educational spending. This suggests that public educational expenditure is likely to increase as tobacco exports

⁸ Variables are stationary if the mean, variance and covariance are time dependent (see also Engle and Granger, 1987)

⁹ Tobacco exports and the residual are statistically significant at 5 % level of significance. However, the per capita income is statistically insignificant. This can be attributed to the data constraints. However, all variables are jointly statistically significant as shown by the F-statistic and there is no serial autocorrelation.

and per capita income increase. Hence, we can conclude that tobacco exports are indeed essential for welfare gains in the Zimbabwean economy.

Twenty-three percent of the variation in educational expenditure is explained by changes in tobacco exports. This suggests that adverse demand shocks will lead to deteriorating welfare levels in the Zimbabwean economy. This deterioration in welfare levels will be more pronounced because the economy has a comparative advantage in the production of the tobacco crop as compared to other alternative crops, such as coffee, maize and cotton.



Chapter 5: Conclusions and Recommendations

The aim of the research paper was to investigate the welfare effects of anti-smoking regulations on small net tobacco exporters. The justification for anti-smoking regulations has been based on the negative health effects of cigarette consumption and the associated health bills. However, although smoking regulations have welfare enhancing effects among net consuming economies, they lead to adverse welfare effects among net producing economies, as production decreases.

It has been substantially found that net tobacco-producing economies, especially small tobacco exporters, are likely to experience a welfare loss due to a decrease in production. Welfare losses come mainly, but not exclusively, in the form of reduced foreign revenue, high unemployment, deteriorating terms of trade and lost government revenue, the later of which negatively affects social services delivery.

Although many studies have focused on the effects of smoking regulations, most of these have concentrated on the effectiveness of sin taxes and the effects of tobacco smoking on health, the health bill and the associated welfare enhancing effects. However, few studies have determined the effects of regulations on small net tobacco producing economies. The World Bank (1999), Mattas et al (1999) and Van Liemt (2002), among a few, acknowledge that smoking regulations do lead to adverse welfare effects among small net producing economies.

The available data on the tobacco industry show a decrease in both world total tobacco consumption and production. Although the trade volumes have remained constant, small net producers have lost their competitive edge to the larger producers like Brazil and India (FAO, 2004). Tobacco exports from the small tobacco exporters, which include Zimbabwe and Malawi, have in fact been decreasing since 1998 (FAO, 2004).

These small net tobacco-exporting economies tend to be agrarian and have a comparative advantage in the production of the tobacco leaf. The results from the research also

support this view. Zimbabwe as an example of a small net tobacco exporting economy has a comparative advantage in the production of the tobacco crop, as can be seen from the fact that all revealed comparative advantage estimates for the period 1980-2002 are above unity.

Furthermore, the reduced VAR regression model was applied to estimate the relationship between tobacco exports and social welfare, controlling for economic growth. The results provide support for the hypothesis that anti-smoking regulations lead to welfare losses among small net tobacco exporters. A 10 % decrease in tobacco exports in Zimbabwe will reduce social welfare spending by 2.3 %, using public educational expenditure as a proxy.

However, the economic benefits of the tobacco-growing sector in the economy should not be underestimated. Other industries, including the chemical and fertilizer industries, also depend highly on the tobacco crop. The purpose of this research paper thus also goes beyond proving the relationship between tobacco exports and welfare.



Policy recommendations are highly important because anti-smoking regulations serve as a permanent shock to the tobacco industry. Diversification into the production of traditional crops and other highly profitable crops, such as paprika and roses for instance, seem to be the best solution. However, these economies need to move in parallel to other world economies by restructuring their industrial structures. Economic policies to counter the welfare reducing effects of smoking regulations on small tobacco exporters like Zimbabwe must include local and international assistance, and may come in the form of both financial capital and human capacity development.

Future research should focus on the differential impact of regulations on small versus large-scale farms. Research on social welfare should furthermore investigate deepening rural poverty and inequality arising from anti-smoking regulations. Computable general equilibrium can also be used to determine the effects of growing other crops instead of tobacco and the effects this will have on the economic growth rate.

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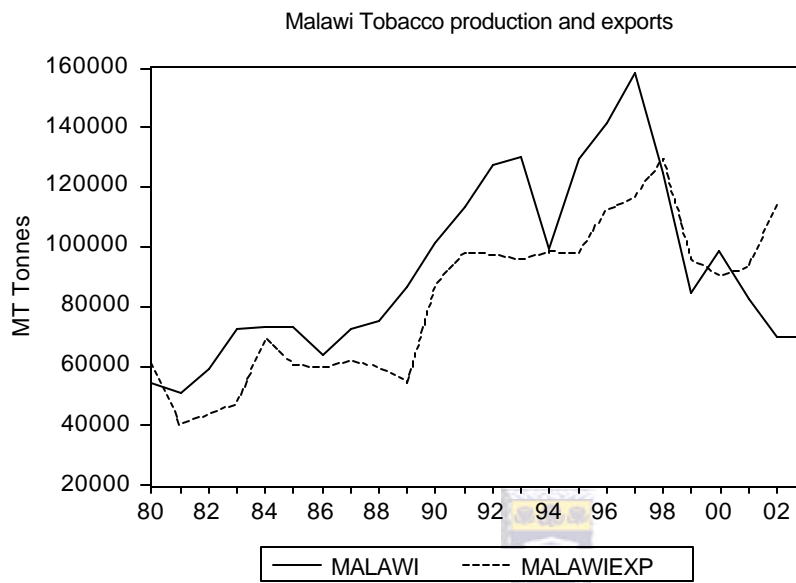
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Appendices

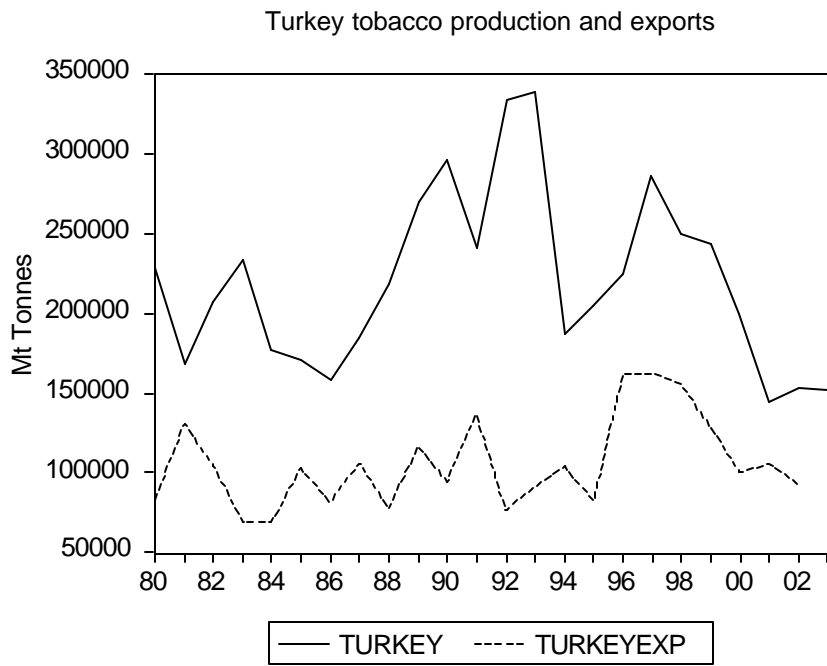
Appendix A

Graph A: Malawi Tobacco Production and Exports (MT Tonnes), 1980-2003



Source: FAO, 2004

Graph B: Turkey Tobacco Production and Exports (Mt Tonnes), 1980-2003



Source: FAO, 2004



Table A: Tobacco contribution to the World and Zimbabwe

Country	% CONTRIBUTION OF TOBACCO TO AGRICULTURE ZIMBABWE	% CONT OF TOBACCO TO WORLD AGRIC INDUSTRY
1971	0.411418	0.023530
1972	0.376117	0.025061
1973	0.413241	0.019237
1974	0.369297	0.020559
1975	0.289382	0.020992
1976	0.351541	0.021295
1977	0.322841	0.019655
1978	0.356537	0.021807
1979	0.297209	0.018316
1980	0.407619	0.016283
1981	0.515370	0.018821
1982	0.495526	0.021657
1983	0.485453	0.019993
1984	0.477992	0.018658
1985	0.456829	0.019368
1986	0.469320	0.016957
1987	0.456676	0.015592
1988	0.459797	0.014261
1989	0.528048	0.014529
1990	0.483052	0.014986
1991	0.641137	0.017443
1992	0.764309	0.016429
1993	0.638245	0.014766
1994	0.566236	0.012972

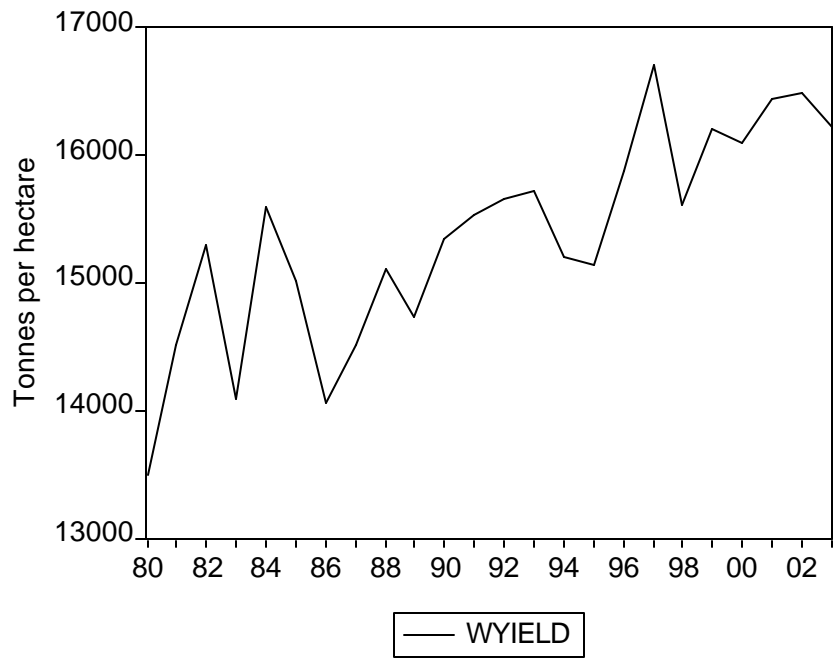


1995	0.553227	0.011521
1996	0.627497	0.014013
1997	0.515768	0.015087
1998	0.492804	0.014446
1999	0.526802	0.014722
2000	0.533524	0.013834
2001	0.715314	0.014251
2002	0.473799	0.012295

Source: FAO, 2004



Graph C: World Tobacco Yield Per Hectare, 1980-2003





Appendix B

Table B: Long-run Regression

Dependent Variable: LOGEDUC

Method: Least Squares

Date: 12/01/04 Time: 17:50

Sample(adjusted): 1981 1999

Included observations: 19 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.777796	4.877800	0.159456	0.8754
LOGEDUC(-1)	0.705532	0.100789	7.000105	0.0000
LOGEXPOV	0.334919	0.119986	2.791313	0.0137
LOGPCAP	0.159695	0.692737	0.230527	0.8208
R-squared	0.928963	Mean dependent var		21.15354
Adjusted R-squared	0.914755	S.D. dependent var		0.422519
S.E. of regression	0.123362	Akaike info criterion		-1.162730
Sum squared resid	0.228271	Schwarz criterion		-0.963901
Log likelihood	15.04594	F-statistic		65.38573
Durbin-Watson stat	2.305117	Prob(F-statistic)		0.000000

Graph D: Recursive residuals for the long-run equation (1985-1999)

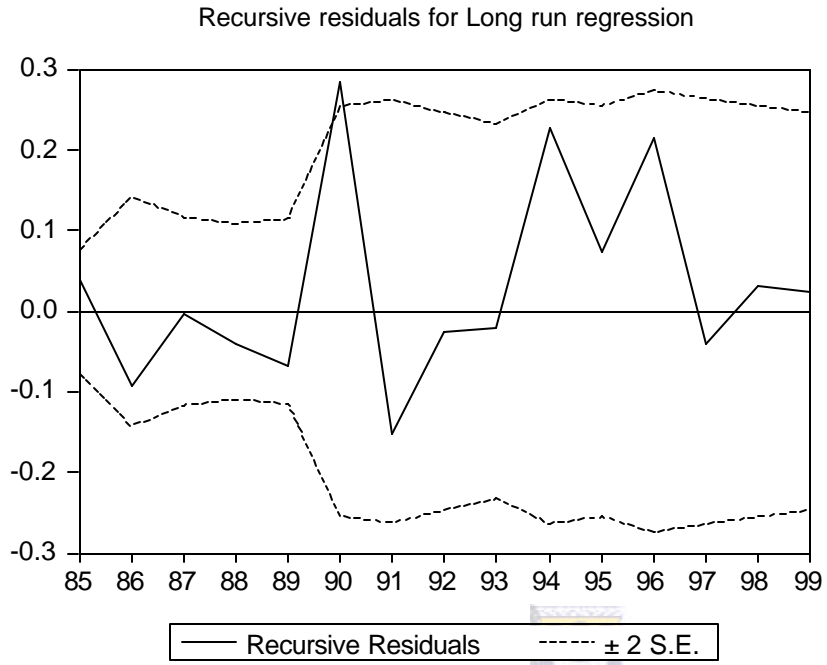


Table C: Short-run Regression

Dependent Variable: D(LOGEDUC,2)

Method: Least Squares

Date: 12/01/04 Time: 17:50

Sample(adjusted): 1982 1999

Included observations: 18 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.001335	0.028881	-0.046213	0.9638
D(LOGPCAP,2)	0.527325	0.558212	0.944669	0.3608
D(LOGEXPOV,2)	0.230462	0.092443	2.493004	0.0258
RESID04(-1)	-1.378193	0.255834	-5.387068	0.0001
R-squared	0.777922	Mean dependent var	-0.011015	
Adjusted R-squared	0.730334	S.D. dependent var	0.234923	
S.E. of regression	0.121994	Akaike info criterion	-1.176559	
Sum squared resid	0.208356	Schwarz criterion	-0.978698	
Log likelihood	14.58903	F-statistic	16.34699	
Durbin-Watson stat	2.280154	Prob(F-statistic)	0.000075	

Graph E: Recursive residuals short-run equation, (1986-1999)

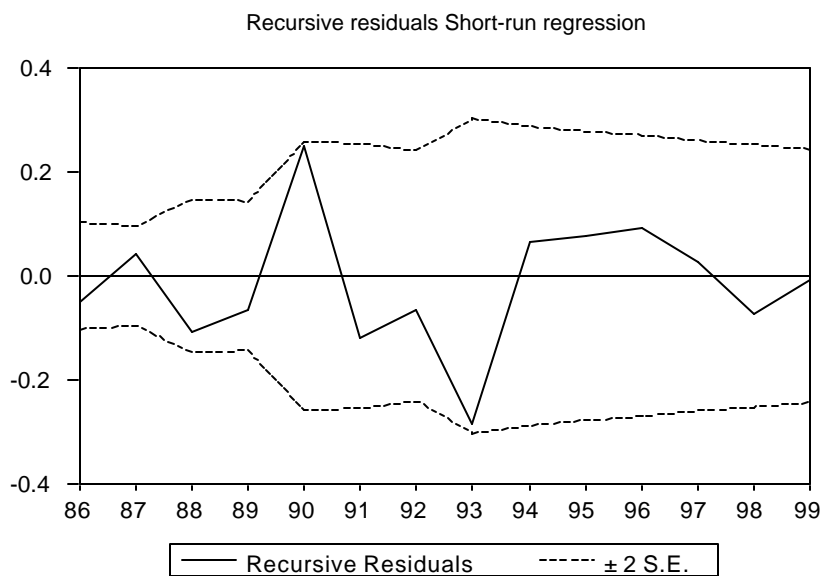


Table D: Unit root test results Residual series (1980-1999)

ADF Test Statistic	-4.981730	1% Critical Value*	-2.7057
		5% Critical Value	-1.9614
		10% Critical Value	-1.6257

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(RESID04)

Method: Least Squares

Date: 12/09/04 Time: 09:26

Sample(adjusted): 1982 1999

Included observations: 18 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RESID04(-1)	-1.170586	0.234976	-4.981730	0.0001
R-squared	0.592979	Mean dependent var		0.005959
Adjusted R-squared	0.592979	S.D. dependent var		0.175826
S.E. of regression	0.112174	Akaike info criterion		-1.483578
Sum squared resid	0.213911	Schwarz criterion		-1.434113
Log likelihood	14.35220	Durbin-Watson stat		2.003527

Table E: Unit root test results (Log) public educational expenditure (1980-1999)

ADF Test Statistic	-3.740209	1% Critical Value*	-4.6712
		5% Critical Value	-3.7347
		10% Critical Value	-3.3086

*Mackinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(LOGEDUC,3)

Method: Least Squares

Date: 12/09/04 Time: 09:27

Sample(adjusted): 1984 1999

Included observations: 16 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOGEDUC(-1),2)	-1.932603	0.516710	-3.740209	0.0028
D(LOGEDUC(-1),3)	0.152173	0.281803	0.539996	0.5991
C	0.172999	0.339598	0.509423	0.6197
@TREND(1961)	-0.006091	0.011026	-0.552393	0.5908
R-squared	0.842654	Mean dependent var		-0.000643
Adjusted R-squared	0.803317	S.D. dependent var		0.455468
S.E. of regression	0.201995	Akaike info criterion		-0.148826
Sum squared resid	0.489626	Schwarz criterion		0.044321
Log likelihood	5.190608	F-statistic		21.42164
Durbin-Watson stat	2.104237	Prob(F-statistic)		0.000041

Table F: Statistics on (Log) Educational expenditure variable

	LOGEDUC
Mean	21.11624
Median	21.04154
Maximum	21.86181
Minimum	20.40748
Std. Dev.	0.443799
Skewness	0.327636
Kurtosis	2.028195
Jarque-Bera	1.144822
Probability	0.564164
Observations	20



Table G: Unit root test results (Log) per capita income (1980-1999)

ADF Test Statistic	-4.766698	1% Critical Value*	-4.5348
		5% Critical Value	-3.6746
		10% Critical Value	-3.2762

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(LOGPCAP,3)

Method: Least Squares

Date: 12/09/04 Time: 09:28

Sample(adjusted): 1984 2002

Included observations: 19 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOGPCAP(-1),2)	-1.877744	0.393930	-4.766698	0.0002
D(LOGPCAP(-1),3)	0.296071	0.229570	1.289678	0.2167
C	0.061446	0.085455	0.719043	0.4832
@TREND(1961)	-0.002158	0.002640	-0.817476	0.4265
R-squared	0.749781	Mean dependent var		0.002418
Adjusted R-squared	0.699737	S.D. dependent var		0.113688
S.E. of regression	0.062297	Akaike info criterion		-2.529150
Sum squared resid	0.058213	Schwarz criterion		-2.330321
Log likelihood	28.02693	F-statistic		14.98251
Durbin-Watson stat	2.044802	Prob(F-statistic)		0.000088

Table H: Statistics on (Log) per capita income variable

	LOGPCAP
Mean	7.603686
Median	7.598527
Maximum	7.690261
Minimum	7.421259
Std. Dev.	0.064687
Skewness	-0.948656
Kurtosis	4.000568
Jarque-Bera	4.409228
Probability	0.110293
Observations	23



Table I: Unit root test results (Log) tobacco exports in value (1980-1999)

ADF Test Statistic	-5.349160	1% Critical Value*	-4.4167
		5% Critical Value	-3.6219
		10% Critical Value	-3.2474

*Mackinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(LOGEXPOV,3)

Method: Least Squares

Date: 12/09/04 Time: 09:45

Sample(adjusted): 1980 2002

Included observations: 23 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOGEXPOV(-1),2)	-2.309661	0.431780	-5.349160	0.0000
D(LOGEXPOV(-1),3)	0.474021	0.239753	1.977124	0.0627
C	0.090615	0.151743	0.597156	0.5575
@TREND(1980)	-0.010077	0.011823	-0.852267	0.4047
R-squared	0.788125	Mean dependent var	-0.022808	
Adjusted R-squared	0.754671	S.D. dependent var	0.758268	
S.E. of regression	0.375576	Akaike info criterion	1.036057	
Sum squared resid	2.680083	Schwarz criterion	1.233534	
Log likelihood	-7.914650	F-statistic	23.55845	
Durbin-Watson stat	1.939007	Prob(F-statistic)	0.000001	

Table J: Statistics on (Log) per exports in value variable

Mean	12.79643
Median	12.73869
Maximum	13.50339
Minimum	12.11587
Std. Dev.	0.397877
Skewness	0.165037
Kurtosis	1.873929
Jarque-Bera	1.319609
Probability	0.516952
Observations	23

