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Indirect Marginal Tax Reforms in Ireland**

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# Poverty-Reducing Directions of Indirect Marginal Tax Reforms in Ireland

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## Abstract

The composition of tax revenue in Ireland had changed dramatically over the past decade, with indirect taxes accounting for a large share of total tax revenue. This shift towards indirect taxation more than direct taxation tends to put excessive burden on the poor, thereby raising the concern about equity implications of the Irish indirect tax systems. In this paper, we utilize Consumption Dominance curve techniques to analyse the impact of marginal indirect tax changes on poverty in Ireland, using the Irish Household Budget Survey data of 1999 and 2005 periods. Using this technique, which is based on the theory of stochastic dominance, we examined the pairwise comparison of different combinations of commodities for both the overall population and the subgroups of population. The technique helps us to identify the directions of indirect marginal tax changes which will reduce poverty for some selected commodities over a broad class of poverty measures and poverty lines.

**Key Words** : consumption dominance curve, poverty, indirect marginal tax.

**JEL Classification** : D12, D63, H21, I32

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# 1 Introduction

Over the period of mid 1990s to the end of the last century, Ireland has experienced an exceptionally rapid rate of economic growth. However, this growth has been accompanied by increasing relative income poverty (Nolan et al, 2003). Recent OECD studies show that from the mid-1980s to 2000, the relative poverty rate rose from 19.5 percent to 23.3 percent in Ireland (OECD, 2007). Similarly, in 2006, 22.7 percent of the Irish population lived in relative income poverty (CSO, 2007). This corresponds to the highest level of relative poverty in the EU over the same period. The main reason for this high level of relative income poverty in Ireland is attributed to the overall income distribution. However, the structure of the tax and social welfare system has also been identified as a major source of rising relative income poverty (Callan et al 2004). These findings therefore call for a serious consideration of the Irish tax system and its impact on poverty.

The Irish tax system consists of three main components; direct tax, indirect tax and corporation tax. The indirect tax consists of two parts; Value Added Tax (VAT) and excise duty. Table 1 shows the composition of tax revenue in Ireland. The total tax receipt on VAT, excise duty, income tax and corporation tax amount to 24.9 billion euro in year 2000 and this increased to 34.3 billion euro in 2005. Total indirect taxes (VAT and excise duty) in year 2000 were 11.9 billion euro or 43.7 percent of total tax revenue, increasing to 17.5 billion euro or 44.4 percent of all tax revenue in 2005. The table also shows that the composition of tax revenue in Ireland had changed over the period. For instance, the income tax as a proportion of total tax revenue had fallen from 33.6 percent in year 2000 to 28.7 percent in 2005. On the other hand, the proportion of tax intake accruing to indirect tax (VAT and excise) had increased from 43.7 percent to 44.4 percent over the same period. This implies that indirect taxes are now a significant source of revenue for the Irish government, accounting for more than 40 percent of total tax revenue between year 2000 and 2005. Thus, the taxation system in Ireland over this period shows a shift towards indirect taxation more than direct taxation.

Though taxation is one of the policy instruments to redistribute income or wealth in the society, much of the policy discussions on taxation relate only to direct taxes and include removal of low income earners from the tax net. But there is far less discussion on the equity or distributional impacts of Irish indirect taxation. Therefore, the basic motivation of this study is that while there has been work looking at the impact of indirect taxes on distribution, none of them address the indirect tax system and its possible impact on poverty reduction<sup>1</sup>.

Indirect taxes affect the price of goods consumed, and the change in indirect taxes can have a major implication on the consumption pattern of different income groups. Since both the poor and the rich often pay the same VAT on broadly similar consumption items regardless of income, hence the equity implications of indirect tax system becomes a source of concern for the poor. Therefore, the main objective of this paper is to analyze the impact of marginal indirect tax changes on poverty, by identifying the direction of marginal indirect tax changes which will reduce poverty, while the government tax revenue remains unchanged.

A number of studies have been undertaken on the Irish indirect tax system, notably among them are the studies by Madden (1989, 1995 and 1996). He addressed the Irish indirect tax system using the well

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<sup>1</sup>Madden (1989, 1995 and 1996) relates indirect marginal tax to social welfare increase. Barrett and Wall (2006); Leahy et al (2011) quantify how the level of indirect taxes paid by households varies across the income distribution.

known tax reform model of Ahmed and Stern (1984). In this paper however, we follow the approach of Makdissi and Wodon (2002), by using the concept of Consumption Dominance curve. Both the Ahmad and Stern's (1984) and Makdissi and Wodon's (2002) approaches are connected except that the latter is applied to poverty as opposed to welfare as in the case of the former. This study builds upon the previous works by Madden (1989, 1995 and 1996) but differs in a number of aspects. First, this paper relates indirect marginal tax to poverty reduction rather than on social welfare increase as in the case of Madden's. The second contribution of this paper is from a methodological point of view. The stochastic dominance approach utilized in this study is robust over large classes of poverty measures and ranges of possible poverty lines. Furthermore, the stochastic dominance approach yields a set of necessary and sufficient conditions which under reasonable assumptions are easy to interpret and to implement since they relies on dominance (graphical) approach.

The study uses Irish household expenditure data for 1999 and 2005 periods. It utilises Consumption Dominance (CD) Curve technique to first look at overall population consumption dominance curves for selected commodities, and then decompose the overall consumption dominance curves into various population subgroups over the same period. By applying this technique, we find that poverty could be reduced at constant tax revenue by increasing subsidies on good with a larger share of it being consumed by the poor and raising taxes on good with a smaller share being consumed by the poor. These types of recommendations are important for policy formulation for the purpose of reducing poverty. Generally, this approach enables various proposed tax reforms to be analysed under the heading of poverty.

The rest of this paper is organized as follows: section two presents the reviews of related literature on marginal indirect tax changes. Section three discussed the data and methodology of indirect tax changes and relates it to poverty changes. Section four explains the results of the findings while section five presents the summary of major findings and conclusion.

## 2 Related Literature

The theory of marginal tax reform was first proposed by Ahmad and Stern (1984), where they examined indirect tax reform for India based on a specific formulation of the social welfare function. According to Santoro (2007), various studies have thereby examined marginal tax reforms using Ahmad and Stern's (1984) framework (among these are Madden, 1989, 1995 and 1996; and Kaplanagous 2004).

Welfare improving marginal tax reforms have also been examined on the basis of concentration curves. This approach was initially proposed by Yitzhaki and Thirsk (1990), Yitzhaki and Slemrod (1991) and Myashar and Yitzhaki (1996). They identify pairs of commodities with non intersecting concentration curves taking into account the differential in the efficiency cost of raising public funds through the two commodities. They show that if the concentration curve of one commodity is above the concentration curve of another commodity, then the first commodity dominates the second in the sense that a small tax decrease in the first commodity accompanied by a tax increase in the second commodity increases social welfare while keeping revenue unchanged. However, if concentration curves of two commodities intersect, then it is impossible to show welfare dominance. A number of studies have attempted to evaluate the impact of marginal tax reforms on social welfare using the concentration curves, notable among them is Makdissi and Mussard (2008a), in which the robustness of the impact of marginal tax reform was tested over a large set of rank dependant social welfare function.

More recently, Makdissi and Wodon (2002) presents the consumption dominance curve, which can be used to test for the impact of indirect tax reforms on poverty for any order of restricted consumption dominance. The impact of marginal tax reform on poverty was first studied by Besley and Kabur (1988) using the FGT measures of poverty. But Makdissi and Wodon (2002) later used a generalization of the approach of Besley and Kabur (1998) to include a larger class of poverty measures. Makdissi and Wodon's (2002) analysis is also similar to checking non intersecting concentration curves based on the seminal work of Yitzhak and Thirsk (1990) and Yitzhak and Slemrod (1991), but extends the method to include any order of restricted stochastic dominance rather than being limited to the second order of dominance. A number of papers have adopted this approach to analyze the indirect marginal tax reforms, for instance Liberati (2003) and Makdissi and Mussard (2008) extended the concept of Consumption Dominance curves to analyze poverty reducing reforms for subgroups of population. Other studies include Duclos, Makdissi and Wodon (2005a) in which Consumption Dominance curves are used to test for sequential stochastic dominance for heterogeneous households, and those of Duclos, Makdissi and Wodon (2008) who used Consumption Dominance curves to assess the social impact of indirect tax reforms at any order of dominance.

The only analysis of marginal indirect tax reform in Ireland is that of Madden (1989, 1995 and 1996). His approach is similar to the model of Ahmed and Stern. He addressed the tax reform by defining for each good the marginal cost in terms of social welfare of raising an extra unit of revenue from increasing the tax on that good. At the optimum, the marginal costs must be equal for all goods. If the marginal costs are not equal, then social welfare can be increased at constant tax revenue by lowering the taxes on goods with higher marginal cost and raising them on goods with lower marginal cost. On the basis of his ranking of goods by marginal cost, Madden (1995) shows that social welfare increase can be achieved at constant tax revenue by lowering the taxes on fuel and power, tobacco and food and raising the taxes on services, transport and equipment, and durables. He also finds that there was considerable scope for reforms in the indirect tax system in Ireland in the 1980s.

Though the issues of taxation and tax reform are of enormous economic and political significance in Ireland, there is comparatively little work on marginal tax reform. Apart from the work of Madden (1989, 1995 and 1996), other recent studies of Irish indirect tax systems focus only on overall issues of distribution as opposed to identifying specific direction of reforms. For instance, Barrett and Wall (2006); Leahy *et al* (2011) analyse the distributional impact of Ireland's indirect tax system by looking at the level of indirect taxes paid by households and how these vary across the income distribution. They concluded that indirect tax system appears to be regressive because the households in the lowest deciles pay a higher proportion of their incomes in indirect taxes relative to households in the higher deciles. In this study however, we look specifically at marginal tax reform by examining how marginal changes in indirect tax rates could improve the outcomes of the existing tax structure, where outcomes are defined in terms of poverty reduction.

## 3 Research Methodology and Analytical Procedures

### 3.1 Model Specification

#### 3.1.1 Poverty Measures

##### The Foster-Greer-Thorbecke (FGT) index

Poverty is to be measured by using the FGT index, which captures the number of the poor, the depth and severity of poverty. The Foster-Greer-Thorbecke (FGT) index is defined as;

$$P_{\alpha} = \frac{1}{n} \sum_{i=1}^q \left( \frac{z - y_i}{z} \right)^{\alpha}$$

where  $n$  = total number of individuals,  $z$  = poverty line,  $y_i$  = income of the  $i^{th}$  household,  $q$  = the number of persons with income below the poverty line and  $\alpha$  = poverty aversion parameter. The larger value of the parameter indicates that a greater weight is attached to the poverty gap of the poorest unit. Therefore the poverty measures, ( $P_{\alpha}$ ) to be used are estimates of the distance between per capita income and the poverty line. For this class of poverty measure ( $P_{\alpha}$ ), if  $\alpha = 0$ , the FGT index becomes the headcount index (HI), when  $\alpha = 1$ , the FGT index is called the poverty gap index (PGI) and if  $\alpha = 2$ , the index is reduced to the squared poverty gap index (SPGI), (Foster et al, 1984).

#### 3.1.2 Poverty Line

The reference poverty line for this study is based on 60 percent of 1999 median equivalised expenditure. To simplify the interpretation of figures and tables, the total household expenditure was normalized by the poverty line. Therefore, a household with a normalized total expenditure equal to one is at the level of poverty line and a household with normalized total expenditure equal to two is twice the poverty line. A fixed absolute poverty line of 101.74 Euro which corresponds to 60 percent of 1999 median equivalized expenditure was used as the reference poverty line.

### 3.2 Methods of Data Analysis: Poverty and Indirect Taxation

This section describes the methodology utilized in analysing the impact of indirect tax changes on poverty. Following Makdissi and Woodon (2002), this paper uses the concept of Consumption Dominance (CD) curve to test for the impact of marginal indirect tax changes on poverty. By defining poverty as in the FGT measures, we test for the impact of indirect tax changes on poverty for second and third order consumption dominance for nine major commodity groups<sup>2</sup>.

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<sup>2</sup>In choosing nine aggregate commodity groups we are merely following standard practice, but the methodology could be applied to more disaggregated groups of goods or to single goods and we show an application of this later on.

### 3.2.1 Overall Consumption Dominance Curve

Consider that the government wants to reduce the aggregate poverty measures with an indirect tax reform. These types of poverty measures can be expressed as;

$$P = \int_0^a p(y^E(q, y), z) f(y) dy \quad (1)$$

where  $z$  is the poverty line defined in the equivalent income space,  $y^E$  is the equivalent income<sup>3</sup> and  $f(y)$  is the density function of income  $y$  defined over  $[0, a]$ , and  $a$  is the maximum income .

Let  $R$  be the government tax revenue from the indirect tax system through commodity taxes. Assume there are  $K$  commodities and that the producer prices of commodity  $k$  is constant and normalized to 1, such that  $q_k$  , the price of commodity  $k$  equals  $1 + t_k$ . Then the tax revenue  $R$  of the indirect tax system is defined as:

$$R = \sum_{k=1}^K t_k X_k$$

where  $X_k$  is the aggregate consumption of commodity  $k$  and  $t_k$  is the tax rate on commodity  $k$

Denote  $dR$  as the change in revenue due to a marginal change in tax rate of commodity  $k$ . For a pair of commodity  $i$  and  $j$  with  $i \neq j$  then,

$$dR = \left[ X_i + \sum_{k=1}^K t_k \frac{dX_k}{dt_i} \right] dt_i + \left[ X_j + \sum_{k=1}^K t_k \frac{dX_k}{dt_j} \right] dt_j \quad (2)$$

Assume the government's marginal tax reform for marginally subsidizing commodity  $j$  and marginally taxing commodity  $i$ , then the change in poverty for a household with an income  $y$  is;

$$dP = \int_0^a \frac{dP}{dy^E(q, y), z} \left[ \left( \frac{dy^E(q, y)}{dt_i} dt_i + \frac{dy^E(q, y)}{dt_j} dt_j \right) \right] f(y) dy \quad (3)$$

By using Roy's identity and setting the vector of reference prices used for equivalent income to be equal to the vector of prices before the reform, i.e.  $y^E = y$  (see Besley and Kabur, 1988), then the change in the equivalent income induced by a marginal change in the tax rate of commodity  $j$  is;

$$\frac{dy^E}{dt_j} = -x_j(q, y) \quad (4)$$

where  $x_j(q, y)$  is the Marshallian demand for commodity  $j$ .

Therefore,

$$dP = - \int_0^a \frac{dP}{dy^E} [(x_i(y) dt_i + x_j(y) dt_j)] f(y) dy \quad (5)$$

Suppose the government wants to reduce marginally a tax on commodity  $i$  and finance this with a marginal increase in tax on commodity  $j$  such that the total revenue remains unchanged. Revenue

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<sup>3</sup>Equivalent income,  $y^E$  is the level of income which at the reference price vector  $q^R$  would have yielded the same level of utility as income  $y$  under  $q$ . Given that  $V(\cdot)$  is the indirect utility function,  $y^E$  can then be implicitly defined as  $V(q^R, y^E) = V(q, y)$

neutrality requires that;

$$\begin{aligned}
dR &= \left[ X_i + \sum_{k=1}^K t_k \frac{dX_k}{dt_i} \right] dt_i + \left[ X_j + \sum_{k=1}^K t_k \frac{dX_k}{dt_j} \right] dt_j = 0 \\
\frac{dt_i}{dt_j} &= -\frac{X_j}{X_i} \gamma \\
dt_i &= -\gamma \frac{X_j}{X_i} dt_j, \quad \text{where } \gamma = \frac{\left(1 + \frac{1}{X_j}\right) \sum_{k=1}^K t_k \frac{dX_k}{dt_j}}{\left(1 + \frac{1}{X_i}\right) \sum_{k=1}^K t_k \frac{dX_k}{dt_i}} \quad (6)
\end{aligned}$$

$\gamma$  is the efficiency cost of taxing commodity  $i$  relative to that of taxing commodity  $j$  (i.e. the ratio of marginal cost of public funds from taxing commodity  $i$  to subsidize commodity  $j$  (see Wildasin, 1984). Yitzhaki and Thirsk (1990) and Yitzhaki and Slemrod (1991) argue that if  $\gamma$  is greater than one, then it is impossible to have a second order dominant reform due to the efficiency loss incurred by the reform. However, Makdissi and Wodon (2002) noted that it is possible to have a reform that is dominant at all orders of stochastic dominance even when  $\gamma$  is greater than one, as long as the efficiency cost is paid by the non-poor.

When we substitute (4.6) into (4.5), the total change in poverty induced by the tax reform is now given by;

$$dP = -X_j dt_j \int_0^a \frac{dp}{dy^E} \left[ \frac{x_j(y)}{X_j} - \gamma \frac{x_i(y)}{X_i} \right] f(y) dy \quad (7)$$

where  $\frac{x_j(y)}{X_j}$  is the share of consumption of commodity  $j$  of a household with income  $y$  to the total consumption of that commodity.

Since  $dt_j < 0$ , the necessary and sufficient condition for a decrease in poverty is given by;

$$\int_0^a \frac{dp}{dy^E} \left[ \frac{x_j(y)}{X_j} - \gamma \frac{x_i(y)}{X_i} \right] f(y) dy < 0 \quad (8)$$

Makdissi and Wodon (2002) introduce the concept of Consumption Dominance Curve (CD-curve) of order  $s$ , ( $s = 1, 2, \dots$ ), which allows for stochastic dominance test to be conducted on indirect tax reforms.

They define consumption dominance as follows;

$$C_k^s(y) = \begin{cases} \frac{x_k(y)}{X_k} f(y) dy & s = 1 \\ \int_0^y C_k^{s-1}(y) dy & s > 1 \end{cases}$$

For instance, each point on the CD-curve of order 1 for commodity  $i$  is the ratio of consumption of commodity  $i$  for an individual with income  $y$  divided by the aggregate consumption of commodity  $i$ , i.e.  $C_i^1 = \frac{x_i(y)}{X_i}$ . Similarly, the CD curve of order 2 is given by  $C_i^2(y) = \int_0^y C_i^1(y) dy$ . This represents the cumulative share of total consumption of commodity  $i$  consumed by the individual whose income is less than  $y$ .



To test for poverty reduction induced by marginal tax reform for two commodities, the necessary and sufficient condition for (4.8) is defined as;

$$C_j^l(y) - \gamma C_i^l(y) \geq 0 \quad \text{for } y \leq z \quad (9)$$

This condition stipulates that the marginal tax reform will reduce poverty at a given order of dominance if the CD-curve of commodity  $j$  is higher than CD-curve of commodity  $i$  for every income level below the maximum poverty line, given that  $\gamma = 1$ . However, if  $\gamma \neq 1$ , the CD-curve of commodity  $j$  and the CD-curve of commodity  $i$  can be compared provided the CD-curve of commodity  $i$  is multiplied by a constant  $\gamma$ .

For this paper, we assume that poverty is defined as in the FGT measures (Foster et al., 1984)

$$P = \left( \frac{z - y^E}{z} \right)^s, \quad s \geq 0 \quad (10)$$

such that the poverty reducing condition (4.8) is rewritten as;

$$\int_0^a \left( \frac{z - y^E}{z} \right)^{s-1} \left( \frac{x_j(y)}{X_j} - \gamma \frac{x_i(y)}{X_i} \right) f(y) dy > 0 \quad (11)$$

We now consider these two possibilities,  $s = 1$  and  $s = 2$ . If  $s = 1$ , the FGT measure indicates the poverty gap, and we now write (4.8) as;

$$\int_0^a \left( \frac{x_j(y)}{X_j} - \gamma \frac{x_i(y)}{X_i} \right) f(y) dy > 0, \quad \text{alternatively } C_j^2(z) - \gamma C_i^2(z) > 0 \quad (12)$$

If  $s = 2$ , the FGT measure is the weighted poverty gap which implies that poverty would decline for any progressive transfer below the poverty line. Hence, the poverty reducing condition (4.8) is thereby rewritten as;

$$\frac{1}{a} \int_0^a \left[ \int_0^a \left( \frac{x_j(y)}{X_j} - \gamma \frac{x_i(y)}{X_i} \right) f(y) dy \right] dy > 0, \quad \text{or alternatively, } C_j^3(z) - \gamma C_i^3(z) > 0 \quad (13)$$

Makdissi and Wodon (2002) define the condition in (4.12) and (4.13) as second and third-order consumption dominance. Similarly, we can also derive poverty reducing condition for  $s = 4, 5, \dots$ . If the poverty line changes, then poverty reducing condition is obtainable when necessary conditions such as (4.12) and (4.13) are satisfied for different value of  $z$ . This corresponds to checking whether the CD-curve of commodity  $j$  lies above the CD curve of commodity  $i$  multiplied by  $\gamma$ . For the purpose of this study, we assumed that  $\gamma = 1$ <sup>4</sup>. This suggests that there is no efficiency cost of taxing one commodity relative to another.

### 3.2.2 Subgroup Consumption Dominance curve

In this section we derive the consumption dominance conditions for subgroups of population. If we assume  $G$  groups of population such that  $g \in \{1 \dots G\}$ , then the overall poverty index is the sum of poverty within

<sup>4</sup>This assumption is almost certainly untrue, especially given the evidence presented in Madden's work (1989, 1995 and 1996). Since we are only interested in distributional and poverty issues, it seems best to assume  $\gamma = 1$  for the moment. But if we have knowledge of the specific value of  $\gamma$  then it is trivial to amend the poverty dominance rule to take account of this.

each population subgroups. From equation (4.1), the aggregate poverty index of subgroups of population is given by;

$$P = \sum_{g=1}^G \theta_g \int_0^a p_g(y^E(q, y), z_g) f_g(y) dy \quad (14)$$

where  $\theta_g$  is the population share of household of group  $g$ ,  $p_g$  is the poverty index of the  $g^{th}$  group,  $z_g$  is the poverty line for household of group  $g^5$  and  $f_g(y)dy$  is the density function of income  $y$  defined over  $[0, a]$  for household of group  $g$ .

The impact of the tax reform on aggregate poverty, which is the subgroup equivalent of equation (4.7) is given by;

$$dP = -X_j dt_j \int_0^a \frac{dp}{dy^E} \left[ \frac{x_{jg}(y)}{X_j} - \gamma \frac{x_{ig}(y)}{X_i} \right] f_g(y) dy \quad (15)$$

where  $\frac{x_{jg}(y)}{X_j}$  is the share of consumption of commodity  $j$  of a household with income  $y$  belonging to group  $g$  to the total consumption of that commodity.

We now define the subgroup consumption dominance curve as follows;

$$CD_{kg}^s(y) = \begin{cases} \frac{x_{kg}(y)}{X_k} f(y) dy & s = 1 \\ \int_0^y CD_{kg}^{s-1}(y) dy & s > 1 \end{cases}$$

For instance, the subgroup CD-curve of order 1 for commodity  $i$  is the ratio of consumption of commodity  $i$  for a household with income  $y$  belonging to group  $g$  divided by the aggregate consumption of commodity  $i$ , i.e.  $CD_{ig}^1 = \frac{x_{ig}(y)}{X_i}$ .

For  $s = 1$ , we can now write (4.15) as;

$$dP = -X_j dt_j \int_0^a \frac{dp}{dy^E} [CD_{jg}^1(y) - \gamma CD_{ig}^1(y)] f_g(y) dy \quad (16)$$

To test for poverty reduction induced by marginal tax reform for two commodities by household of group  $g$ , the sufficient condition for equation (4.16) is defined as;

$$\sum_{g=1}^G \theta_g [CD_{jg}^s(y) - \gamma CD_{ig}^s(y)] \geq 0, \quad y < z \quad \text{and } g \in \{1, 2, \dots, G\} \quad (17)$$

This condition stipulates that, a revenue-neutral marginal tax reform will reduce poverty if and only if the CD curve of commodity  $j$  of group  $g$  is higher than the CD curve of commodity  $i$  of the same group for every income level below the maximum poverty line, given that  $\gamma = 1$ .

<sup>5</sup>This corresponds to a fixed absolute poverty line based on 60% of 1999 median equivalised household expenditure of group  $g$ .

### 3.3 Data Sources and Description

The main source of data for this study is the Irish Household Budget Survey (HBS) of 1999/2000 and 2004/2005. It is a survey of a representative random sample of Irish households carried out by the Central Statistics Office (CSO). This survey contains detailed information on income, expenditure on food items and non-food items as well as socio-demographic characteristics and labour market activities of 7644 and 6884 households respectively.

The expenditure data in the HBS is the total expenditure by the household excluding repayment of loans and debts other than house purchase mortgages, business expenses, savings and taxes. It also includes the value of income-in-kind received from employers or other sources and the retail value of home-grown food consumed by the household. For this study, the expenditure measure consists of total household expenditure for nine major commodity groups namely: food, alcoholic drink, tobacco, clothing and footwear, fuel and light, household non durable goods, household durable goods, transport and services. We excluded housing expenditure from the total household expenditure because it includes rent and local authority charges as well as house purchase repayment<sup>6</sup>. We also excluded insurance and pension contribution, hire purchase and credit club installment payment under the household expenditure on services and other expenditure<sup>7</sup>. To avoid the problem of missing or extreme value of expenditures, and also to minimize the influence of measurement errors, the expenditure data outside the 3-97 percentile range were excluded from the analysis. Since household tends to vary depending on size and composition, expenditures are thereby deflated by OECD equivalence scale which assigns a value of 1 to the first adult, 0.7 for every additional adult and 0.5 for every child. A child is defined as persons under the age of 14. This implies that total household expenditure is deflated to produce equivalised expenditure. In addition, total household expenditure is reweighed by the number of person in the household. Household expenditure measures are in euro and the nominal values were adjusted for changes in price using the CPI for each commodity at q3 2000 price.

Table 2 presents the summary statistics of equivalised expenditure and poverty lines for the periods of survey. The mean weekly equivalised expenditure on food was 47.75 euro and 55.76 euro in 1999 and 2005 respectively, and this constitutes the largest proportion of total household expenditure. Similarly, expenditures on transport and services were also high in both periods. The mean and median of equivalised household expenditure increased over the period. The table also shows that the household size declined between the two survey periods. Table 3 shows the average weekly share of household expenditure for each commodity. The weekly shares of expenditure on food, alcohol and tobacco were 25.87 percent, 4.89 percent and 2.03 percent respectively in 1999<sup>8</sup>. The shares of expenditure on transport and services were 18.04 percent and 22.41 percent respectively in 1999. Among the nine commodity group considered, the share of expenditure on food was the highest followed by services and transport in both survey periods. The shares of expenditure on food and services decreased slightly from 1999 to 2005, while the share on transport increased between 1999 and 2005. The share of expenditure on alcohol and tobacco also decreased from 6.92 percent in 1999 to 5.12 percent in 2005.

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<sup>6</sup>These are expenditure in form of rent payment, but which later translates into a form of investment or saving especially for owner-occupiers.

<sup>7</sup>These are current expenditure on services which does not relate to current consumption. Once purchased, they provide consumption services for a number of years.

<sup>8</sup>The low value of the weekly share of household expenditure on alcohol and tobacco is due to the fact that expenditure on these commodities are often under-reported. Most households tend to avoid or under-report them in their survey.

Tables 4 and 5 present the average weekly household expenditure by expenditure deciles in 1999 and 2005 survey periods respectively. The households in the bottom 10 percent spend a greater share of their weekly expenditure on food and spend less on other non food items such as household durable and non durable goods and clothing and footwear. On the other hand, the richest households spend a larger share of their total expenditure on non food items such as clothing and footwear, transport and services.

For the households in the bottom 10 percent, shares of expenditure on food was 49 percent, followed by services and transport which were 16 percent and 10 percent respectively in 1999. On the other hand, expenditure on services was found to be highest for households in the top 10 percent, followed by transport and then food. Average shares of expenditure on alcohol, tobacco, clothing and footwear were 4 percent each. Similar trend was observed for the households in the bottom 10 percent in 2005 period, with food taking up 42 percent of their share of weekly expenditure, followed by services and transport. For the households in the top 10 percent, the share of expenditure on transport was 23 percent, followed by services and food.

The average shares of expenditure on food at each decile fell between 1999 and 2005. For the bottom 10 percent, shares of food expenditure fell by 14.3% while for the top 10 percent average shares of expenditure on food fell by 6.3% between 1999 and 2005. This is a reflection of an improvement in the mean income of Irish households between 1999 and 2005. On the other hand, share of expenditure on transport at each decile increased between 1999 and 2005.

The share of expenditure on alcohol at each decile fell between 1999 and 2005, while the share of expenditure on tobacco at each decile remains more or less the same in both periods. In both years, shares of expenditure on necessity goods such as food and fuel & light were very high for poorest households while shares of expenditure on luxury goods such as transport and services were very high among the households in the top ten percent.

With regards to commodity group, there is a large difference in the shares of expenditure on food between the households in the top and bottom deciles. The difference in expenditure shares between the top and bottom 10 percent was 33 percentage points in 1999 and 27 percentage points in 2005. From the tables, it is obvious that a sizeable portion of the difference in expenditure shares between the top and the bottom decile is accounted for by share of expenditure on food.

In the case of services, share of expenditure increases from the bottom to the top deciles (ninth decile) in 1999/2000 while the share decreases across the deciles from the bottom to the top in 2004/2005 period. Though, there is a difference between the bottom and top decile, the pattern of expenditure share is not uniform across the decile. For 1999/2000 period, the seventh, eighth and ninth deciles have higher expenditure shares than the tenth, while for 2004/2005 period, the sixth and seventh deciles have higher shares than the eighth, ninth and tenth.

## 4 Results

### 4.1 Overall Consumption Dominance Curves

Figure 1(a) presents the consumption dominance curves of order 2, which corresponds to poverty gap (FGT(1)) index, for three broad classes of commodities (Food, Fuel & Light and Transport) for 1999/2000

survey period<sup>9,10</sup>. Given that consumption dominance curve measures the cumulative share of total consumption of each commodity by the individual whose income is less than  $y$ , it is observed that the CD curve of fuel & light lies above that of food and transport up to the maximum poverty line<sup>11</sup>. This implies that the share of consumption of fuel & light by the poor over total consumption of fuel & light is higher than the corresponding share for food and transport. This means that given revenue neutrality, the good to be subsidised is identified by a larger fraction of consumption by the poor. The figure also shows that the CD curve of food and transport crosses at various level of poverty line up to the maximum poverty line which is 2.5 times the reference poverty line. This implies that there is no complete dominance between these two commodities at second order.

Figure 1(b) shows the CD curves of order three, which corresponds to the poverty index of FGT(2), for 1999/2000 period. The CD curve of fuel and light lies above the CD curves of all other commodities up to the maximum poverty line. This implies that by subsidizing fuel and light and increasing taxation on food and transport is third order poverty reducing.

Figure 1(c) shows the consumption dominance curves of order 2 for 2004/2005 survey period. It is observed that the CD curve of fuel & light dominates up to the maximum poverty line. The figure also shows that the CD curves of food and transport cross at various levels of poverty line. Therefore, there is no complete dominance at second order between the two commodities.

Figure 1(d) shows that the CD curve of fuel & light dominates that of other commodities up to the maximum poverty line. Hence, by reducing taxation on fuel and light and increasing taxation on food and transport is third order poverty reducing.

Next, we present the differences in consumption dominance curves. Recalling that difference in consumption dominance curve measures the difference between the CD curve of one commodity ( $j$ ) minus  $\gamma$  times the CD curve of another commodity ( $i$ ) for every income level below the reference poverty line. If  $\gamma = 1$ , marginal tax reform will reduce poverty whenever one CD curve lies wholly above another throughout the range of poverty lines considered. If on the other hand, two CD curves intersect, then it is impossible to show dominance. In other words, it is only when CD curves do not intersect that marginal tax reform will reduce poverty. Tables 6 and 7 show the consumption dominance curve grids for the overall population, which summarize the outcomes of dominance for each pair-wise commodity combinations. For illustrative purposes, three pair-wise commodity combinations were selected, these are: Alcohol and Tobacco; Household Non Durable Goods and Clothing & Footwear and Services and Clothing & Footwear. Figure 2 shows the difference in consumption dominance curve of order two between alcohol and tobacco. The curve crosses the horizontal axis several times below the maximum poverty line, which is 2.5 times the reference poverty line. This implies that neither alcohol nor tobacco dominates one another in 1999/2000 survey period.

Figure 2(a) shows that the curve of the difference between consumption dominance curve of household non durable goods and clothing and footwear crosses the horizontal axis below the maximum poverty line, and hence neither household non durable goods nor clothing and footwear dominate each other.

<sup>9</sup>The three commodities were selected for purpose of clear graphical representation. The CD curve of all commodities are presented in the appendix figure C1.

<sup>10</sup>Note that because the expenditure data outside the 3–97 percentile range were excluded from the analysis, we do not show estimate for values of  $z$  below 0.5.

<sup>11</sup>Reference poverty line that is considered is 101.74 Euro, which corresponds to 60 percent of 1999 median equivalised expenditure and the maximum poverty line is 2.5 times the reference poverty line.

Figure 2(b) shows that the curve of the difference between consumption dominance curve of services and clothing and footwear lies above the horizontal axis over the range of maximum poverty line considered, and hence services completely dominate clothing and footwear. Therefore, a marginal increase in the tax on clothing and footwear that finances a marginal increase in the subsidy on services will be second order poverty reducing in 1999/2000 survey period.

Figure 3 shows the difference in consumption dominance curve of order two between alcohol and tobacco in 2004/2005 survey period. The curve crosses the horizontal axis at several points below the maximum poverty line. Hence, there is no dominance between alcohol and tobacco. Similarly, Figure 3(a) shows the difference in consumption dominance curves of order 2 between household non durable goods and clothing and footwear. The two curves intersect the horizontal axis below the maximum poverty line. This means that neither commodity dominates the other. On the other hand, figure 3(b) shows that the curve of the difference in consumption dominance curve of order 2 between services and clothing & footwear lies above the horizontal axis. This implies that services completely dominates clothing and footwear. By increasing subsidies on services and at the same time reducing subsidies on clothing and footwear will reduce the poverty gap (second order poverty) in 2004/2005 period.

## 4.2 Sub-group Consumption Dominance Curves

In this section we decompose the overall consumption dominance curve for each survey period into various population subgroups over the same period. The main reason for this procedure arises from the fact that the overall consumption dominance curves may not provide detailed information about the impact of marginal indirect tax changes on population subgroup. For the purpose of this study, we considered four different population subgroups, these are; single adult households, single adult with children households, multiple adult households and multiple adult with children households.

Table 8 presents the summary statistics of expenditure for the four different population subgroups in both survey periods. The mean and median equivalised expenditure for each subgroup rose between 1999 and 2005. The table also shows a clear trend towards smaller sized households for both single adult with children households and multiple adult with children households. The fractions of individuals living in multiple adult households increased between the two survey periods.

We now examine the difference in sub-group consumption dominance curves of some selected commodities for 1999/2000 and 2004/2005 periods. These are then compared to the difference in the consumption dominance curves of the same commodities for the overall population in the same periods. As in previous section, we selected three pair-wise commodity combinations for each subgroup, these are; Alcohol and Tobacco; Household Non Durable Goods and Clothing and Footwear and Services and Clothing and Footwear.

Figure 4(a) shows the difference in consumption dominance curve of order two for single adult households in 1999/2000 survey period. The figure shows that the curve of the difference between consumption dominance curves of alcohol and tobacco crosses the horizontal axis below the maximum poverty line. Hence, neither commodity dominates the other. The same pattern is observed in the difference between consumption dominance curves of household non durable goods and clothing & footwear and that of services and clothing & footwear. Figure 4 (b) shows the same pattern for single adult with children households in 1999/2000 period.

For multiple adult households, figure 4(c) shows that all the curves cross the horizontal axis below the reference poverty line and therefore there was violation of dominance, while figure 4 (d) shows that for multiple adult with children households, only the difference in consumption dominance curves of household non durable goods and clothing & footwear was poverty reducing. For alcohol and tobacco and services and clothing & footwear, there was violation of dominance.

Figures 5 (a) and 5 (b) show the differences in the subgroup consumption dominance curves of order two for single adult households and single adult with children households respectively in 2004/2005 survey period. Figure 5 (a) shows that all the curves cross the horizontal axis below the reference poverty line and therefore dominance are not observed. On the other hand, figure 5 (b) shows that the difference in consumption dominance curve between alcohol and tobacco was poverty reducing over the whole range of poverty line. This implies that by increasing subsidies on alcohol and taxing tobacco will reduce the poverty gap of single adult with children households in 2004/2005 period. However, there are violation of dominance between consumption dominance curves of household non durable goods and clothing & footwear as well as between that of services and clothing & footwear.

Figure 5 (c) shows that only the difference between the consumption dominance curve of services and clothing and footwear was poverty reducing for multiple adult households in 2004/2005 period. In contrast, there was no dominance between alcohol and tobacco as well as between household non durable goods and clothing & footwear. Figure 5 (d) shows the same pattern for multiple adult with children households in 2004/2005.

Tables 9 and 10 show the outcomes of consumption dominance curve of the selected commodity combinations for the overall population, each population subgroup and each reform for 1999/2000 and 2004/2005 survey periods. By rows, the tables show the outcome of each reform across the overall population and population subgroups. By columns, the table gives the outcome of each group across reforms.

The consumption dominance curve grid provides useful information given the fact that by looking at the columns of the grid it is possible to identify all reforms which are poverty reducing for a particular demographic group. Generally, by looking down the columns or across the rows of the grid give different perspective on poverty.

For 1999/2000 survey period, by rows, it is observed that there was no dominance in the difference in consumption dominance curve of alcohol and tobacco for the overall population as well as population subgroups, while household non durable goods and clothing & footwear combination was poverty reducing only for multiple adult with children households.

The consumption dominance curve of services and clothing & footwear is poverty reducing for the overall population, but violation of dominance occurs for the population subgroups. This particular outcome satisfies the condition that the overall dominance for a reform is the sum of dominance within each population subgroup. For most of population subgroups, violation of dominance occurs below the reference poverty line, but above the reference poverty line the outcome is poverty reducing for single adult and single adult with children households. This implies that getting dominance for population subgroup is a sufficient but not a necessary condition for the overall dominance.

By columns, it can be seen that for the overall population only the difference in consumption dominance curve of services and clothing & footwear is poverty reducing. For single adult households, single adult with children households and multiple adult households, there are violation of dominance. For multiple

adult with children households, only the household non durable goods and clothing & footwear is poverty reducing, for others dominance are not observed.

For the 2004/2005 survey, by rows, it can be seen that alcohol and tobacco reform is poverty reducing for only the single adult with children households, while there is no dominance between household non durable goods and clothing & footwear reform for the overall population as well as population subgroups. The difference in consumption dominance curve of services and clothing & footwear is poverty reducing for the overall population, multiple adult and multiple adult with children households.

By columns, it is observed that for the overall population, multiple adult and multiple adult with children households, the difference in consumption dominance curve of services and clothing & footwear is poverty reducing. For single adult households, there is violation of dominance while for single adult with children households, only the alcohol and tobacco combination is poverty reducing.

## **5 Summary and Conclusion**

### **5.1 Summary of Major Findings**

This study adopted the Consumption Dominance curve technique of Makdissi and Wodon (2002) to analyze the impact of marginal indirect tax changes on poverty in Ireland between 1999 and 2005 survey periods. The technique can be used to test for the impact of an indirect tax change on poverty for large classes of poverty indices and for ranges of possible poverty lines. In particular, we analyzed the direction of marginal tax changes which will reduce poverty for some selected commodities when there is an increase in tax on one commodity and decrease in tax on another commodity while the government tax revenue remained unchanged. We specifically examined the impact on both the overall population as well as on the subgroups of the population. For our analysis, the expenditure measure consists of total household expenditure for nine commodity groups namely; food, alcohol, tobacco, clothing and footwear, fuel & light, household non durable goods, household durable goods, transport and services. We find that poverty could be reduced at constant tax revenue by lowering tax on goods with a larger share of it being consumed by the poor and raising tax on good with a smaller share being consumed by the poor. We also examined the pairwise comparison of different combination of commodities and checked whether the direction of reform is poverty reducing. For services and clothing and footwear combination, we find that services completely dominate clothing and footwear, and so by subsidizing services and taxing clothing and footwear at the same time is poverty reducing in both 1999/2000 and 2004/2005 survey periods. With regards to subgroup consumption dominance curves, our analysis of poverty reducing reforms show that reform could be poverty increasing for different population subgroups even when the direction of reform is poverty reducing for the overall population.

### **5.2 Conclusion**

We have shown in this paper how consumption dominance curves can be used to identify the direction of marginal tax changes which will reduce poverty for all poverty measures and possible range of poverty lines. The basic motivation for this analysis was based on the fact that there is no study undertaken in recent times to address the impact of indirect tax system on poverty. Furthermore, previous studies



of Irish indirect tax system focus mainly on distribution rather than on possible tax reform. Our main objective is to identify the direction of marginal indirect tax changes which will reduce poverty while the government tax revenue remains unchanged, by using Consumption Dominance curve techniques. From our analysis, we find that poverty could be reduced at constant tax revenue by increasing subsidies on good with a larger share being consumed by the poor and raising taxes on good with a smaller share being consumed by the non-poor. For population subgroups, the findings of this chapter is useful as it enables the decision-maker to formulate specific poverty reducing strategies for groups of population which is totally different from that of the overall population.

This approach relies on stochastic dominance approach which is easy to interpret, however, we could not identify the actual poverty decreasing tax reform. This was due to the fact that we were unable to obtain data on prices of different commodities as they were omitted from the Household Budget Survey (HBS). As a result of missing price information, we could not estimate and use own and cross-price elasticities of demand to assess the marginal efficiency cost of fund. Generally, price elasticity estimates for various commodities are essential in order to identify the actual poverty decreasing marginal tax reform for practical policy formulation. To determine the marginal efficiency cost of fund using the HBS data, a more sophisticated application of this methodology would be required. This is left for future work.

The Consumption Dominance (CD) curve technique proposed in this chapter can be subjected to further research. One possibility is for testing whether indirect tax reforms are pro-poor. This implies that the benefits of the tax reform must favour the poor more and its costs must hurt the poor less (Duclos, Makdissi and Arrar, 2010). In this case, the concept is not to determine if a tax reform reduces or increases poverty but whether it can be deemed pro-poor. Therefore, to achieve the pro-poor tax reform will depend on the combination of price and income elasticities of various goods, which will ensure that a balance between efficiency and redistribution is maintained.

Another possibility for future research is in the application of "fat tax" in an attempt to reduce the alarming increase in obesity and related heart diseases. The general consensus is that if a "fat tax" is implemented, it will affect the poor in an unfair manner since any tax on food will be regressive by costing the poor relatively more than the rich. However, by implementing this technique could enable the policy makers to identify any "fat tax" reforms that will be deemed favourable to the poor while at the same time can be justified with the health concern in mind. This would be similar to the current taxation on alcohol and tobacco which can be justified on the account of health and environmental reasons.

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## Appendix

### Commodity group and VAT rates

Most goods or services supplied in Ireland fall into four VAT categories. The standard VAT rate is 21 percent and the reduced rate is 13.5 percent. Goods and services which are liable to 21 percent VAT rate include alcohol, tobacco and furniture. The reduced rate of 13.5 percent applies to commodities such as electricity, heating gas, newspapers, building services, repair, cleaning and maintenance services and provision of commercial sporting facilities. There is also a VAT rate of zero percent on some goods and services. Examples include food and drink, oral medicine and children's footwear and clothing. In addition, there are a number of goods and services which are exempted from tax. These include financial, medical and educational activities<sup>12</sup>. In this section, various commodities were selected based on four VAT categories. These include food and drinks which are liable to zero VAT rate. Alcohol, tobacco, petrol, telephone and furniture fall under standard VAT rate while electricity falls under reduced rate. Public transport and education are exempted from VAT.

Table 11 presents the average weekly expenditure share of different commodity. The weekly shares of expenditure on tobacco, electricity and petrol were 4.52 percent, 5.92 percent and 9.73 percent respectively in 1999. The average weekly share of expenditure on furniture was less than one percent while shares of education and public transport were 1.99 percent and 2.33 percent respectively in 1999. The shares of expenditure on electricity, furniture, petrol, telephone, education and public transport increased from 1999 to 2005 while expenditure share of food, alcohol and tobacco fell between 1999 and 2005.

### Poverty-reducing reforms

We now analyze the impact of tax changes on poverty reduction by examining the differences in consumption dominance curves of various commodities. To accomplish this, three regularly consumed non-food items were selected from the commodity group in Table 11, these are; tobacco, electricity and petrol. As shown in Tables 4 and 5, tobacco is a major commodity consumed mostly by the poor and is liable to standard VAT rate of 21 percent. On the other hand, electricity (fuel & light) is also more consumed by the lower deciles and with reduced VAT rate of 13.5 percent, while petrol (transport) is consumed more by the upper deciles and is liable to 21 percent VAT rate.

Based on this information, three pair-wise commodity combinations were selected: Tobacco-Petrol; Electricity-Tobacco and Electricity-Petrol. The pair-wise comparison will enable us to check whether the VAT rate on selected commodities is justified or not in terms of poverty reduction.

Figures C2 and C3 show the difference in consumption dominance curves of order two between tobacco and petrol in 1999/2000 and 2004/2005 survey period. The curves lie above the horizontal axis from the reference poverty line up to the maximum poverty line. Hence, tobacco completely dominates petrol over a wider range of poverty lines. These figures show that the increase in tax on tobacco with an increase in tax on petrol is not a poverty improving reform in both periods. These results thereby suggest that there should be a decrease in tax on tobacco and an increase in tax on petrol in order to achieve poverty

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<sup>12</sup>For further detail regarding VAT rate on over 2500 goods and services, see [www.revenue.ie](http://www.revenue.ie)

reduction<sup>13,14</sup>. However, this result would not hold at marginally lower poverty lines below the reference poverty line.

Figures C2(a) and C3(a) show that the curves of the difference between consumption dominance curve of electricity and tobacco cross the horizontal axis several times below the maximum poverty line. Therefore, neither electricity nor tobacco dominates one another in both 1999/2000 and 2004/2005 survey periods. These results indicate that the current reduced VAT rate on electricity and the standard rate on tobacco is desirable and should be maintained, since the direction of reform is poverty reducing.

Figures C2(b) and C3(b) present the result of the difference in consumption dominance curve between electricity for which VAT rate is 13.5 percent and petrol which is liable to standard rate of 21 percent. The curves lie above the horizontal axis from the reference poverty line. Hence, electricity completely dominates petrol. These figures show that the direction of reform is poverty improving over a wider range of poverty lines. This implies that the current VAT rate on both commodities is desirable to achieve poverty reduction for this kind of reform. This result however would not hold for poverty lines below the reference poverty line.

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<sup>13</sup>Madden (1995) reaches similar conclusion for tobacco while ranking commodities by marginal cost in term of social welfare increase.

<sup>14</sup>The current standard VAT rate on tobacco and petrol can be justified on the account of health reasons and environmental considerations.

Table 1: Composition of Tax Revenue in Ireland

<b>Taxes</b>	<b>Euro Million</b>						
	1999	2000	2001	2002	2003	2004	2005
Value Added Tax	6216	7467	7907	8844	9716	10717	12125
Income Tax	8007	9125	9319	8979	9156	10695	11339
Corporation Tax	3442	3885	4144	4804	5155	5335	5503
Excise	4016	4424	4213	4595	4736	5066	5391
Stamp Duties	913	1090	1223	1139	1664	2070	2673
Capital Gains Tax	452	774	876	619	1436	1528	1982
Capital Acquisition Tax	192	223	168	151	214	190	249
Customs	183	207	165	134	137	174	226
<b>Total</b>	<b>23421</b>	<b>27195</b>	<b>28015</b>	<b>29265</b>	<b>32214</b>	<b>35775</b>	<b>39490</b>

Source: [www.revenue.ie](http://www.revenue.ie)

Table 2: Summary Statistics: Expenditure and poverty line

	1999	2005
Food expenditure	47.75	55.76
Alcohol expenditure	9.02	8.61
Tobacco expenditure	3.74	3.12
Clothing & footwear expenditure	17.88	25.76
Fuel & light expenditure	10.24	12.27
Household non durable expenditure	6.16	7.84
Household durable expenditure	15.15	21.22
Transport expenditure	33.31	43.05
Services expenditure	41.36	51.24
Mean equivalised expenditure	184.60	228.86
Median equivalised expenditure	169.56	212.87
Household size	3.84	3.64
Number of households	7644	6844

*Note:* Monetary values are in euro and weekly averages.

*Source:* Author's calculation from HBS of 1999 and 2005.

Table 3: Average weekly share of household expenditure

Commodity Group	1999	2005
Food	25.87	24.36
Alcohol	4.89	3.76
Tobacco	2.03	1.36
Clothing & footwear	9.69	11.26
Fuel & light	5.55	5.36
Household non durable goods	3.34	3.43
Household durable goods	8.21	9.27
Transport	18.04	18.81
Services	22.41	22.39

*Source:* Author's calculation from HBS of 1999 and 2005.

Table 4: Average weekly household expenditure share by expenditure deciles, 1999/2000

Commodity Group	Expenditure Deciles										All
	1	2	3	4	5	6	7	8	9	10	
Food	0.49	0.40	0.35	0.32	0.29	0.26	0.24	0.21	0.19	0.16	<b>0.29</b>
Alcohol	0.04	0.05	0.06	0.06	0.06	0.07	0.07	0.07	0.08	0.08	<b>0.06</b>
Tobacco	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.03	0.03	0.02	<b>0.04</b>
Clothing & footwear	0.04	0.07	0.08	0.09	0.10	0.11	0.11	0.12	0.13	0.14	<b>0.10</b>
Fuel & light	0.06	0.06	0.05	0.05	0.05	0.05	0.04	0.04	0.04	0.03	<b>0.05</b>
Household non durable goods	0.03	0.03	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.03	<b>0.03</b>
Household durable goods	0.05	0.06	0.06	0.07	0.07	0.08	0.08	0.08	0.09	0.10	<b>0.07</b>
Transport	0.10	0.13	0.14	0.15	0.15	0.16	0.16	0.18	0.20	0.21	<b>0.16</b>
Services	0.16	0.17	0.18	0.20	0.21	0.21	0.22	0.22	0.22	0.21	<b>0.20</b>

Source: Author's calculation from HBS of 1999/2000.

Table 5: Average weekly household expenditure share by expenditure deciles, 2004/2005

Commodity Group	Expenditure Deciles										All
	1	2	3	4	5	6	7	8	9	10	
Food	0.42	0.35	0.32	0.29	0.26	0.25	0.22	0.20	0.18	0.15	<b>0.26</b>
Alcohol	0.03	0.04	0.04	0.05	0.05	0.05	0.06	0.06	0.06	0.06	<b>0.05</b>
Tobacco	0.04	0.04	0.04	0.04	0.04	0.03	0.03	0.02	0.02	0.01	<b>0.03</b>
Clothing & footwear	0.03	0.06	0.08	0.10	0.11	0.12	0.13	0.14	0.15	0.16	<b>0.11</b>
Fuel & light	0.07	0.06	0.05	0.05	0.05	0.05	0.04	0.04	0.04	0.03	<b>0.05</b>
Household non durable goods	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	<b>0.03</b>
Household durable goods	0.07	0.07	0.07	0.08	0.08	0.08	0.08	0.09	0.09	0.10	<b>0.08</b>
Transport	0.12	0.15	0.15	0.16	0.16	0.17	0.19	0.20	0.21	0.23	<b>0.17</b>
Services	0.22	0.22	0.22	0.21	0.22	0.21	0.21	0.20	0.20	0.20	<b>0.21</b>

Source: Author's calculation from HBS of 2004/2005.



Table 6: Consumption Dominance Curve Grid: 1999/2000

Commodity Group	F	A	Tob	C&F	F&L	HNDGs	HDGs	T	S
Food	-	No	No	No	No	No	No	No	No
Alcohol	No	-	No	No	No	No	No	No	No
Tobacco	No	No	-	No	No	No	No	No	No
Clothing & footwear	No	No	No	-	No	No	No	No	No
Fuel & light	Yes	No	No	No	-	No	No	No	No
Household non durable goods	No	No	No	No	No	-	No	No	No
Household durable goods	No	No	No	Yes	No	No	-	No	No
Transport	No	No	No	No	No	No	No	-	No
Services	No	Yes	No	Yes	No	No	No	No	-

*Source:* Author's calculation.

Table 7: Consumption Dominance Curve Grid: 2004/2005

Commodity Group	F	A	Tob	C&F	F&L	HNDGs	HDGs	T	S
Food	-	No	No	No	No	No	No	No	No
Alcohol	No	-	No	Yes	No	No	No	No	No
Tobacco	No	No	-	No	No	No	No	No	No
Clothing & footwear	No	No	No	-	No	No	No	No	No
Fuel & light	Yes	No	No	No	-	No	No	No	No
Household non durable goods	No	No	No	No	No	-	No	No	No
Household durable goods	No	No	No	Yes	No	No	-	No	No
Transport	No	No	No	No	No	No	No	-	No
Services	No	No	No	Yes	No	No	No	Yes	-

*Source:* Author's calculation.

Table 8: Population Subgroups: Summary Statistics of Expenditure

Population Subgroups	Mean equivalised expenditure		Median equivalised expenditure		Household size	
	1999	2005	1999	2005	1999	2005
Single Adult	151.60	190.55	127.30	163.35	1.00	1.00
Single Adult with Children	134.45	166.79	113.72	150.31	3.41	3.23
Multiple Adult	212.59	257.07	197.70	242.21	2.37	2.41
Multiple Adult with Children	194.04	245.90	183.22	234.75	3.81	3.64

Source: Author's calculation

Table 9: Consumption Dominance Curve Grid Outcomes; 1999/2000

Reforms	Overall Population	Single Adult	Single Adult with Children	Multiple Adult	Multiple Adult with Children
ALC - TOB	No	No	No	No	No
HNDG - C & F	No	No	No	No	Yes
SERV - C & F	Yes	No	No	No	No

Source: Author's calculation

Table 10: Consumption Dominance Curve Grid Outcomes; 2004/2005

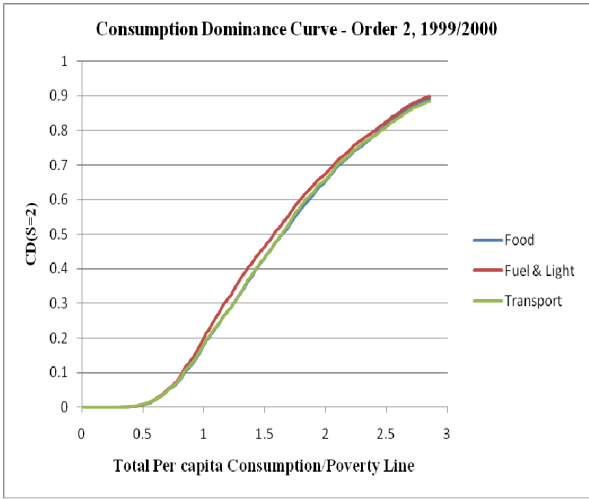
Reforms	Overall Population	Single Adult	Single Adult with Children	Multiple Adult	Multiple Adult with Children
ALC - TOB	No	No	Yes	No	No
HNDG - C & F	No	No	No	No	No
SERV - C & F	Yes	No	No	Yes	Yes

Source: Author's calculation

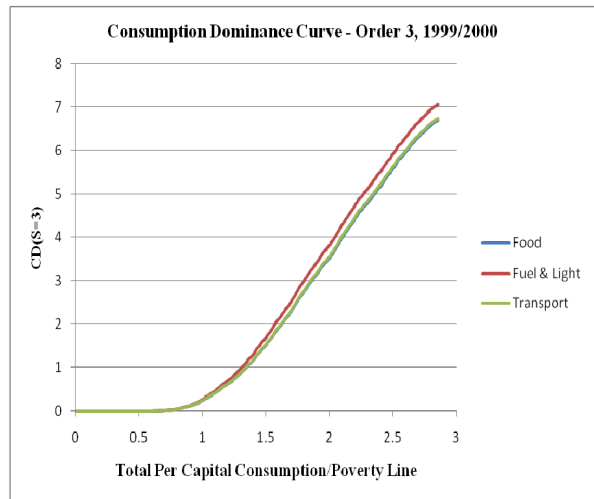
Table 11: Average weekly share of household expenditure

Commodity Group	1999	2005
Food	57.72	51.95
Alcohol	10.60	7.96
Tobacco	4.52	2.83
Electricity	5.92	8.68
Furniture	0.69	1.06
Petrol	9.73	11.28
Telephone	6.57	10.19
Education	1.99	3.77
Public Transport	2.23	4.42

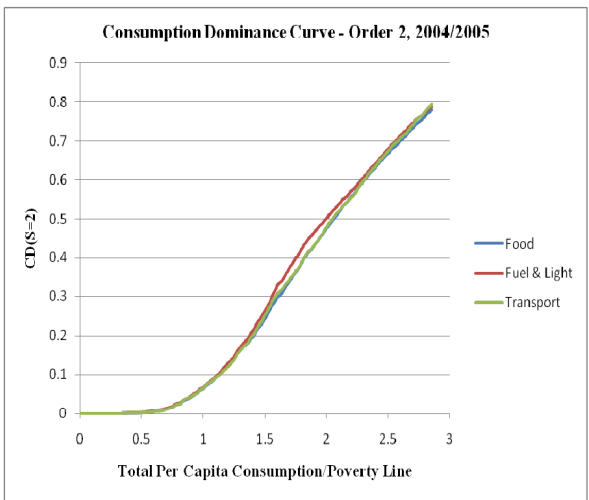
Source: Author's calculation from HBS of 1999 and 2005.



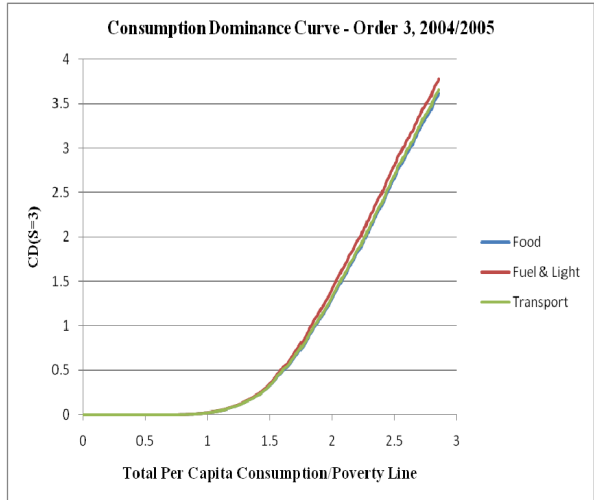
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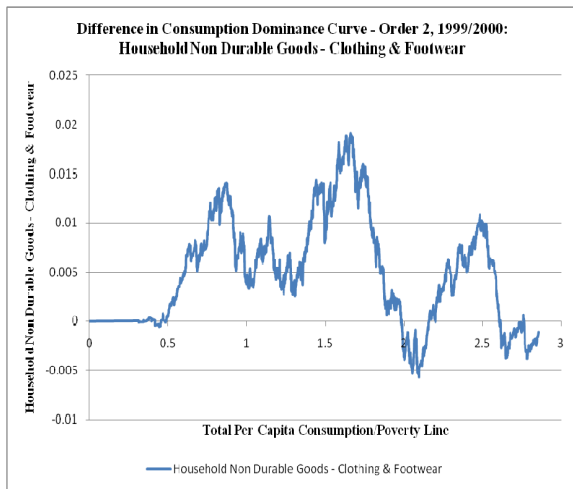
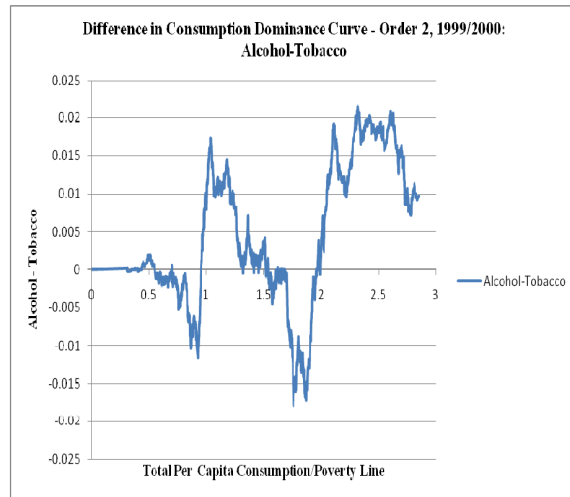


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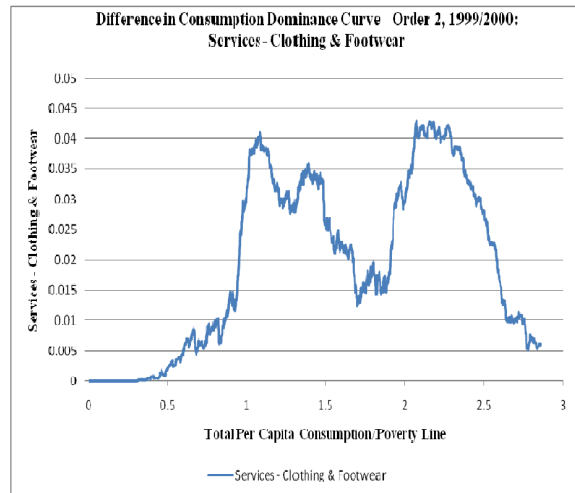


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Figure 1: Consumption Dominance Curves; Overall Population

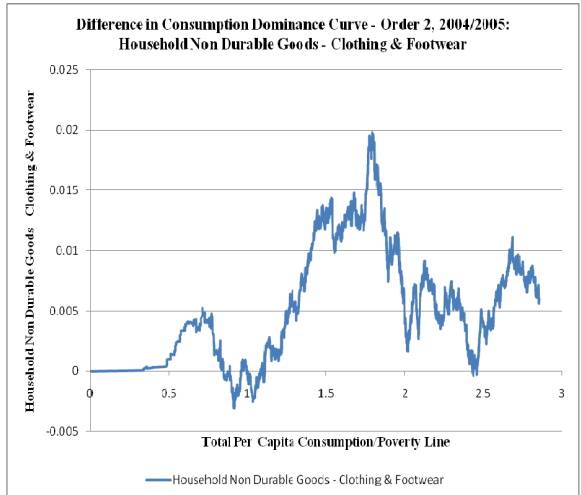
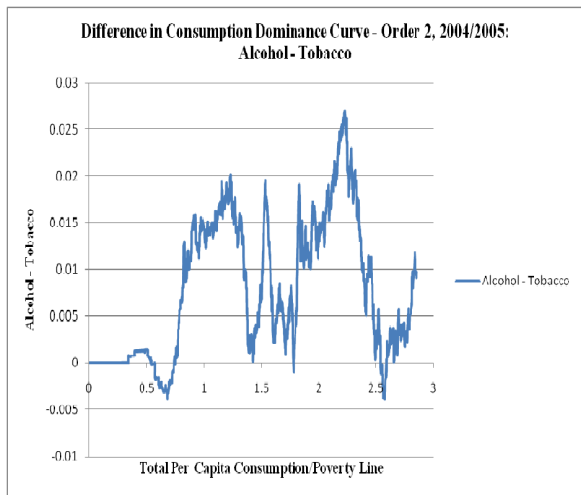


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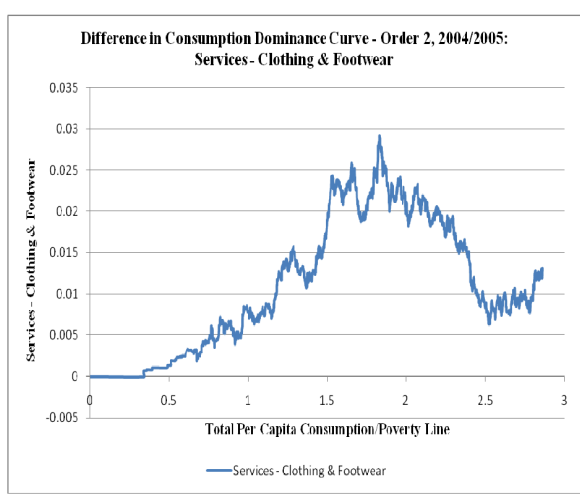


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Figure 2: Poverty Reducing Direction of Reform; Overall Population, 1999/2000

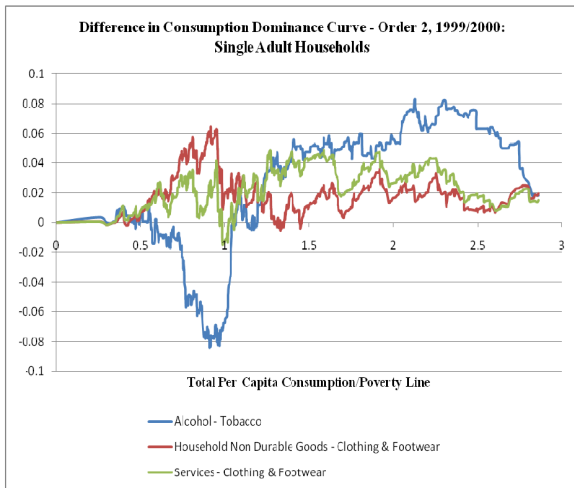


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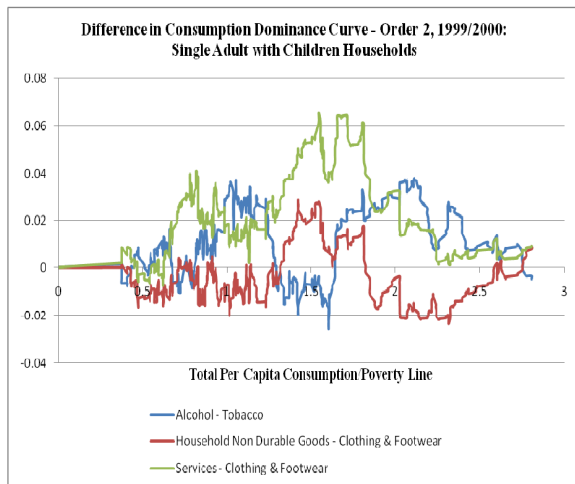


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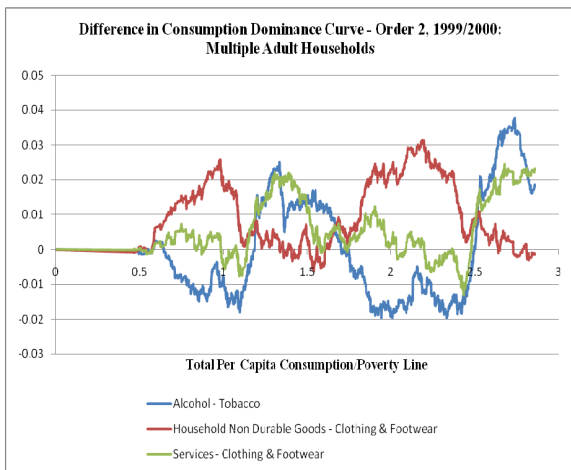
Figure 3: Poverty Reducing Directions of Reform; Overall Population, 2004/2005



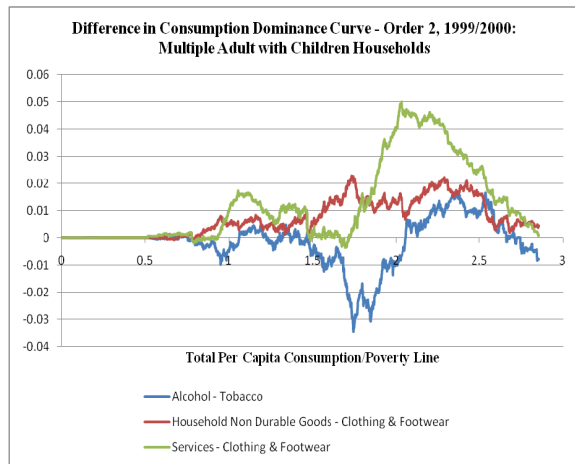
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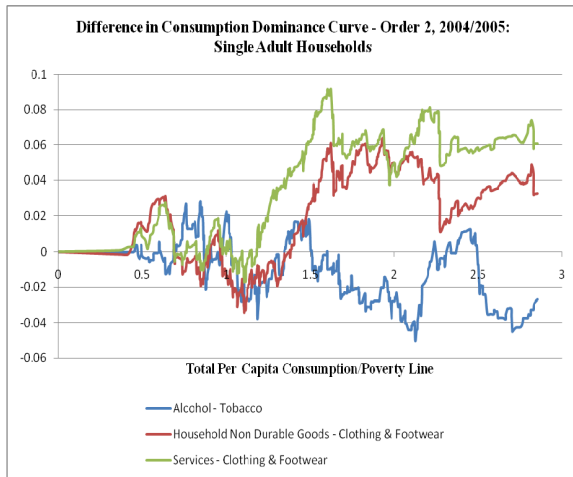


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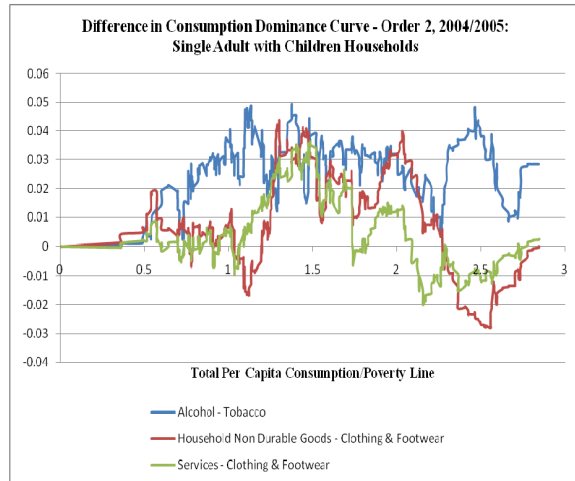


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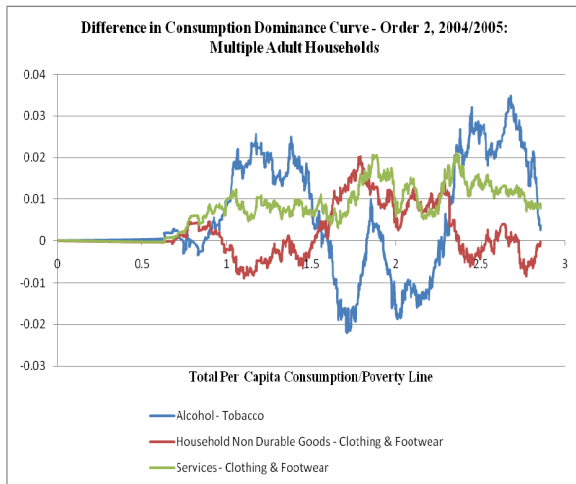
Figure 4: Poverty Reducing Directions of Reform; Population subgroups, 1999/2000



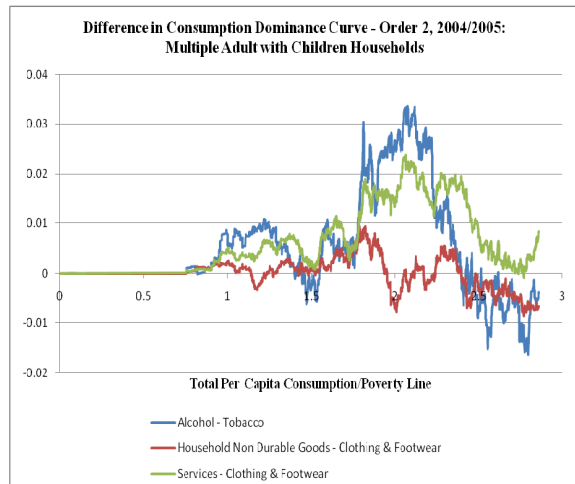
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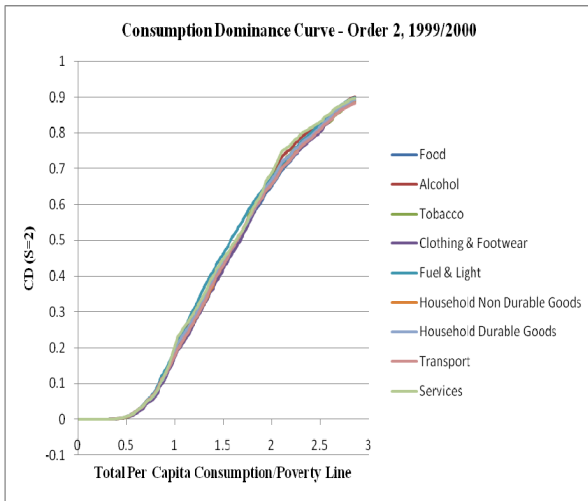


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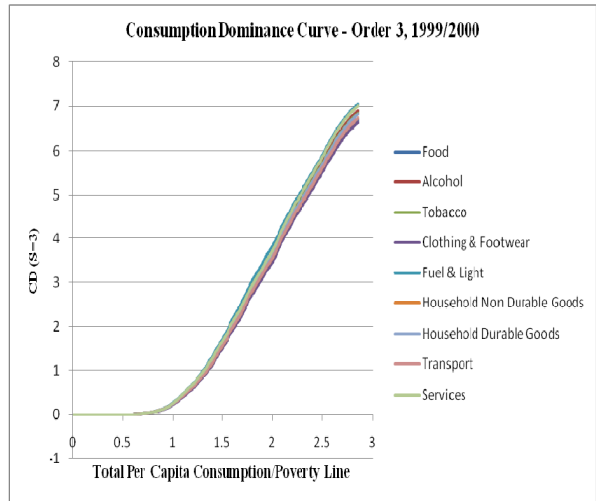


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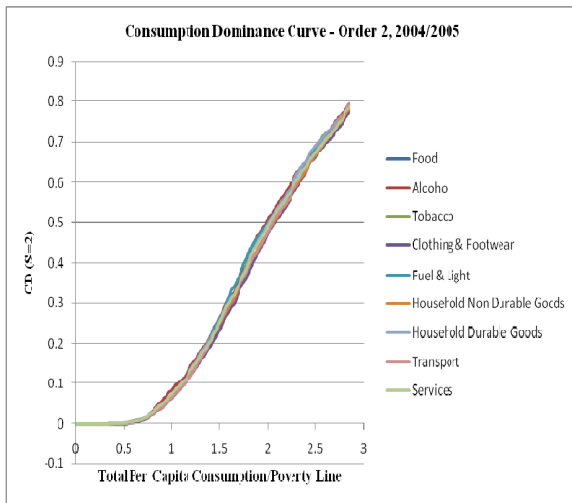
Figure 5: Poverty Reducing Directions of Reform; Population Subgroups, 2004/2005



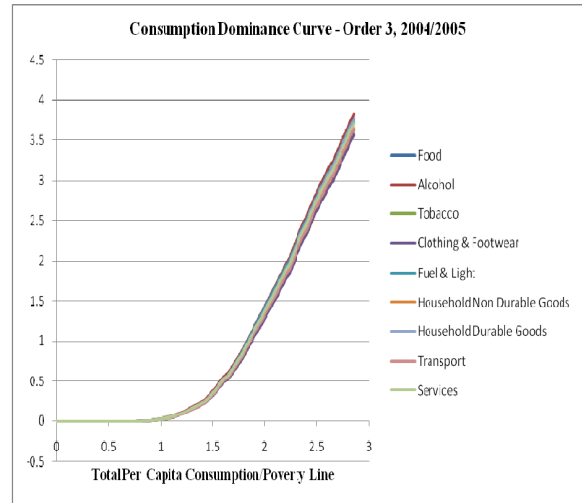
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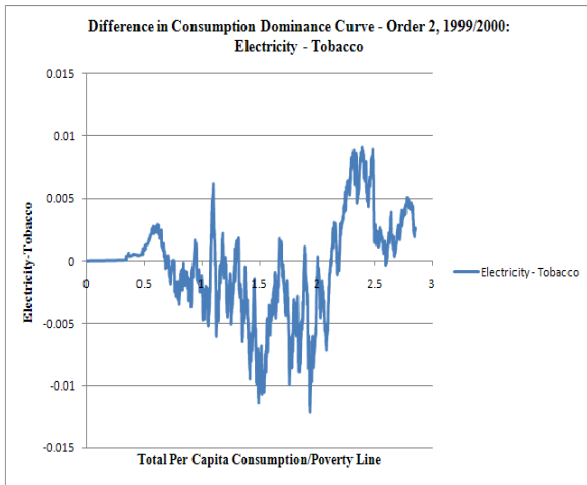
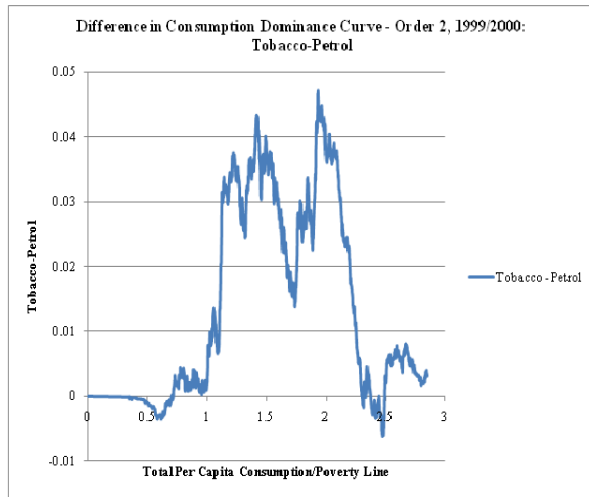
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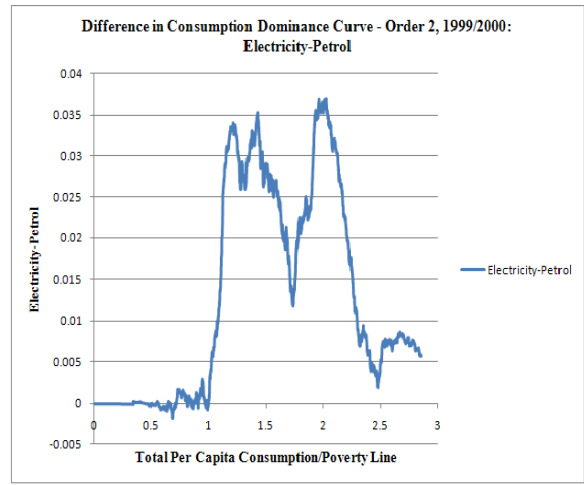
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Figure C1: Consumption Dominance Curves; Overall Population



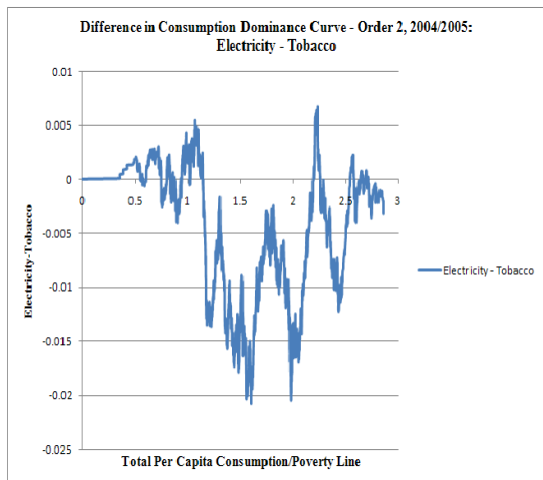
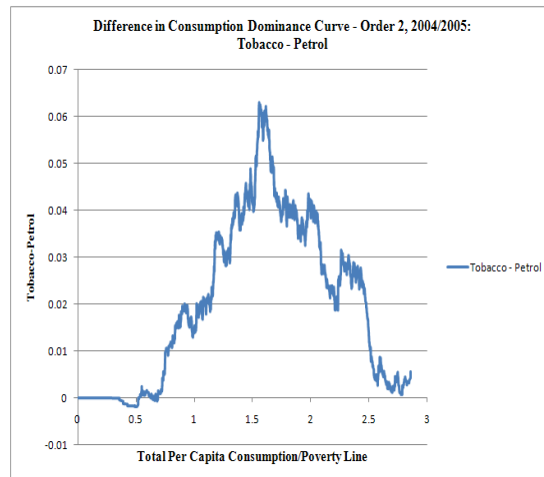


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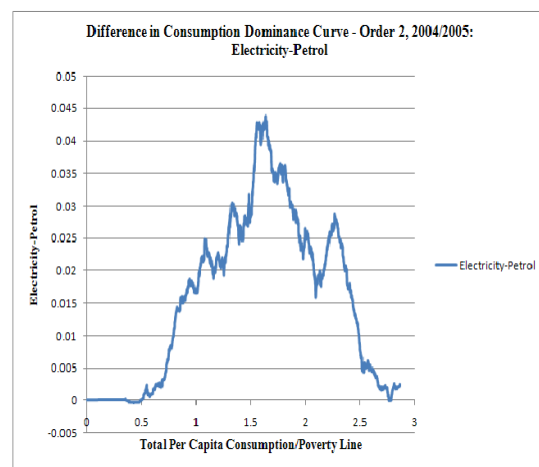


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Figure C2: Poverty Reducing Directions of Reform; Commodity Group and VAT Rates, 1999/2000



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Figure C3: Poverty Reducing Directions of Reform; Commodity Group and VAT Rates, 2004/2005

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