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**THE IMPACT OF TOBACCO MARKETING AND PRICING POLICY
REFORMS ON INCOME INEQUALITY AMONGST GROWERS IN MALAWI:
WHAT LESSONS CAN BE LEARNT FROM THE AUSTRALIAN
EXPERIENCES?¹**

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ABSTRACT

Three key questions are addressed in this paper: (1) Have Malawi's tobacco policy reforms led to improvements in the absolute prices that smallholders get? (2) How do the prices that smallholders receive compare with what the rich estate owners get? (3) Are there any lessons that Malawi can learn from the Australian experiences? Results from three tests, namely the empirical fluctuation process (efp) test, Poe, *et al.* (1994) convolutions test and Kolmogorov-Smirnov (KS) test indicate that overtime tobacco policy reforms have indeed led to some improvements in both absolute and relative prices that smallholder farmers receive. However, when compared with Victoria in 2006, Malawi's tobacco land use is nearly 256 times more than Victoria and engages more farmers but gets far less farm gate value from tobacco. Adoption of modern farming technologies, specialization and value adding at the domestic scene can be appropriate lessons for Malawi. The closure of the Victorian tobacco industry in 2006 suggests that relying on tobacco as the only tool for Malawi's economic growth and poverty reduction may not be sustainable in the long run. There is need to diversify to other crops such as cotton, pulses, cassava, and bananas.

1.0 Introduction

Since 1981, Malawi has implemented a series of Enhanced Structural Adjustment Facilities (ESAF) supported by the IMF and World Bank, particularly in the agricultural sector. Most of these agricultural policy reforms have been carried out in the tobacco industry for two main reasons. Firstly, tobacco is the main cash crop with no major close substitutes so policy makers felt that positive reforms in this industry would have far-reaching economic benefits. Secondly, prior to the reforms, the tobacco industry had growing, marketing and pricing policies that strongly discriminated against smallholders. Reviewing such restrictive policies was therefore regarded as the best way to ensure that smallholders became active participants and beneficiaries of the socio-economic growth and development of the country.

The reforms were designed with three main objectives, namely to allow market forces to drive allocation in crop production, promote competition and ensure that smallholder farmers get good producer (tobacco) prices. The last two objectives were regarded as central because it was observed that nearly fifteen years after independence the majority of smallholders remained poor and that the income gap between the rich estate owners and the poor smallholder farmers had greatly increased. Competition and favourable producer prices were therefore viewed as an effective route to reducing absolute and relative poverty, especially amongst those in the worse-off category.

While Malawi's agricultural policy reforms in general, and the tobacco policy reforms in particular, have triggered great attention amongst researchers, the impact of these reforms on producer prices has not been adequately examined. By extension, this means that the welfare effects of the tobacco policy reforms on smallholders are still not well informed. This paper therefore intends to make a contribution by examining whether the policy reforms in the tobacco industry have indeed helped to improve the

prices that smallholder farmers receive. To achieve this, three key questions are raised as follows: (1) Have the tobacco policy reforms led to an improvement in the absolute prices that smallholders get? (2) How do the prices that smallholders receive compare with what the rich estate owners get? (3) Are there any lessons that Malawi can learn from the Australian experiences? To address the first question, we test for structural changes by employing the CUSUM based empirical fluctuation process (efp) test. Later, we carry out the Poe, *et al.* (1994) convolutions test and the Kolmogorov-Smirnov (KS) test in order to tackle the second question. Prior to these tests, a review of the tobacco crop production, marketing and pricing policies is carried out. In the final section, we discuss lessons that Malawi can learn from the Australian experiences.

2.0 Tobacco production and its economic significance in Malawi

Malawi's over-reliance on rain-fed agricultural production is well documented. For decades, agriculture has accounted for an average of 36 percent of GDP and 90 percent of total exports. Tobacco stands out as the major foreign exchange earner, followed by tea and sugar. Tobacco alone accounts for more than 70 percent of agricultural exports while tea makes up 7.5 percent and sugar 7.4 percent. Nearly 15 percent of GDP and 25 percent of Malawi's total tax base emanate from tobacco exports (GoM, 2005, 2006a) and nearly 20 percent of Malawian households derive most of their income from the tobacco sector (Jaffee, 2003).

The history of tobacco production in Malawi stretches back to 1889 when David Buchanan, a white farmer, planted the first Virginia (flue-cured) tobacco crop in the Shire highlands (Mwasikakata, 2003). By 1920, the number of white farmers engaged in tobacco production had increased substantially, such that some started to trek to the central region of the country in search of more land to grow the crop. Over time, other types of tobacco were introduced and by the end of the 1920s three main types were cultivated, namely burley, flue-cured and oriental. Currently, four main types of tobacco are grown which include the aforementioned three plus Malawi Western. The Malawi Western tobacco is subdivided into three categories: sun/air-cured, Southern Division Dark-fired and Northern Division Dark-fired.

Initially, the tradable tobacco crop was exclusively grown by the white settlers. However, towards the end of the 1940s some Africans were allowed to cultivate a limited amount of the crop on their trust land as long as it was not burley or flue-cured tobacco. The restriction on the cultivation of burley and flue-cured tobacco took a new twist after independence in 1964. This time around, for the first time, some members of the African elite, mostly those with strong political ties with the Malawi Government, were allowed to own estates and grow burley and flue-cured tobacco. However, flue-cured tobacco is generally very capital-intensive, a thing which has over time created an automatic barrier against the majority of Africans². This may explain why the Special Crop Act of 1972 did not include flue-cured tobacco but rather prevented smallholders from growing burley tobacco. Smallholder farmers were only allowed to grow the two unpopular and less lucrative types – oriental and Malawi Western.

The segregation between those who grew burley tobacco and those who did not was clearly replicated in the chasm between the rich and the poor. While estate owners enjoyed increasing wealth, the majority of smallholders slipped into more poverty. By

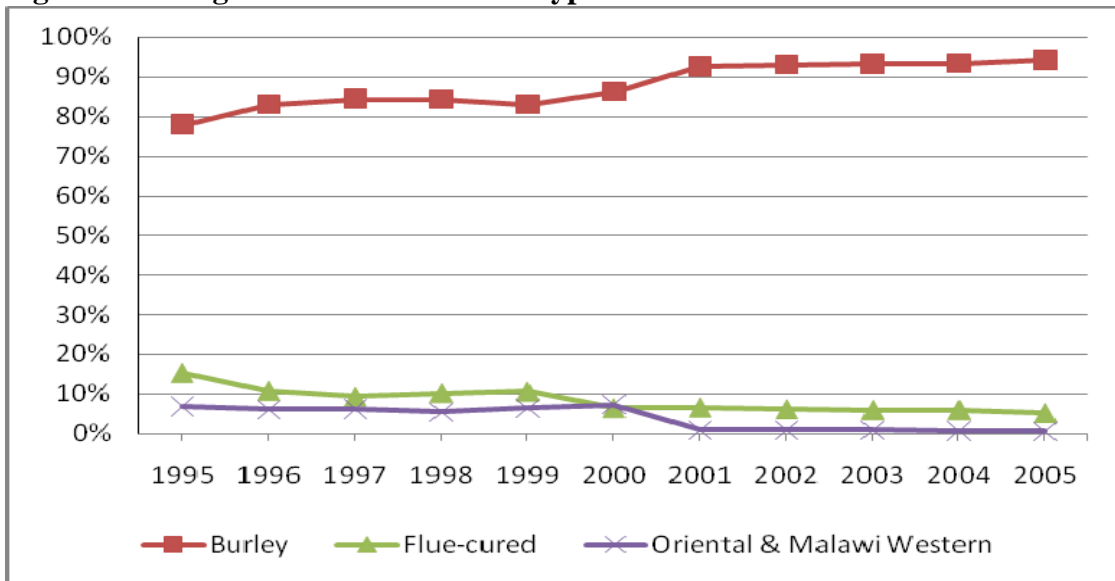
² Today, flue-cured tobacco is largely grown by the rich white farmers.

the beginning of the 1980s it became apparent, especially through the eyes of the donor community, that irrespective of its strong government support, Malawi's elite-centred growth model was having a grave negative effect on poverty reduction especially amongst smallholder farmers. This prompted the IMF and World Bank to put pressure on the Malawi Government to liberalize tobacco cropping. At first, many government officials, who in most cases happened to be estate owners, were strongly opposed to the idea of liberalization. They cited poor quality and excess supply of the crop as some of the potential weaknesses. However, towards the end of the 1980s the government reluctantly succumbed to pressure from the donor community and in 1990, the Special Crops Act was amended to allow smallholders to grow burley tobacco for the first time (Kaluwa, Silumbu, Ngalande-Banda, & Chilowa, 1992).

The amendment of the Special Crops Act triggered an increase in the number of smallholder tobacco growers. About 7600 smallholder farmers entered the burley tobacco industry immediately after they were allowed to produce the crop in 1990. By 1994 there were nearly 50,000 smallholder tobacco farmers and the number swelled to about 200,000 in 1996. Currently, it is estimated that the number has reached a plateau oscillating between 315,000 and 330,000. The '15,000' difference relates to the erratic entry and exit into the industry in response to the international price changes of the crop. So far, the benefits of tobacco growing among smallholders bear some evidence of rural household welfare improvements ranging from tin-roofed houses to cell phones, radios and bicycles. As a result of these developments, other related small-scale enterprises have also mushroomed in many rural areas such as radio and bicycle repairs, carpentry and brick making.

The increase in the number of tobacco growers was paralleled by an increase in burley tobacco production. With the liberalization of the tobacco growing industry, many smallholder farmers chose to cut back on their traditional types of tobacco and switched to burley as this type fetches high prices (second to flue-cured), is not capital intensive and is very easy to cure. As such, there was a substantial increase in the cultivation of burley tobacco as a share of total national production from 77.84 percent in 1995 to 94.16 percent in 2005. Figure 1 below shows changes in the shares of tobacco types cultivated in Malawi between 1995 and 2005.

Figure 1: Changes in shares of tobacco types: 1995-2005



Source: Tobacco Association of Malawi (2008)

3.0 Crop marketing policy changes in the tobacco industry

According to Mathews & Wilshaw (1992), the first tobacco export, weighing about 40 pounds was auctioned in London in 1893. However, it is reported that the crop failed to obtain a good price due to its poor quality. As more white settlers joined the tobacco production industry, its exportable quantity and quality improved substantially. For instance, in 1909, “the total value of [tobacco] exports was £90,000” (Sharpe, 1910, p. 341). By 1924, Smith (1924, p. 17) reported that “the tobacco crop, which in recent years has averaged five to six million pounds of dried leaf, and this year is estimated at nine million pounds, is the highest output of any of his Majesty’s dominions.” In response to increase in the number of growers, the National Tobacco Board (NTB) was formed in 1926 with the principle objective of coordinating overseas marketing of the crop and later management of the domestic production became NTB’s auxiliary objective.

However, starting from 1929, tobacco exports were hampered by increasing transport costs amidst plummeting world prices which translated into huge losses for the estate owners. To help farmers reduce transport costs, the British Government recommended that local auction floors be introduced and this led to the establishment of the Limbe auction floors in 1938. At that time NTB was entrusted with the intermediary role of purchasing the graded and packaged tobacco leaf from some estate owners, especially those that had transport problems, and selling it at the auction floors. However, the majority of estate owners traded directly with the auction floors.

Later in the 1950s, NTB started to deal with Africans that had been allowed to grow some tobacco and changed its name to African Tobacco Board (ATB) in 1952. A few years later, ATB started to include on its list other farm produce such as cotton and

groundnuts and this led to a change of its name to Farmers Marketing Board (FMB) in 1962.

The role of FMB in trading with estate owners was further weakened after independence as nearly all the white farmers and the newly introduced African burley growers sold their tobacco directly at the auction floors. This compelled FMB to concentrate its intermediary role on smallholder farmers who were growing either oriental and Malawi Western tobacco or other crops such as cotton, groundnuts and rice.

In 1971, the Agricultural Development and Marketing Corporation (ADMARC) was established by Act of parliament and took over the role of FMB. Up until the early 1990s, ADMARC was in charge of marketing nearly all smallholder crops. The parastatal was also responsible for the procurement and supply of farm inputs to smallholder farmers. All the tobacco varieties³ ADMARC purchased from smallholders were sold at the auction floors except for oriental, which was sold abroad under a special treaty (Mkandawire, 1999).

After the tobacco production liberalization, it was noted that ADMARC alone was very unlikely to adequately serve the growing pool of smallholders. This came on the heels of mounting pressure from the donor community to ensure that smallholders were given freedom to choose between selling their crop directly at the auction floors or via ADMARC. In view of this, by early 1991, smallholder burley farmers were asked to form clubs. It was envisaged that club members would organize resources together and hire transport to the auction floors.

According to Collion & Rondot (1998), clubs were also expected to fulfill other functions such as offering a voice in political affairs and augmenting the government's role of providing local public goods. However, by 1994, it was observed that most clubs were weak and a large number of burley growers did not join them⁴. As such, it was recommended that in addition to ADMARC there was a need for other intermediaries to be engaged in the tobacco marketing chain. This led to the revoking of the Agricultural Produce (Marketing) Regulation Act and the introduction of the intermediate tobacco buyer (IB) program in 1994.

Under the IB system, which became operational in 1995, intermediaries bought tobacco from smallholder farmers and sold it at the auction floors using their registered names. The system attracted a wide range of players including civil servants, estate owners and other traders. Jaffee (2003) points out that the motivations for obtaining IB licenses were as varied as the players themselves ranging from profit maximization to bypassing of delivery quota restrictions and credit defaults. While it was initially envisaged that the IB program would attract players that had prior knowledge in growing and handling tobacco, by the year 1997, the majority of the 4,000 IBs had no such experience. The system was later marred by accusations of credit defaults, theft and declining quality of

³ The term 'all the varieties' mainly refers to the three categories of the Malawi Western tobacco, namely sun/air-cured, Southern Division Dark-fired and Northern Division Dark-fired.

⁴ Jaffee (2003) reports that by 2001 the Tobacco Control Commission had a registration figure of 23,363 burley clubs most of which had less than five members per club. However, club membership became almost mandatory after 2002 and today nearly 95 percent of smallholders belong to a club.

burley tobacco arising from ineffective grading (Kadzandira, Phiri, & Zakeyo, 2004) so the government terminated the program in the year 2001.

Currently, smallholder burley growers trade their crop via the Tobacco Association of Malawi (TAMA) satellite depots situated throughout the country. The system works in such a way that smallholder farmers (as a club) take their crop to any of the 88 satellite depots depending on proximity. TAMA arranges transport on behalf of the farmers to the auction floors where club representatives monitor the trading. However, this system is not free from challenges and bottlenecks. For instance, there have been many instances where tobacco “is damaged or goes missing at the depots or in transit to the auctions, yet no one is held accountable for this and the farmers affected end the season without any earnings and perhaps with a defaulted loan” (Jaffee, 2003, p. 41).

4.0 Tobacco pricing policies

Before 1994, tobacco pricing policies did not favour smallholder farmers and largely failed to reduce their poverty (Harrigan, 2003). Firstly, the tobacco growing restriction policy which was framed by the colonialists and upheld by the dictatorial one-party Malawi Government limited smallholders to oriental and Malawi Western tobacco which were sold at low prices dictated by the state. Unlike the estate tobacco growers who have been selling their crop directly to the international buyers at the auction floors since 1938, the smallholder sales were largely channelled through NTB, ATB, FMB and, till recently, ADMARC and IBs. By buying tobacco from smallholders at very low prices and selling at the usually high international prices, the parastatals were implicitly taxing the poor smallholders.

Between 1990 and 2001, the ADMARC prices stood at average of 33 percent of the international prices. In half of the indicated time period the ADMARC prices were actually less than 30 percent of the international prices with the lowest standing at 19 percent. A similar picture was painted by the United Nations and Malawi Government in 1993 when they both pointed out that in the 1980s crop prices paid by ADMARC oscillated between 20 and 30 percent of the international prices. However, other scholars have defended the parastatals’ implicit taxes on smallholders. For instance, Harrigan (1988) argues that a portion of ADMARC’s profit was utilized to finance development in the smallholder sector in form of employment, smallholder credit facilities and a network of markets, especially in the rural areas. ADMARC is also said to have been at the forefront in safeguarding domestic prices for producer goods and inputs.

Furthermore, it has been argued from other quarters that much as ADMARC prices appeared to be exploitative, the whole approach to trading with smallholders was better than it is today. For instance, it was ADMARC’s tradition to guarantee minimum crop purchasing prices before the commencement of the planting season which would either be confirmed or increased during the selling season. It has further been contended that although in theory, price fixing is said to distort market operations, in reality, with this approach farmers were able to predict their after-sale income and hence plan accordingly. In addition, farmers were getting cash on delivery right at the ADMARC depot and this could help them make use of their payment immediately and, in most cases, effectively (Chilowa, 1998).

In contrast, nowadays much as the system at the auction floors guarantees payment within 24 hours, most smallholders receive their income from tobacco sales two or three months down the road. This is because many of them have no personal bank accounts and therefore they rely on group (or club) accounts which usually take a long time to sort out as to who gets how much, especially when clubs have so many members. Now, prices at the auction floors are paid in U.S. dollars but the majority of smallholders receive their money in local currency. The local currency tends to appreciate against the U.S. dollar during the tobacco selling period and usually weakens after that. Unfortunately, with the above cited delays the majority of smallholders receive their payment at the time when the local currency is weak. Paradoxically, this is the time they are supposed to buy their farm inputs such as fertilizer and pesticides and since these inputs are imported their prices are usually adjusted upwards during this time as the local currency depreciates. This leaves most smallholders worse off and less competitive than their counterparts, particularly estate owners.

Despite the stated advantages, it was still argued that monopsony and crop price fixing policies would be more hurtful to poor farmers than if they were allowed to operate in a liberalized and free market system. This led to floating of the smallholder crop prices in 1995. On the input side, the marketing of fertilizer and hybrid seed was liberalized in 1993 culminating in the amending of the Fertilizer Farm Feeds and Remedies Act to allow for private sector importation and distribution. Furthermore, the Seed Act was amended to open up for the private sector participation in seed marketing and the price subsidies for fertilizer and hybrid seeds were abolished in 1995 (GoM, 2006b; Mkandawire, 1999).

Most of the above amendments were seen by policy makers as the best way to make prices for smallholders more competitive – a phenomenon that would translate into poverty reduction. Jaleta & Gardebroek (2007) employ a bidding model to explain the phenomenon. They postulate that in a situation where buyers and sellers were allowed to negotiate their prices, buyers would strive to quote a lower price while sellers would do the opposite. The final price (P_f) that both parties would agree upon would therefore be between the buyer's asking price (P_b) and the seller's offered price (P_s), i.e.:

$$P_f = \theta_s P_s + (1 - \theta_s) P_b \quad (1)$$

where $\theta_s \in [0, 1]$ is the relative bargaining power of the seller. During ADMARC's monopsony, the seller, who happened to be the smallholder farmer had no bargaining power implying that θ_s was zero as such the final price was essentially the buyer's asking price. By increasing the number of tobacco buyers the government expected to widen choices and therefore the bargaining power of the seller.

It is reported that the post 1994 sales partly reflected government's expectation of the prices that smallholder farmers would get after introducing competition. According to Jaffee (2003) and Mkandawire (1999) smallholder burley farmers that traded with intermediate buyers received better prices than before. However, it is not clear whether these price improvements were significant, sustainable and evenly distributed amongst smallholders, especially when some of the reasons that led to termination of the IB system included poor quality tobacco, theft and price exploitation. It is also very

doubtful that the improvements in the prices that smallholders got had anything to do with their improved bargaining powers. Traditionally, the majority of smallholders have had very weak bargaining powers mainly due to low education levels, asymmetric information regarding international prices and poor quality of the tobacco crop that they produce.

4.1 Transaction and logistics costs: Their effect on the final price

In Malawi, tobacco farmers incur various transaction and logistics costs that impact negatively on their final price. The situation is worse for smallholders than estate owners. For the majority of smallholders, transaction and logistics costs start with TAMA which gets a commission for membership, handling and arranging transport. It is alleged that the transport that TAMA arranges is usually unfavourable to farmers and there are suspicions that profits from such deals are shared between the transport providers and TAMA. For instance, Jaffe (2003) reports that in 2002 members of the National Smallholder Farmers' Association of Malawi (NASFAM) were paying MK350 (about US\$5) per bale⁵ while their counterparts under TAMA were paying MK600 (about US\$8) per bale. Much as transport costs have overtime adjusted upwards in nominal terms, these charges remain relatively the same when converted to the US dollar. This implies that on average smallholders that transport their tobacco via TAMA are more than one-and-a-half times worse off than their counterparts that do not. Unfortunately, those that are outside TAMA are less than 5 percent of the entire population of smallholder tobacco growers.

Apart from the transport cost, which translates to about US\$0.08 per kilogram, smallholders are required to pay institutional taxes which translate into an average of 2.48 percent⁶ of their total earnings. In addition they are required to pay Auction Holdings Limited (AHL) a logistics fee of 3.95 percent and a loan stop-order handling fee of 3 percent of their total revenue. On the other hand, estate owners and well-off smallholders⁷ tend to pay only the AHL logistic fee of 3.95 percent and TCC fee of 0.13 percent of their gross revenue. Their average transport costs estimated at US\$0.01 per kilogram⁸ are also more reasonable when compared with what the above highlighted smallholders incur.

Since the above costs are deducted at the auction's fall of the hammer, the total transaction and logistics costs incurred by tobacco growers of group j in time t

$(\sum TLC_{jt})$ can therefore be estimated by weighting their sum against the export prices, P^E as follows:

⁵ A bale of tobacco weighs between 75 and 100 kilograms.

⁶ These taxes are broken down as follows: 1 percent goes to Agricultural Research and Extension Trust (ARET), 0.85 percent goes to associations, 0.5 percent goes to TAMA and 0.13 percent goes to TCC.

⁷ Estate owners and well-off smallholders usually do not belong to clubs. They are also not supported by TAMA or ARET. These farmers seldom require loans from the bank to run their estates and in the case where they have loans every thing is done right at the bank without involving the auction floors.

⁸ The US\$0.01 per kilogram estimate is arrived at by the fact that most estate owners own trucks that carry an average of 100 bales and they spend approximately US\$100 on fuel per trip. While the domestic cost of fuel has been oscillating in nominal terms, it has generally been stable in dollar terms.

$$\left[\sum_{j=1}^J \text{TL}C_{jt} \right] P_t^E \quad (2)$$

4.2 Have smallholder tobacco prices improved?

This sub-section intends to establish whether the absolute prices received by smallholders have registered statistically significant improvements since the introduction of major tobacco policy reforms in 1990. To do this, we test for structural changes by employing the CUSUM⁹ based empirical fluctuation process (efp) test. This test is carried out by firstly determining an error correction model (ECM) for the tobacco price function as follows:

$$\Delta p_t = \gamma_0 + \gamma_1 \varepsilon_{t-1} + \gamma_2 \Delta p_{t-1} + \mu_t \quad (3)$$

$$\varepsilon_t = p_t - \beta_1 - \beta_2 p_{t-1} \quad (4)$$

where, p_t is price of tobacco in period t . Δp_t , which is later referred to as ‘diff.Smaprice’, denotes changes in tobacco price received by smallholders. γ_i and β_i are coefficients while ε_t and μ_t are residuals.

Secondly, from equation (4), we conduct cointegration analysis whose residuals, $\hat{\varepsilon}_t$ (later referred to as ‘coint.res’), plus changes in the lagged Δp_t (later referred to as ‘diff.Smaprice1’) are used as regressors in equation (3). Figure 2 (diagrams: A & B) indicates the transformed data used to estimate equation (3).

Our null hypothesis is premised on the assumption that there are no structural changes hence:

$$H_0: \gamma_i = \gamma_0 \quad (5)$$

$$H_1: \gamma_i \neq \gamma_0 \quad (6)$$

⁹ The idea of cumulative sums (CUSUM) process dates back to the work of Brown, Durbin, & Evans (1975). The process aims at determining the cumulative sums of recursive residuals as follows:

$$S_n(t) = \frac{1}{\sigma \sqrt{\eta}} \sum_{i=k+1}^{k+(t\eta)} \tilde{\mu}_i \quad (0 \leq t \leq 1), \text{ “where, } \eta = n - k \text{ is the number of recursive residuals and}$$

$(t\eta)$ is the integer part of $t\eta$ ” (Zeileis, Leisch, Hornik, & Kleiber, 2009, p. 4). The other important

structural change tests include the moving sums of residuals (MOSUM), the Chow test and the F

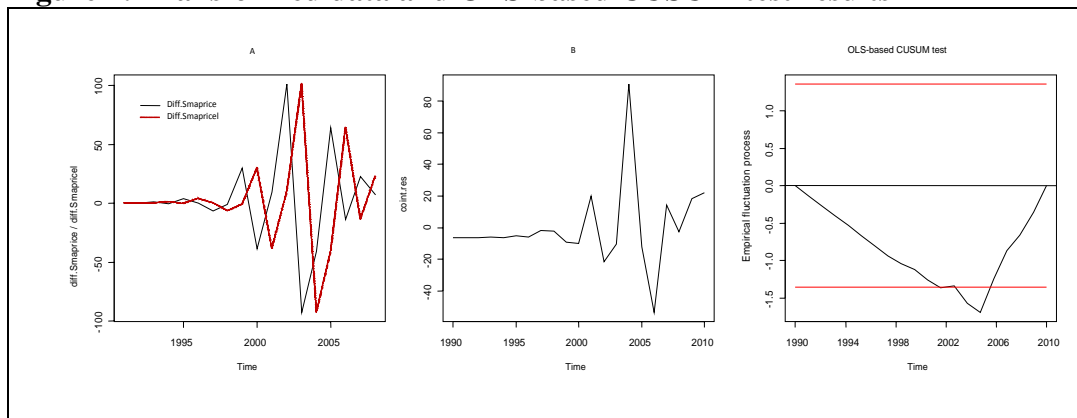
test (see, Zeileis et al., 2009).

According to Zeileis, Leisch, Hornik, & Kleiber (2009, p. 3), the efp test is principally designed:

to fit a model to the given data and derive an empirical process, that captures the fluctuation either in residuals or in estimates. For these empirical processes the limiting processes are known, so that boundaries can be computed, whose crossing probability under the null hypothesis is α . If the empirical process path crosses these boundaries, the fluctuation is probably large and hence the null hypothesis should be rejected.

In our case, the derived empirical process is designed to capture changes in residuals at 5 percent significance level. The OLS-based CUSUM test results are as indicated in the last graph of Figure 2 below.

Figure 2: Transformed data and OLS-based CUSUM test results



Results indicate that the efp crosses the lower boundary firstly between the years 2002 and 2003 and secondly in the year 2005. This implies that the fluctuations are unusually large and hence the null hypothesis is rejected at 5 percent significance level¹⁰. In terms of absolute prices, results indicate a general slide in price changes for the majority of smallholders between 1990 and 2001. However, this trend partially reverses in 2002 and has continuously improved starting from 2005.

Changes in absolute prices that smallholders receive do not necessarily divulge a complete picture with regards to how such price improvements (or decreases) compare with what their counterparts (estate owners) get. In order to gain this insight, we carry out two econometrics tests, namely the Poe, *et al.* (1994) convolutions test and the Kolmogorov-Smirnov (KS) test. The Poe, *et al.* (1994) convolutions test is conducted to establish whether there are significant differences between the distributions of the

¹⁰ The structural change test (sctest) provides the following results: $S_0 = 1.6893$, $p\text{-value} = 0.006642$, which lead to a similar conclusion.

prices received by smallholders (smaprice) and estate owners (estprice). The KS test augments the Poe test by examining whether the means of these two price distributions are significantly different. These tests are addressed in the following sub-section.

4.3 Smallholder tobacco prices versus what estate owners get

To conduct the Poe et al. test, we assume that the two sets of price distributions are randomly and independently selected. According to Poe, Giraud, & Loomis (2002, pp. 3-4), “the distribution of the difference of these two distributions is given by the subtractive variant of the convolution formula:

$$f_v(v) = \int_{-\infty}^{\infty} f_x(v+y)f_y(y)dy \quad (7)$$

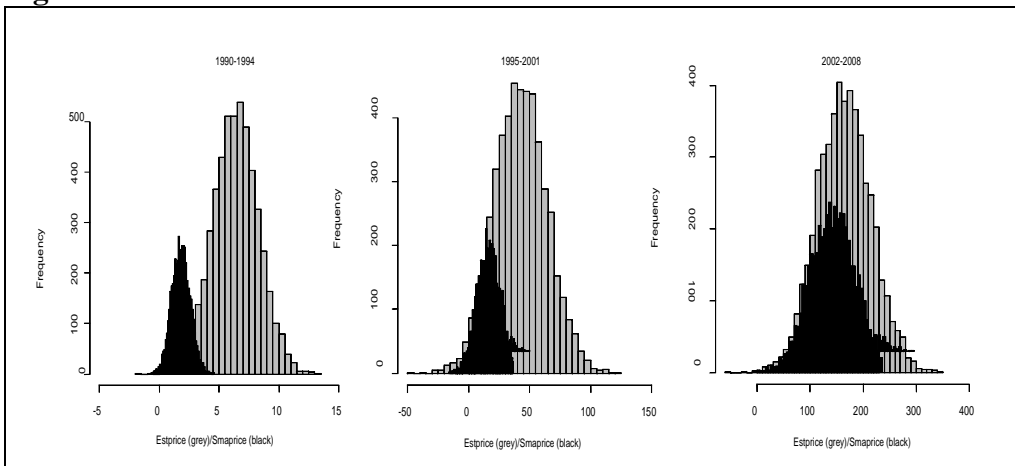
The associated cumulative distribution function at a specific value V' is:

$$f_v(V') = \int_{-\infty}^{V'} \int_{-\infty}^{\infty} f_x(v+y)f_y(y)dydv, \quad (8)$$

where, $f_x(x)$ and $f_y(y)$ are probability density functions of independent random variables X and Y while v is the probability of the event V . The “union of all the possible combinations of x and y result in a difference of v ” (Poe et al., 1994, p. 907).

In this study, five thousand draws generated through a non-parametric bootstrapping process were randomly selected using the convolution technique which “calculates the probability of each possible outcome, considering all possible combinations of the two independent distributions. The probability of outcome is simply the sum of the products of each possible combination” (ibid, p. 4). Results, estimated at 5 percent level of significance, are as indicated in Figure 3 and Table 1 below.

Figure 3: Poe et al. convolutions test results



From Figure 3, it can be seen that during the period of monopsony (1990-1994), the bar graphs hardly overlap. The situation improves between 1995 and 2001 when competition was introduced thorough the IB programme. The two bar graphs completely overlap during the post IB era which started in 2002. This means that the

distribution of prices between smallholders and estate owners was clearly different in the first phase of the reform programme. These differences narrowed during the second phase and today the price distributions between the two groups can be said to be statistically insignificant. This picture is also reflected in the differences between the mean prices of the two groups as indicated in Table 1 below. Between 1990 and 1994, the estate mean price was nearly 3.5 times more than that of smallholders. This difference narrowed down to about 2.5 times between 1995 and 2001 and currently, it is about 1.1 times.

Table 1: Poe et al. convolution and Kolmogorov-Smirnov (KS) test results

	Mean price	Quartiles					KS Test	
		0%	25%	50%	75%	100%		
estprice (1990-1994)	6.45	-1.54	5.15	6.45	7.69	13.17	} D P-value	0.9304 0.013
smaprice (1990-1994)	1.82	-0.69	1.28	1.82	2.33	4.6		
estprice (1995-2001)	43.33	-48.48	28.46	43.4	57.7	120.6	} D P-value	0.6372 0.058
smaprice (1995-2001)	17.11	-14.76	10.33	17.15	23.58	52.55		
estprice (2002-2008)	164.82	-49.98	130.02	164.99	198.44	345.62	} D P-value	0.187 0.783
smaprice (2002-2008)	144.23	2.08	113.97	144.38	173.07	302.29		

The quartiles reveal that the first two phases of the reform process were marked by increasing tobacco income inequalities between the richest estate owners and the poorest smallholders. Between 1990 and 1994, the poorest 25 percent of smallholders got about one-tenth of what the richest 25 percent of estate owners received. This worsened between 1995 and 2001 when the poorest 25 percent of smallholders earned nearly one-twelfths of what the richest 25 percent of estate owners got. Inequalities in tobacco incomes were experienced not just between the poorest smallholders and the richest estate owners, but also amongst the smallholders themselves. During the same periods, tobacco earnings for the top 25 percent of smallholders increased from 3.6 times to 5.1 times more than the earnings for the lowest 25 percent of the group.

The above income inequalities can be attributed to the alleged exploitations by the state owned monopsony (ADMARC) and later the IB system. At that time, the poorest smallholders were said to have sold their tobacco at very low prices. Rapid reductions in the tobacco income inequalities experienced in the post ADMARC and IB era that began in 2002 probably testify to the alleged exploitations.

We now turn to the KS test to establish whether the mean prices between the two groups of tobacco growers are significantly different. This is important because differences (or similarities) in estimated distributions do not necessarily denote differences (or similarities) in the means derived from these distributions. “For instance, it is possible that two significantly different distributions can cross and have identical means” (Poe et al., 1994, p. 912) and by extension, significantly similar distributions may have different means. The KS test is a non-parametric and distribution-free technique of comparing means of different distributions. According to Alexander & Jaforullah (2005, p. 13), the KS test “computes the maximum vertical deviation (D statistic) between the empirical distribution functions of a pair of samples along with a p-value appropriate for testing the null hypothesis” – in our case – that the means of the two price distribution functions are the same. Low p-values together with high D statistics would signify differences in the means of the two distribution functions.

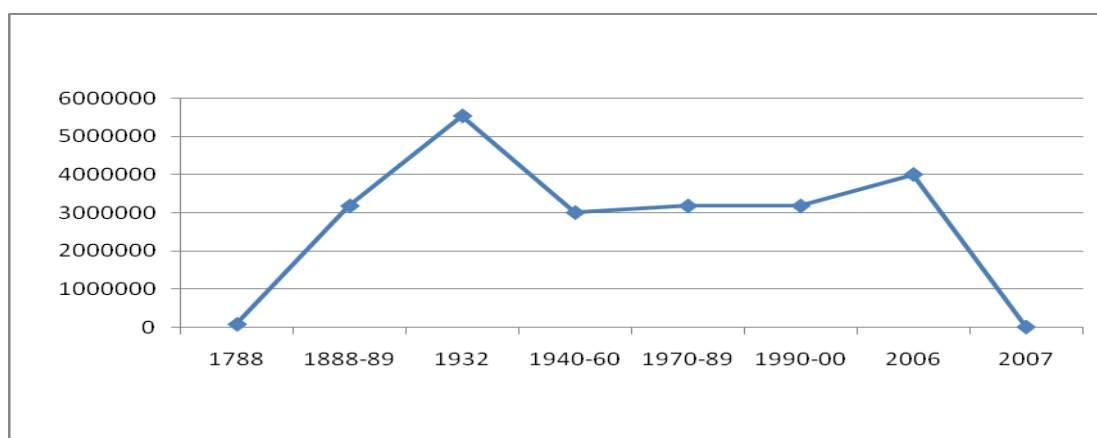
Table 1 above indicates that between 1990 and 1994, the mean prices between smallholders and estate farmers were different at 1 percent level of significance. In other words, the mean price differences were very large. Between 1995 and 2001, the differences were only significant at 10 percent level of significant implying that the differences had narrowed down significantly. The high p-value and low D statistic computed between 2002 and 2008 indicate that there are no statistically significant differences between the mean prices of the two groups of farmers.

From the above three tests, it can be concluded that the tobacco policy reforms that started in 1990 have not only helped to improve the absolute prices that smallholders receive but they have also narrowed the mean and distributional price gaps between the rich estate owners and smallholders. All tests consistently point to the fact that major positive changes in the tobacco price structure have occurred after the ADMARC and IB system era which started in 2002.

5.0 What lessons can Malawi learn from the Australian Experiences?

The Australian southeastern state of Victoria has tobacco as one of its important crops from which nearly AUD26 million was realized each season until 2006 (Department of Primary Industries, 2008). According to Hill (1952), tobacco was introduced to Australia in 1788. Figure 4 indicates production of tobacco in Australia for selected years and in turn approximates the general production trend.

Figure 4: Volume of tobacco (kilograms) produced in Australia: 1788-2006



Sources: Department of Primary Industries (2008), Hill (1952)

With regards to production, the crop can be said to have undergone limited expansion over the 219 years of cultivation. For instance, in the 1888/89 growing season, 7 million lb (about 3 million kilograms) were produced from 6,641 acres (about 2,688 hectares) of land. The highest volume was produced in 1932 when 12.2 million lb (about 5.5 million kilograms) were produced. At the close of the industry in 2006, about 4 million kilograms were produced from 1,400 hectares of land. However, higher yields from less land use signify increased factor productivity in tobacco production. Table 2 below gives a 2006 snapshot of how Victoria's tobacco production compared with that of Malawi.

Table 2: Tobacco production in Australia and Malawi in 2007

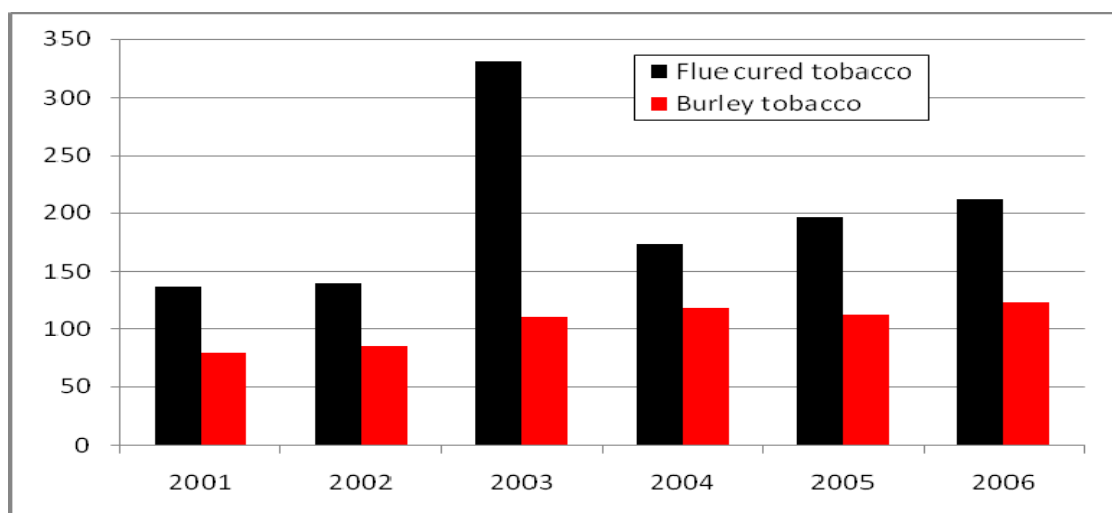
	Total land for tobacco (ha)	Number of farmers	Average land holding (ha)	Total revenue (AUD million)	Revenue per capita (AUD)	Revenue per ha (AUD)
Australia (Victoria)	1,400	130	11	26	200,000	18,571
Malawi (Estate)	47000	5000	9	150	30,000	3,191
Malawi (Smallholder)	265000	325000	0.8	90	277	340
Malawi	312,000	330,000	1	240	727	769

Source: Reserve Bank of Malawi (2008); Department of Primary Industries (2008)

While Malawi's tobacco land use is nearly 256 times more than Victoria, with farmers engaged in production standing at 33000 and 130 in Malawi and Victoria, respectively, the latter generates, by far, more revenue per capita from the crop than the former. An Australian tobacco farmer's revenue of AUD200,000 is about 7 times more than what a Malawian estate farmer generates and nearly 722 times more than what is received by a smallholder in Malawi. Differences in average tobacco revenue per hectare between Victoria and Malawi stand at a ratio of 6 to 1 for the estate sector and 55 to 1 for the smallholder sector. The following question therefore arises: Why is Victoria's farm gate value much higher than that of Malawi?

According to The Tobacco Co-operative of Victoria Ltd (2005), Australia primarily cultivates capital intensive flue cured tobacco. In contrast, Malawi's focus is on labour intensive burley tobacco which accounts for nearly 95 percent of all the varieties cultivated. Generally, flue-cured fetches higher prices than burley tobacco. Figure 4 below indicates how prices of flue cured tobacco compare with those of burley tobacco in Malawi between 2001 and 2006.

Figure 5: Flue cured versus burley tobacco prices in Malawi Kwacha/Kg: 2001-2006



Source: Reserve Bank of Malawi (2008)

The foregoing suggests that Victoria fetches higher farm gate tobacco prices than Malawi because of differences in the varieties that are cultivated. However, other reasons can be cited. Until the closure of the sector in 2006, Victoria was producing better quality tobacco than Malawi mainly due to technological advancements employed at planting, harvesting, curing and packaging stages. In addition, irrigation water in Victoria was central in ensuring that sustainable high quality tobacco is produced. On the other hand, Malawi's tobacco production is solely rain-fed so much that quality has often been compromised partly due to drought.

Reliable domestic demand that used to offer favourable and stable prices was an added advantage to tobacco cultivation in Victoria. For instance, in 2001 the minimum and maximum prices of flue cured tobacco in Australia were AUD1.80 and AUD7.35, respectively. Paradoxically, the minimum price in Victoria was much higher than the maximum price in Malawi at about AUD1.05 for the same variety.

Some lessons can therefore be learnt. There is need for Malawi to consider adopting modern technology to cultivate varieties that attract high market prices if the country's farm gate value is to improve. Much as encouraging all poor smallholders to cultivate tobacco is a good policy option for income distribution, promoting specialization might be better. In order to enhance quality and prices, tobacco must be cultivated by those farmers who have adequate capacity, in terms of both physical and financial capital. Malawi must also strive to add value to tobacco at the domestic market. For instance, as is the case in Australia, Malawi must encourage domestic processing of tobacco such as

threshing and cigarette manufacturing. This would have a multiplier effect on employment and investment to the benefit of many Malawians.

The closure of the tobacco industry in Victoria offers another very important lesson for Malawi. Until 2006, “tobacco was a major contributor (about 26 percent) to the gross value of agricultural products in the Ovens-Murray region” (Department of Primary Industries, 2008, p. 7). As such, the closure of the industry had a huge impact on the tobacco farmers, particularly with regards to adopting changes in land use and business opportunities. While this paper does not address the causes and effects of the closure of the sector, it recognizes an important fact that the agricultural industry, like any other industry, is destined to undergo changes overtime. This being the case, Malawi needs to reconsider its absolute dependence on tobacco by, *inter alia*, diversifying to other crops.

Malawi has had negligible success in diversifying its exports away from tobacco during the past forty five years. For instance, the share of tobacco in total domestic exports was planned to fall below 50 percent starting from 1981. Instead, it rose from 47.4 percent during 1980-83 to 64 percent in 1988 and to 70 percent by 1998 (Mkandawire, 1999). The Victorian experiences suggest that relying on tobacco as the only tool for Malawi’s economic growth and poverty reduction may not be sustainable in the long run. Therefore, there is need to diversify to other crops such as cotton, pulses, cassava, and bananas.

5.0 Conclusions

A number of agricultural policy reforms have been pursued in Malawi since 1981. However, major policy reforms have been undertaken in the tobacco industry due to its socio-economic importance and hence the welfare benefits that were expected to be derived from the reforms. In this paper, it has been indicated that overtime such reforms have indeed led to some improvements in both absolute and relative tobacco prices that smallholder farmers receive.

However, when compared to Australia in 2006, Malawi uses more land and engages more farmers but gets far less farm gate value from tobacco. Adoption of modern farming technologies, specialization and value adding at the domestic scene can be appropriate lessons that Malawi can learn from Australia.

The closure of the tobacco industry in Victoria in 2006 suggests that the tobacco industry in Malawi is not immune from change. This being the case, Malawi needs to reconsider its over-reliance on tobacco. Currently, tobacco exports are greatly threatened by an expected decline in demand particularly from the developed world. Diversifying to other crops may be a better option if economic growth and the improvement of smallholders’ welfare are to be upheld in the long term.

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