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Behavioral Response to Plastic Bag Legislation in Botswana

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Abstract

This paper investigates the use of charges and standards in dealing with a common externality, plastic litter from shopping bags in Botswana. The country passed a plastic bag tax (effective 2007) to curb the plastic bag demand. Interestingly, the legislation did not force retailers to charge for plastic bags, which they did voluntarily at different prices. We assessed the environmental effectiveness and efficiency of the plastic bag legislation by analyzing consumers' sensitivity to the improvement of the plastic bag and related price charges. The introduction of the plastic bag levy led to a significant decline in the consumption of plastic bags per 1,000 Botswana pulas of shopping. The partial success of the Botswana levy was due to the constantly high prices of the bags.

Key Words: demand, environment, litter, plastic bags, price

JEL Classification: Q53, Q58

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Introduction

Plastic shopping bags rapidly became popular among retailers and consumers worldwide in recent decades due to their functionality, strength, and low cost (UNEP 2004). Plastic bags are widely used to transport small consumer goods, particularly food (Rayne 2008).

In Botswana, widespread use of lightweight, disposable plastic shopping bags only appeared in 1975. Diamonds were discovered in Botswana in 1967, which seemed to assure the future of one of the world's poorest countries. Prior to this, the retail sector was characterized by small family outlets. Newfound wealth due to the discovery of diamonds significantly changed the economic landscape of Botswana, attracting large South African retail chains and, with them, free, disposable, branded plastic bags.

Plastic shopping bags have undoubtedly been a boon to consumers, but at a cost, because the bags degrade slowly and present a number of negative externalities. Moreover, the technological advances that led to ever-lighter gauge plastic did not ameliorate the problem, but rather worsened it. The lighter bags are unsuited for reuse and heavy items need to be double-bagged.

Agriculture and tourism, both critical to the local Botswana economy, are two sectors affected by plastic bag litter, which has become a scourge in cities, towns, and villages across Botswana. Plastic bag litter is both unsightly and a hazard to the environment, particularly to wildlife and livestock. The extent of the agricultural hazard has not been researched extensively,

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although it is presented strongly in the popular media. A study by Dee (2002) found that 143 species were injured and killed by plastic bags through suffocation, ingestion, or entanglement.

While plastic litter is unattractive, the value of the externality has not been estimated locally. Plastic bag litter was a market failure, prompting the government to intervene. Due to concerns over the environmental impact of plastic bags, the Botswana government made the decision to regulate the plastic bag market in 2005, joining a growing number of countries, such as Denmark, Italy, Ireland, and South Africa.

Different countries have taken different measures to address plastic bag litter. Before Botswana introduced its tax, Ireland and South Africa were the only countries with a plastic bag levy that targeted consumers directly. Ireland introduced a levy in 2002 (Convery, McDonnell, and Ferreira 2007), and South Africa followed suit in 2003 with a similar levy (Hasson, Leiman, and Visser 2007).

Our study is similar to those by Hasson, Leiman, and Visser (2007) and Dikgang, Leiman, and Visser (2010) on the effectiveness of the plastic bag legislation in South Africa. This paper assesses the effectiveness of Botswana's legislative efforts to reduce plastic bag use by measuring whether consumers are sensitive to improvement in the quality of plastic bags and if, in their view, this warranted a price charge.

1. Waste Management Act in Botswana

Although Botswana's 1998 Waste Management Act made no specific mention of plastics,[1] origins of the movement to regulate and control the use of plastic bags predated it. According to Chilume (2002), in April 1997, the nongovernment organization (NGO) Somarelang Tikologo [Take Care of the Environment] organized a workshop for its stakeholders' (general plastic bag opponents, environmentalists, and students) on plastic bags. The workshop was so prominent that it came to be popularly known as the "Plastic Menace." At the workshop, the NGO argued that lightweight (15–20 microns) disposable plastic bags posed an environmental hazard and should be replaced by thicker, reusable bags.

A campaign and public petition, which was submitted to the government in 2000, followed the workshop. In a subsequent report for the NGO, Chilume (2002) reported that the

[1] http://www.laws.gov.bw/Docs/Principal/Volume10/Chapter65/PR-VOL-X-CHP-65-06%20WASTE%20MANAGEMENT.pdf

"broad stakeholder involvement" showed popular support for an anti-development position (advocating "slow growth") and for the positive effect that fewer bags would have on the environment. It is recognized that plastic bag use is a consequence of economic growth; hence, the focus of the policy should not be to eliminate the bags, but rather to encourage recycling, reduction of plastic litter, and safe disposal of residual plastic waste.

The Botswana plastic bag legislation set out these terms (Meintjies 2007):

- It regulated the minimum thickness of plastic bags.
- Manufacture and import of plastic bags thinner than 24 microns for use in Botswana was outlawed.
- Any violation of the Standard Act by any firm or individual was punishable by a jail sentence of three years and a fine of BWP[2] 5,000.
- The cost of plastic shopping bags had to be transparent and disclosed publicly.
- It imposed a levy to support environmental initiatives. (However, the levy amount was not specified.)
- Individual bags or consignment slips had to indicate clearly in English and/or Setswana the name and country of origin of the producer, importer, or distributor.

Although the Botswana Parliament passed the plastic bag amendment (to curb demand) to the Waste Management Act in August 2006, it was not until July 2007 that implementation began. The delay was due, in some measure, to lack of communication between the government and retailers. A point to note is that the policy excludes plastic refuse bags and plastic packaging. It affects only plastic bags that are used by food and retail entities, and excludes those used by other sectors, such as clothing retailers. According to Meintjies (2007), the new standard effectively phases out all plastic bags of less than 24 microns.

Importantly, the legislation did not stipulate that retailers had to charge for the stronger plastic bags. The application of this price-based tool came about when retailers voluntarily decided to impose their own prices (on top of the tax). This is unique because it allows market forces (demand and supply of plastic bags) to determine the equilibrium price, without distorting the market share of any retailer or influencing customers with regard to where they choose to do

[2] BWP = Botswana pulas; US$ 1 = BWP 6.8259 at the time the paper was written.

their shopping. Beginning in July 2007, customers wanting plastic bags had to pay for each bag at the counter.

2. Literature Review

Developing countries are facing unprecedented pressure from economic growth and environmental protection as they enter the 21st century. Exploitation and utilization of their resources ought to be based on sustainable development and improvement of ecological environments—where coordination between society, economy, energy, and sustainable environment does not compromise the ability of future generations to meet their own needs (WCED 1989; Demirbas 2001; Dincer 1998).

Standard approaches, such as technology-based and performance-based approaches, were instrumental in shaping the early environmental policies of the 1970s. Policymakers deemed such approaches to be in line with the prevailing legal traditions of dealing with activities considered excessive by society (Spence and Weitzman 1994; Stavins and Whitehead 1992).

For example, the "command-and-control" approach implemented by the United States successfully achieved the first tranche of emissions reductions in previously unregulated markets—more than two decades after they were first introduced. However, by its very nature, command and control requires vast amounts of resources, such as capital, government revenue, administrative and enforcement capabilities—the very resources that are particularly scarce in developing countries (Panayotou 1994).

Economists have long advocated for the adoption of economic instruments as an alternative, or complement, to direct regulation. Economic instruments[3] aim to address environmental problems by harnessing the power of market incentives. They are cost-effective, flexible, and a more dynamic form of regulation than conventional measures, such as command-and-control (Austin 1999).

The use of economic instruments to address environmental challenges is an attempt to correct market failures, reinstate full-cost pricing, and realign resource allocation with public objectives and interests—a necessary requirement for sustainable development. Economic

[3] The literature now generally supports the advantages of market-based instruments, such as taxes and levies (Rayne 2007), over the command and control approach, in terms of static and dynamic efficiency. (For detailed examples, see Baumol and Oates 1988; Sterner 2003).

instruments can send signals regarding resource scarcity and environmental damage that promote efficient resource use and minimize waste, which are further steps toward sustainable development (Panayotou 1994).

In the case of plastic bag litter, consumers are not faced with the full consequences of their consumption or disposal choices. An environmental levy is one way to make consumers more sensitive to the implications of excessive plastic bag consumption. Pigou (1960) backed the now-familiar environmental tax, arguing that external costs of pollution could be internalized by imposing a tax on the pollutant at such a rate that the marginal benefits of polluting equal the marginal costs of abatement.

Another point of debate is whether charges for polluting products should be applied, like Pigouvian producer taxes, as behavior-related charges (such as recycling deposits) or as simple consumer charges on the user. Basic microeconomics suggests that in a frictionless market the point of application is irrelevant; the incidence of the tax will be determined by the elasticity of demand and supply. Convery et al. (2007) made a rather different point. They argued that the Irish charges introduced in March 2002 were less a Pigouvian tax than a simple product tax, explicitly aimed at changing consumers' behavior. The same can be said of the current charges in Botswana.

The literature on applications of environmental taxation on waste has primarily focused on producer-generated pollution. Typically, policies have been aimed at consumers, to reduce the quantity of materials in the waste stream through deposit-refund systems or user charges for waste collection (see Bohm 1981; Callan and Thomas 1999; Choe and Fraser 2001). In this study, we focused on an alternative instrument discussed by Pearce and Turner (1992) and Convery et al. (2007), namely, a product tax on plastic bags in Botswana. It is important to note that the environmental problems discussed here relate to the final use of plastic bags.

The tax (plus retailers' charges for plastic bags) introduced in July 2007 in Botswana is not Pigouvian because it was not intended to identify the marginal external costs and determine the optimum level of the tax. The direct tax (on pollutants) was intended to correct the litter problem caused by plastic bags by explicitly changing consumers' behavior. The economic principle behind the tax was that an increase in the price of plastic bags (all things being equal) would curb demand for the bags. Plastic bag levies have being successful in reducing demand in some parts of the world (notably, Ireland and Denmark). This study aimed to assess whether the introduction of levies had the same effect in Botswana with regard to demand levels.

Economic theory argues that the optimum levy should be set at the price where the marginal social benefit is equal to the marginal social cost. However, there is limited knowledge about the cost of litter and other environmental and social costs that are not included in the price that retailers pay for plastic bags. It is therefore not possible to set the levy using theoretical methods. Given this shortcoming, it is more useful to take the main goals of a levy on plastic carrier bags into consideration and to set the levy at a level where these goals are likely to be met in the most efficient manner. This is possible if we understand the elasticity in demand for plastic bags (Nolan-ITU 2002).

3. Methodology

If carried out effectively, a levy on plastic bags should lead to the desired environmental improvement, that is, reduction in waste generation and littering. In the context of our study, a reduction in the consumption of bags is a proxy for a reduction in waste generation. How effective the plastic bag charges are depends on the actual amount charged for each bag. If, as is the case in Ireland, the levy on plastic bags is set high enough, then success appears certain. However, should the levy be set too low, as in South Africa, it will not be effective in the long term.

The environmental effectiveness and efficiency of the plastic bag legislation can be assessed by analyzing consumers' sensitivity to the improvement of the plastic bag qualities and related price charges. Responsiveness of consumers is measured by estimating whether there has been any behavioral change in the demand for plastic bags. The initial problem was the excessive use of plastic bags, seen as "free goods," and the litter from them.

We analyzed the influence of variables, such as income, on the elasticity of demand for plastic bags, as well as the trend in plastic bag demand, by studying food retailers, which are the intermediaries linking consumers and manufacturers of plastic bags. For this purpose, we deliberately collected data from four food retail chains that had a significant share of the market and distinct target markets.

Some retailers expressed concern that the data might be of value to their competitors. In order to maintain a measure of anonymity, we referred to them merely as high-income retailer, upper-middle-income retailer, lower-middle-income retailer, and low-income retailer. We interviewed representatives from the retailers and studied their annual financial reports. Low-income retailers are traditionally located in rural areas, so it was essential to include one because

most of the population in Botswana lives in rural areas. (Table 1 below indicates the market share of the four selected retailers.)

Despite their potential threat to livestock, plastic bags are useful assets to nonurban households. This issue has been poorly addressed in the literature and is one we try to clarify in this paper. The responsiveness of low-income consumers offers valuable insight into the effect of income and concerns that taxing plastic bags may lead to a further deterioration of the living standards of the poor. Because of the charge, they are forced to divert some of their already-low disposable income to buying plastic bags.

Table 1. Retailer Information

Retailer	Market share
High-income retailer	4%
Upper-middle-income retailer	20%
Lower-middle-income retailer	7.5%
Low-income retailer	40%

Source: Statistics are from annual reports for the financial year 2007–2008 and from personal communications with the respective retailers' representatives.

The revenue estimates in this study only refer to revenues generated in the Botswana operations of the retailers. The plastic bag volumes for the selected retailers ranged from the 2005–2006 financial year to 2008–2009. The consumer price index estimates were recalculated according to each retailer's financial year. If the size of a standard bag changed with legislation, a correction is included.

It is vital to stress that, in our analysis, we used the number of plastic bags corrected for total (real) retail sales, which is total bags divided by a retail sales index adjusted for inflation. The real value of sales divided by the number of bags sold yields the amount of actual purchased items put in an average bag, which we report in this paper.

The demand for bags is co-integrated with the volume of consumers' purchases: all things being equal, a rise in supermarket sales should mean a rise in the number of plastic bags issued. To overcome this problem, we estimated variations in the number of bags used to carry a certain volume of purchases, such as bags used per BWP 1,000 of purchases (in constant 2008 Botswana pulas), giving us an indication of lags.

4. Impact of the Plastic Bag Approach Adopted in Botswana

The main motivation for the "taxation" of plastic bags in Botswana originated in the pre-legislation base period: for most outlets, "flimsy" bags were issued at zero prices. Bag sizes were not standardized and if changes in bag size occurred in the post-legislation period, we corrected for bag volume. The high-income retailer already had better-quality bags during the pre-legislation period, but they were free. Charging for bags began in July 2007, and retailers charged different prices, ranging from 20 thebe[4] to 35 thebe, including the four we studied.

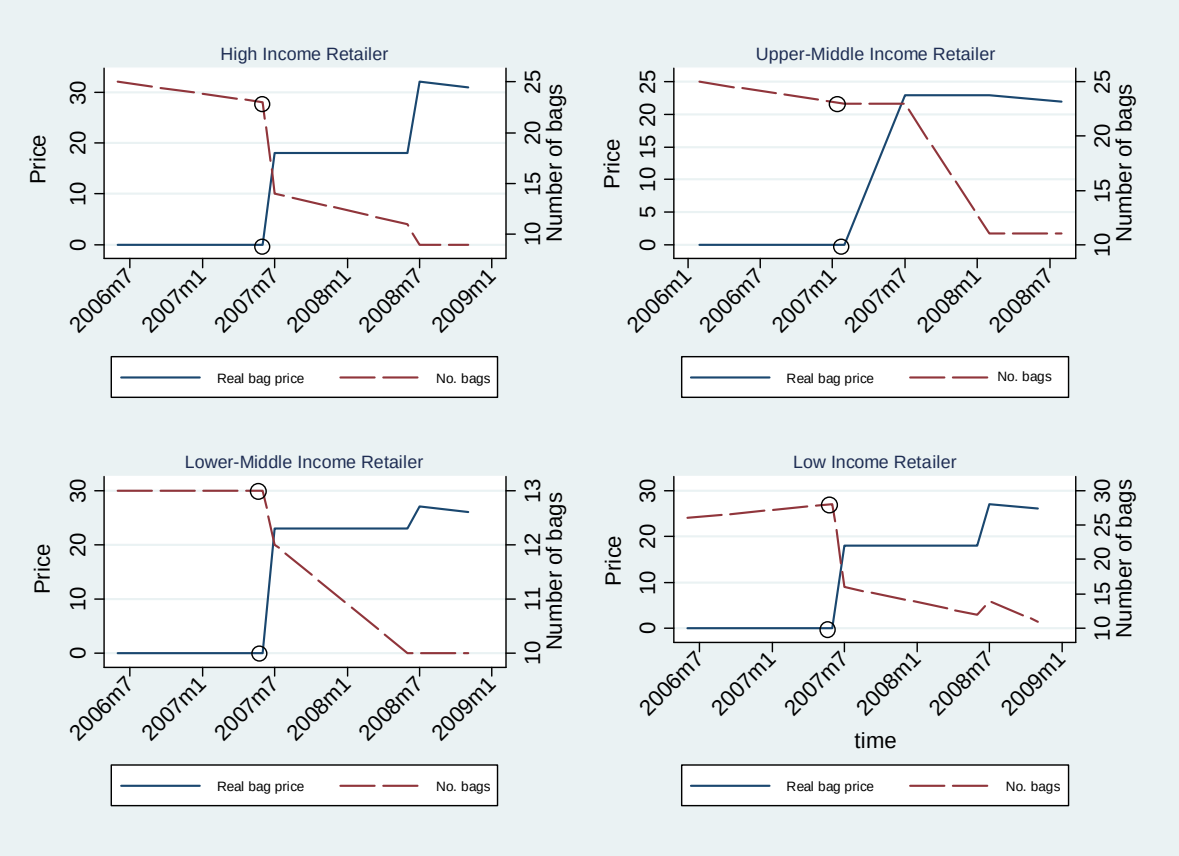
Data on the number of bags issued by each of the selected retailers were collected from the beginning of the 2005–2006 financial year to the 2007–2008 financial year. It covers the period before the introduction of regulations and charges for plastic bags to 18 months after the levy introduction. Hence, figure 1 only illustrates the short-term trends in plastic bag consumption across the four selected retail chains in Botswana.

Note that the price changes shown in figure 1 are not the same. (See the appendix for a detailed analysis of elasticity of demand at the four retailers.) It is interesting from a distributional perspective that taxing plastic bags had the greatest response in the luxury purchases of the high-income group, as well as the poorest segment of the market, because purchases per shopping trip were low in both cases.

When comparing the high-income and upper-middle-income retailers with lower-middle- and low-income retailers, it is important to recognize that the value per item in each bag is probably much higher. Therefore, high-income and upper-middle-income retailers had the opportunity to increase the number of items per bag and decrease the number of bags used per BWP 1,000.

[4] The pula, the currency of Botswana, is divided into 100 thebe.

Figure 1. Plastic Bag Consumption in Botswana for Four Retailers



Note: The real bag price is in (pula-thebes) and number of bags per 1,000 refers to quanties of bags per BWP 1,000 of purchase items. Furthermore, the "m" after the years refers to a particular month in a year. For example, the highlighted "m7" in the figure refers to July 2007, the seventh month.

There was a concomitant sharp fall in the number of bags issued per BWP 1,000 of real retail purchases.[5] Plastic bag use dropped 24% in the weeks following the introduction of charges for plastic bags, with the low-income retailer experiencing the steepest decline (42%), followed by the high-income retailer (39%).

[5] The number of bags (per BWP 1,000) at the high-income retailer are greater, compared to other retailers, and real purchases per bag are low. The high-income retailer's customers tend to buy fewer luxury goods and only buy relatively small volumes each time. They also tend to do their shopping weekly, in contrast to customers at other retailers who mainly purchase once a month. The real purchases per bag at the upper-middle-income retailer are much higher than for other firms.

Within 18 months, overall plastic bag use fell sharply—by 50%—compared to pre-levy consumption. The high-income retailer experienced the sharpest decline in demand at 64%, followed by the low-income and upper-middle-income retailers with 58% and 56%, respectively. The lower-middle-income retailer experienced the least decline of 26%. During this period, the overall price of plastic bags increased by 31%. The price for the bags at the high-income retailer increased the most, by a staggering 72%, followed by the low-income retailer, with a price increase of 44%. This also explains the significant decline in bag use at these two retailers, relative to the other two.

The consumers with the lowest income level had the highest number of bags per BWP 1,000 of shopping, as compared with the other retailers, but this is likely due to the fact that the value of shopping per bag at the low end of the income spectrum is lower. At the poorest end of the market, fewer items are purchased on an average shopping outing, hence, the higher number of bags per BWP 1,000. In addition to the quality of the bag and larger size, the declining pattern in bag use was mainly due to the increasing price of plastic bags. The declining pattern is evidence of the extent to which charging for bags affected quantities demanded.

6. Conclusion

The plastic bag trends discussed in this paper only illustrate short-term changes in demand for them. Four retailers, each targeting a specific income group (from high-income earners to low-income earners) were selected to assess the impact of the plastic bag policy in Botswana. The plastic bag legislation assessed in this study is similar to that in Ireland and South Africa.

The consumption of plastic bags was relatively stable across the selected retailers until the introduction of the plastic bag legislation in July 2007. The amount of shopping carried per bag rose sharply as the price of bags increased across all retailers. The tax on bags led to a significant decrease in the demand for plastic bags per BWP 1,000 of shopping across all the selected firms. A study by Hasson et al. (2007) had similar findings with regard to short-term changes in demand for plastic bags in South Africa after a positive value was attached to plastic bags. However, subsequent trends indicate that bag consumption has increased again, despite the tax.

Unlike South Africa, plastic bag consumption in Botswana fell sharply and remained significantly low 18 months after charging for them began. It suggests that South Africa's attempt to use taxes to regulate plastic bag consumption failed because the initial price that was

too low. Moreover, to be effective, changes in the price should be large, obvious increases and not small increments. The partial success of the Botswana levy was due to the constant high prices of the plastic bags. Even after the initial significant decline in consumption, prices of bags continued to increase.

Whether the Botswana levy will result in sustained lower consumption, as in Ireland, remains to be seen. However, based on the Irish experience, we predict that as long as the price remains high the levy in Botswana will continue to be effective over time.

Appendix

Table A1. Sensitivity of Bags per BWP 1,000 to Changes in Bag Prices

	High-income retailer		Upper-middle-income retailer		Lower-middle-income retailer		Low-income retailer	
Phase	***% Δ in price (Pula-thebes)***	**ε***	***% Δ in price (Pula-thebes)***	**ε**	***% Δ in price (Pula-thebes)***	**ε**	***% Δ in price (Pula-thebes)***	**ε**
Phase 1	0-18 (100%)	-24.32	0-23 (100%)	0	0-23 (100%)	-4	0-18 (100%)	-27.27
Phase 2	18-32 (78%)	-35.71	23-22 (-4%)	-15.88	23-27 (17%)	-1.14	18-27 (50%)	38.46
Phase 3	32-31 (-3%)	0			27-26 (-4%)	0	27-26 (-4%)	6.36

*

$$\varepsilon = \left(\frac{New\ Price + Old\ Price}{New\ Quantity + Old\ Quantity}\right) \times \left(\frac{New\ Quantity - Old\ Quantity}{New\ Price - Old\ Price}\right)$$

Source: Parkin (2009)

With the exception of the upper-middle-income retailer, the bag consumption levels per BWP 1,000 of shopping decreased with the initial price increments; hence, the price elasticity of demand is negative as expected. Consumption of bags at the upper-middle-income retailer had a price elasticity of one, implying that the introduction of a levy stabilized bag use.

The upper-middle-income retailer is the only one that followed initial charging with a reduction in bag price. Note that this price reduction occurred eight months after charging for bags began. For the other retailers, their second price changes came a year later. With the

exception of the low-income retailer, consumers were sensitive to the subsequent price hikes. Interestingly, consumption of plastic bags at the low-income retailer increased after the second price increase, which was despite a substantial hike of 50%. This inelasticity of the second price increase for the low-income consumers could indicate that these consumers had already made maximum adjustments when charging ensued.

Note also that the second price change was the last by the upper-middle-income retailer. Following the second price increase, there was an overall 4% price reduction in bags by the other three retailers. Interestingly, consumption of plastic bags at the high-income and lower-middle-income retailers remained constant following the third price reduction. This implies that the decrease of 1 thebe may have been too small to warrant a significant response. However, this was not necessarily the case for low-income consumers, as they used more bags despite a marginal 1-thebe decline in the price. Perhaps this is a signal that plastic bags are a necessity for low-income consumers.

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