

Inequality and Indirect Taxation in Greece: 1988-2005

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1. INTRODUCTION

In the past twenty years Greece has been increasingly exposed to economic internationalization and competition, especially due to its accession to the European Union in the beginning of the 1980s. During this process, the Greek tax system was radically affected in a two fold way. First, the need for fiscal consolidation initially imposed by the Maastricht Treaty and later by the Stability and Growth Pact was almost exclusively met by tax increases. The tax share in GDP increased by almost 15 percentage points during this period. Secondly, the European Commission pressed for tax harmonization to remove trade and factor mobility distortions to further integrate the market and increase efficiency.

Among the different components of the Greek tax system, mainly indirect taxes were affected by both pressures, both because indirect taxes are the main source of tax revenue in Greece, yielding almost two thirds of tax revenue (excluding social security contributions), and because EU tax coordination has to date concentrated on coordinating indirect taxes. Thus Greece moved from a very complicated, highly differentiated system of indirect taxes, involving a high number of taxes levied at different rates to a much simpler tax structure, where the bulk of tax revenues is levied through VAT and a small number of excises.

The tax reforms prompted by EU accession raise two important issues from a distributional perspective. The first is who has born the burden of fiscal consolidation, at least that part arising from increasing levels of indirect taxation during the last twenty years. The second issue is to what extent the process of simplification of the indirect tax structure sacrificed the goal of equity.

The paper addresses these two issues and attempts to answer questions like “How has the distributional impact of indirect taxes changed during this period?”, “How have changes in the consumption patterns of the population been correlated with large uneven discretionary changes in the tax rates of commodities?” “Did the tax reforms adopted under the influence of EU membership and as a result of the exposure of the Greek economy to the ‘open market’ improve the targeting of the indirect tax system in favour of the ‘socially deserving’?”, “Have these reforms enhanced or alleviated changes in underlying inequality?”

We do this by comparing the distributional impact of indirect taxes at three points in time; 1988, 2002 and 2005. 1988 is a year after VAT was introduced but with many hangovers from the protectionist indirect tax system of the past remaining. By 2002 the major indirect tax reforms had been completed and Greece had successfully entered the core of the monetary union. In 2005 existing fiscal imbalances had triggered the corrective arm of the Stability and Growth Pact and major increases in indirect taxes were employed by the Greek government in order to bring the excessive deficit procedure launched by the ECOFIN Council against Greece to an end. For this purpose we use Household Expenditure Survey data to simulate the corresponding indirect tax systems on the populations of 1988, 2002 and 2005.

The paper further studies how the effect of the indirect tax system on inequality evolved over this period in comparison with a distributionally neutral equal-yield uniform tax. The paper also applies a method proposed by Newbery (1995) which relies on the theory of marginal tax reform and is applied to take into account changes in real relative prices in order to measure the welfare effects of selective changes of tax rates vis-à-vis a hypothetical proportional change of all indirect tax rates at constant revenue.

The structure of the paper is as follows. Section 2 provides some summary information on the structure of indirect taxation in 1988, 2002 and 2005. Section 3 explores and compares the distribution of the indirect tax burden among Greek households in the three years on the basis of the raw Household Expenditure Survey data of the respective years (National Statistical Service of Greece, 1994, 2001 and 2006) and assesses the effects of indirect taxes on welfare inequality. Section 4 reviews the theory of marginal tax reform and of the distributional impact of relative price changes and presents results when this methodology is applied in the Greek case for the period 1988-2005. Section 5 concludes.

2. THE STRUCTURE OF INDIRECT TAXATION: 1988-2005

Indirect taxes occupy a dominant position in the Greek tax system, since they yielded about 60% of total tax revenue (excluding social security) in 2005. In the past, indirect taxes were mainly adjusted to meet budgetary targets and to protect domestic producers discriminating against imported goods. This led to the accumulation of an uncommonly large number of taxes, most of which had very low yields. This structure was judged unacceptable within the European Union, one of the main objectives of which was the efficient allocation of resources within and between member states. As one of the EC requirements, a large number of taxes discriminating against imports had to be eliminated in 1984, while VAT was introduced in 1987, replacing the two main general sales taxes¹ and several smaller ones. Several excises also had to be reformed in terms of rates and coverage.

Table 1 presents the revenue structure of indirect taxes in 1988, a year after VAT was introduced, in 2002 and in 2005, when the reforms initiated by EU membership had been largely completed. Immediately after its introduction, VAT became the main source of indirect tax revenue. In the following years its share in indirect taxes increased by almost 10 percentage points, reaching 57.5% in 2002 and almost 60% three years later. In 1988 VAT was levied at four rates: 3%, 6%, 16% and 36%. The very low 3% rate covered cultural items (books, newspapers, magazines and theatres). The low 6% rate covered most food items, heating oil, medicines, transport services, etc. The high (36%) rate applied to luxury items or products creating negative externalities, like spirits, tobacco, television sets, motor fuel. The standard (16%) rate applied to the remaining goods and services. Several items, like educational, medical and financial services, were and still are exempt from VAT. VAT rates and product classifications have changed several times. By 2002, the two low and the standard VAT rates increased to 4%, 8% and 18% respectively, while the top VAT rate was abolished. Within the European Union fiscal surveillance framework, in 2005 Greece was judged by the ECOFIN Council to have breached the 3% of GDP reference value for the budget deficit and the Council recommended Greece to end the situation of an excessive deficit by the end of 2006 at the latest. In response to the Council's recommendation, the Greek government launched a fiscal consolidation package, which included a permanent increase of all VAT rates by one percentage point in March 2005.

¹ Namely, stamp duties and the business turnover tax, which at the beginning of the 1980s yielded around 90% of revenue from general sales taxes.

TABLE 1

The Revenues from Indirect Taxes Levied on Behalf of Central Government

Indirect Taxes	1988		2002		2005	
	Million Euro	% of total	Million Euro	% of total	Million Euro	% of total
1. Value-added tax	<u>1,758</u>	<u>48.3</u>	<u>11,421</u>	<u>57.5</u>	<u>13215</u>	<u>58.8</u>
2. Traditional excises	<u>721</u>	<u>19.8</u>	<u>4,714</u>	<u>23.7</u>	<u>5043</u>	<u>22,4</u>
a) Fuel taxes	481	13.2	2,280	11.5	2,478	11.0
b) Tobacco tax	216	5.9	2,142	10.8	2258,4	10,0
c) Alcoholic drinks and beer tax	24	0.7	292	1.5	307	1,4
3. Stamp duties	<u>186</u>	<u>5.1</u>	<u>641</u>	<u>3.2</u>	<u>655</u>	<u>2.9</u>
4. Taxes on cars	<u>257</u>	<u>7.1</u>	<u>1,416</u>	<u>7.1</u>	<u>1,655</u>	<u>7.4</u>
a) Registration tax and other car taxes	175	4.8	821	4.2	950	4.2
b) Transport dues	82	2.3	595	3.0	705	3.2
5. Other indirect taxes	<u>352</u>	<u>9.7</u>	<u>1,476</u>	<u>7.4</u>	<u>1,650</u>	<u>7.3</u>
a) Turnover tax	24	0.7	235	1.2	270	1.2
b) Special banking tax	153	4.2	0	0.0	0	0.0
c) Capital transfers tax	110	3.0	790	4.0	885	3.9
d) Other	65	1.8	451	2.3	495	2.2
6. Indirect taxes abolished	<u>366</u>	<u>10.1</u>	<u>187</u>	<u>0.9</u>	<u>257</u>	<u>1.1</u>
a) Revenue from Custom Offices	22	0.6	187	0.9	257	1.1
b) Consolidated special consumption taxes	80	2.2				
c) Regulatory tax	141	3.9				
d) Entertainment and luxury taxes	3	0.1				
e) Other consumption taxes	120	3.3				
TOTAL	3,640	100.0	19,855	100.0	22,475	100.0

Source: Greek Ministry of Economy and Finance, State Budget 1990, 2003 and 2007 Ordinary Budget, Central Services, Vol. I, Part 1, Athens, November 1989, 2002 and 2006.

Excises are levied on all the traditional candidates for such taxation, namely tobacco, petroleum products, alcoholic beverages and beer, altogether now yielding around a quarter of total indirect tax revenue. Excise rates in general increased between 1988 and 2002. In 2003 a major cut in the heating oil excise tax was adopted, while the 2005 fiscal consolidation plan envisaged an increase in alcohol and tobacco excises. Regarding petrol

excises, between 2002 and 2005 the excise tax did not increase in pace with petrol prices and therefore decreased in real terms.

A variety of taxes are levied on car purchase and use (in addition to the petrol tax) yielding another 7% of total indirect tax revenue. Car purchase taxes differ according to engine power and type of car, while transport dues differ according to engine power only. In 1988 car purchase taxes were much more finely differentiated, more progressive and on the whole higher. On the other hand, the share of population owing a car increased dramatically since then. Thus, although the share of car taxes in total tax revenue has remained broadly stable over the years, its composition has changed in favour of car use rather than car purchase.

Stamp duties, the main general sales tax before the introduction of VAT, still apply to a large number of transactions outside the VAT field of taxation, but their importance has diminished over time. Several other taxes yielding around 10% of indirect tax revenue in 1988, were abolished as a result of EU membership. It is worth noting that most of these taxes applied at varying rates to a large number of commodities and their abolition greatly simplified the tax structure.

Table 1 shows that between 1988 and 2005 the indirect tax system became more concentrated with VAT and excises now yielding over 80% of total indirect tax revenue. At the same time, the tax structure was further simplified even after VAT had been introduced.

3. DISTRIBUTIONAL ASPECTS OF THE INDIRECT TAX SYSTEM: 1988-2005

The evaluation of the distributional effects of indirect taxes in 1988, 2002 and 2005 is based on Household Expenditure Survey microdata (HES), collected by the National Statistical Service of Greece.² The population sample consists of around 6,500 households and is representative of the population.³ Such surveys provide information on the demographic structure, working patterns, income sources, spending patterns etc. of the households surveyed. Information is collected on around 300 goods and services in the 1988 HES, on over 400 goods and services in the 1999 HES and over 500 categories in the 2005 HES.

² For the analysis of the 1988 and the 2005 tax systems, the 1988 and the 2005 HES have been used respectively, while for the analysis of the 2002 tax system, we have used the data from the most recent HES, conducted in 1999. This should provide a good description of expenditure patterns for 2002.

³ Various dimensions of the representativity of the HES sample have been checked against macro-variables from other sources and results are quite satisfactory, thus guaranteeing the quality of results, see Kaplanoglou (1999) and Kaplanoglou and Newbery (2002).

Information on the tax rates applying to each commodity group has been collected and tax payments have been calculated at a household level. We assume that indirect taxes are fully shifted to consumer prices, and we ignore indirect taxes on intermediate goods that are not rebated.

Assessing the distributional impact of any tax reform requires a ranking of households in terms of welfare, which is not directly observable. The HES data provide information on several concepts of household income and household consumption. Theoretical arguments based on the permanent income hypothesis and the theory of life-cycle consumption smoothing (Friedman, 1957; Modigliani and Brumberg, 1954), suggest that consumption is a better measure of ‘life-cycle’ or ‘permanent’ income than current income. The latter may be subject to short-term fluctuations that do not reflect changes in the underlying welfare levels. Uncertainty about future income may be dealt with by increased precautionary saving, which will depress current consumption levels. The cost of increased income risk can at least partly be captured by using consumption instead of income as a welfare indicator (see Blundell and Preston, 1995). Nevertheless, the use of current consumption as an appropriate welfare indicator has limitations. The absence of perfect capital markets required by the strong form of the permanent income hypothesis can make current consumption an imperfect proxy (although the same is true of current income) while current (and expected) future tastes and needs may vary (see Blundell and Preston, 1991, 1994 and 1995). Ideally, both income and consumption should be combined to assess households’ standards of living.⁴ However, the practical limitation that income is severely under-reported in the Greek HES provides a powerful argument for just using household consumption as the welfare indicator.

A further complication is that the HES records current expenditure rather than current consumption. The two notions may differ substantially for consumer durables, such as home repairs, cars and refrigerators. We therefore measure welfare by the household’s expenditure on all non-durable items. Given that households face fairly homogeneous prices in each period, and that expenditure on non-durables bears a monotonic relationship to long-run average welfare, this should give a good ordinal welfare indicator.⁵ Household non-durable expenditure has been deflated and adjusted for differences in household size and composition using the modified OECD equivalence scale. To sum up, households are ranked by

⁴ This has been recognised in several studies on inequality, poverty and tax incidence (e.g. Blundell and Preston, 1994 and 1995, Goodman and Webb, 1995).

⁵ This view is defended and followed in a number of studies (e.g. McGregor and Borooah, 1992, Newbery, 1995, Newbery and Révész, 2000).

equivalent expenditure on non-durables for the assessment of the distributional effects of indirect taxes, while the calculation of inequality measures is derived by assigning equivalent household expenditure on non-durables to each equivalent member.

FIGURE 1

Evolution of the Indirect Tax Burden by Expenditure Group, 1988-2005

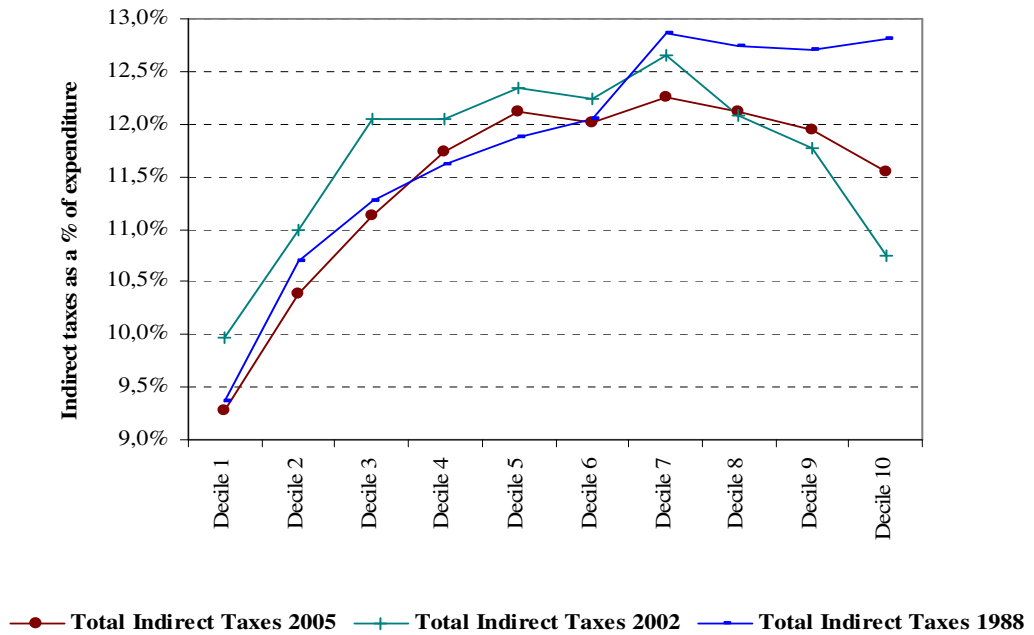
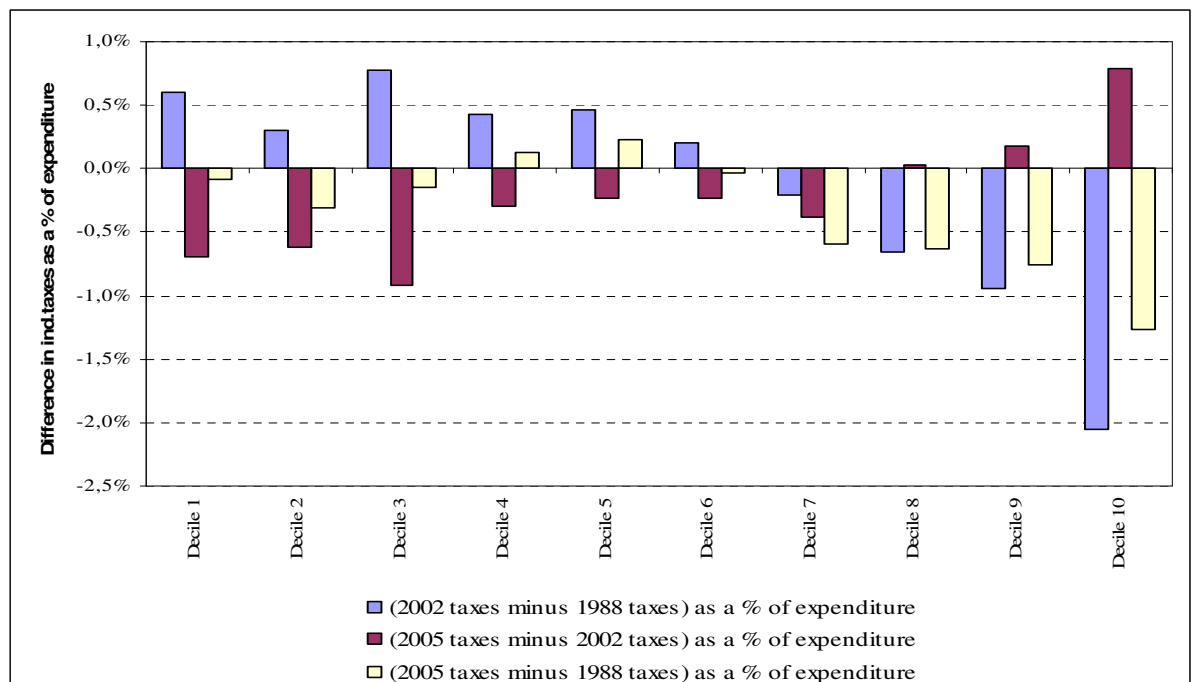


FIGURE 2

Difference in the Indirect Tax Burden by Expenditure Group, 1988-2005



Despite profound changes in the structure and rates of indirect taxes, the total burden of the indirect tax system has remained remarkably stable over the last twenty years. The average proportion of total household expenditure absorbed by indirect taxes is around 11.5%. The indirect tax burden has not remained stable across the welfare distribution of households. Figure 1 shows the evolution of the indirect tax burden (share of household expenditure paid in taxes) across deciles of households in 1988, 2002 and 2005, while Figure 2 shows the differences in the tax shares during this period. Between 1988 and 2002 the distribution of the indirect tax burden changed in favour of wealthier groups, since the tax share rose in the lower half of the welfare distribution and fell among richer deciles. The opposite pattern is detected between 2002 and 2005, though much less pronounced. Looking at the whole 1988-2005 period, the indirect tax burden appears to have remained broadly unchanged in the lower half of the distribution and to have fallen in increasing proportions among richer households.

The pattern of indirect tax payments by commodity group in these years appears in Figures 3, 4 and 5. These figures show the cumulative distribution of tax payments in the three years at a commodity level, where taxes have been ranked in order of regressivity. It becomes apparent that there is a clear grouping of regressive taxes, namely those on food, tobacco, housing (which includes heating oil), health and communication. The tax base of these taxes represent around 60% of total household expenditure in 1988 and around 45% in 2005. In all three years the pattern of regressivity is reversed to smaller or bigger extent when taxes on cars and their use is taken into account. Considering the total tax burden from indirect taxes (top line in Figures 3, 4 and 5), we draw the conclusion that households in the middle of the welfare distribution gradually became the ones mostly burdened by indirect taxes.

FIGURE 3

Cumulative Indirect Taxes by Deciles of Equivalent Non-Durable Expenditure 1988- Taxes are Ranked by Degree of Regressivity

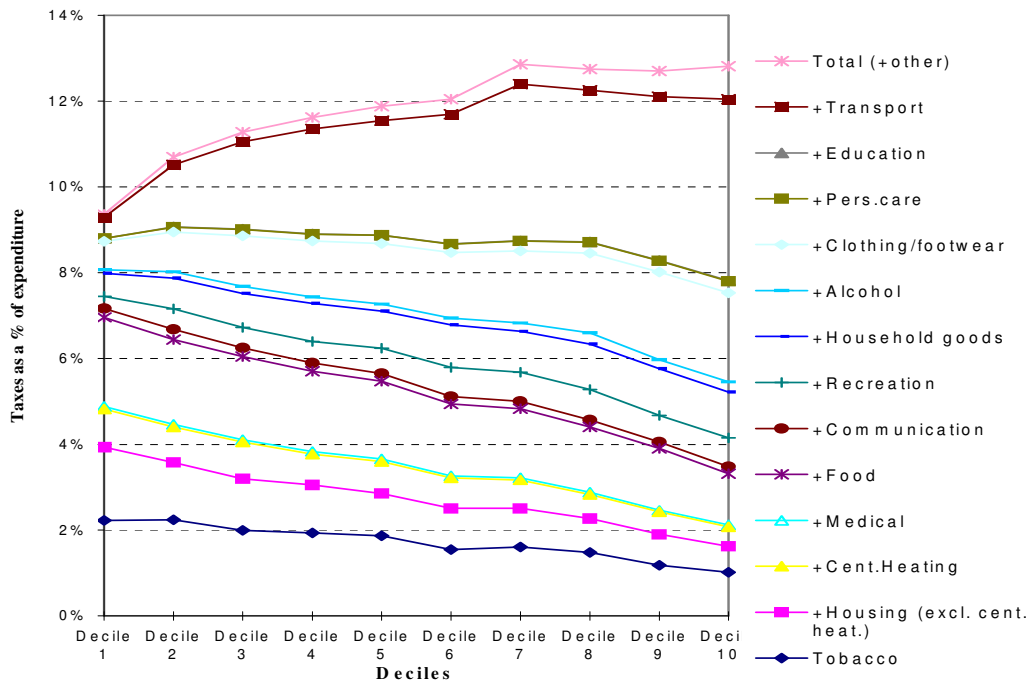


FIGURE 4

Cumulative Indirect Taxes by Deciles of Equivalent Non-Durable Expenditure 2002 - Taxes are Ranked by Degree of Regressivity

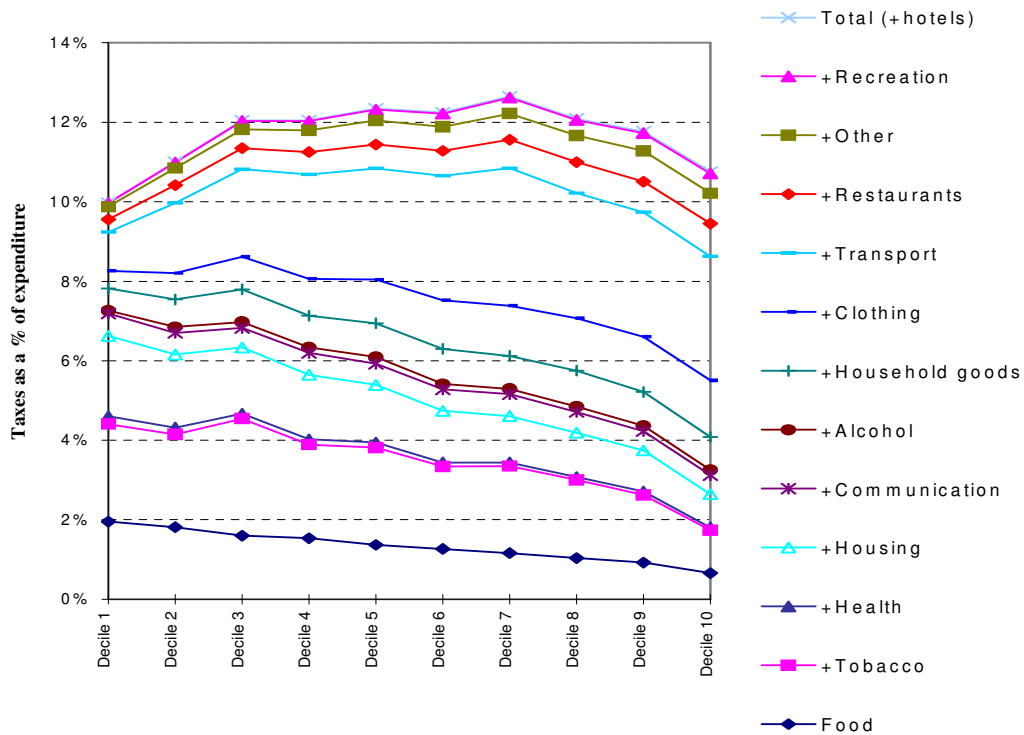
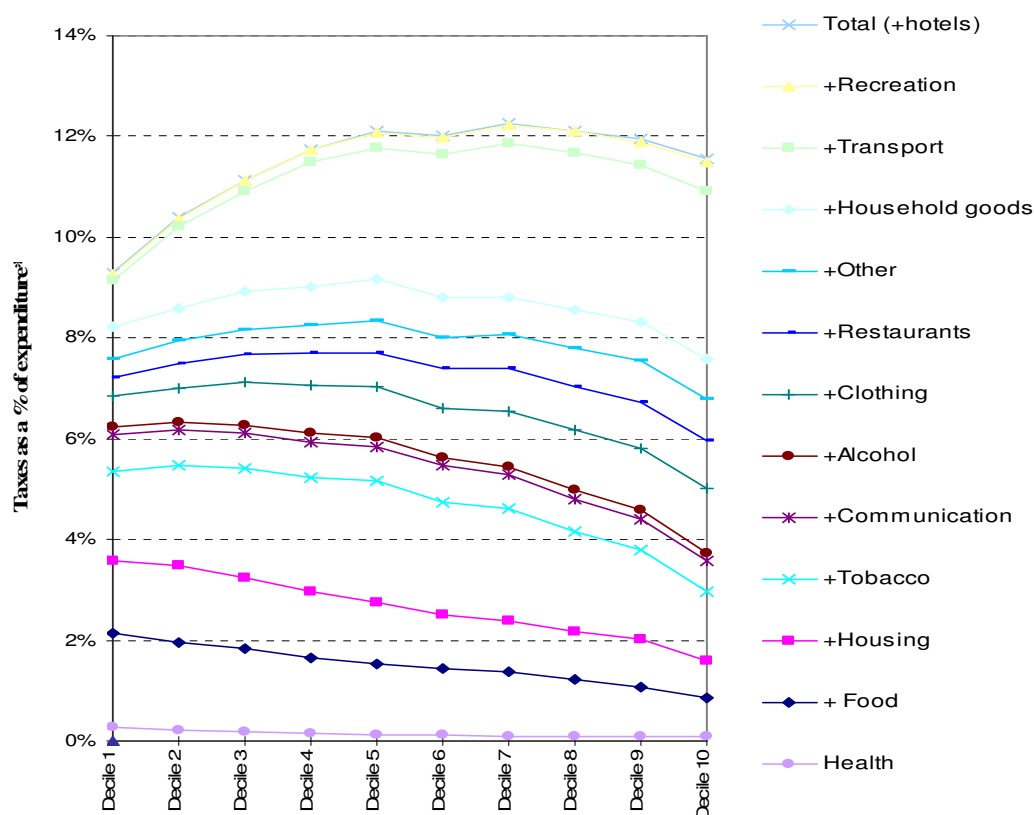


FIGURE 5

Cumulative Indirect Taxes by Deciles of Equivalent Non-Durable Expenditure 2005 - Taxes are Ranked by Degree of Regressivity



The effect of road taxes

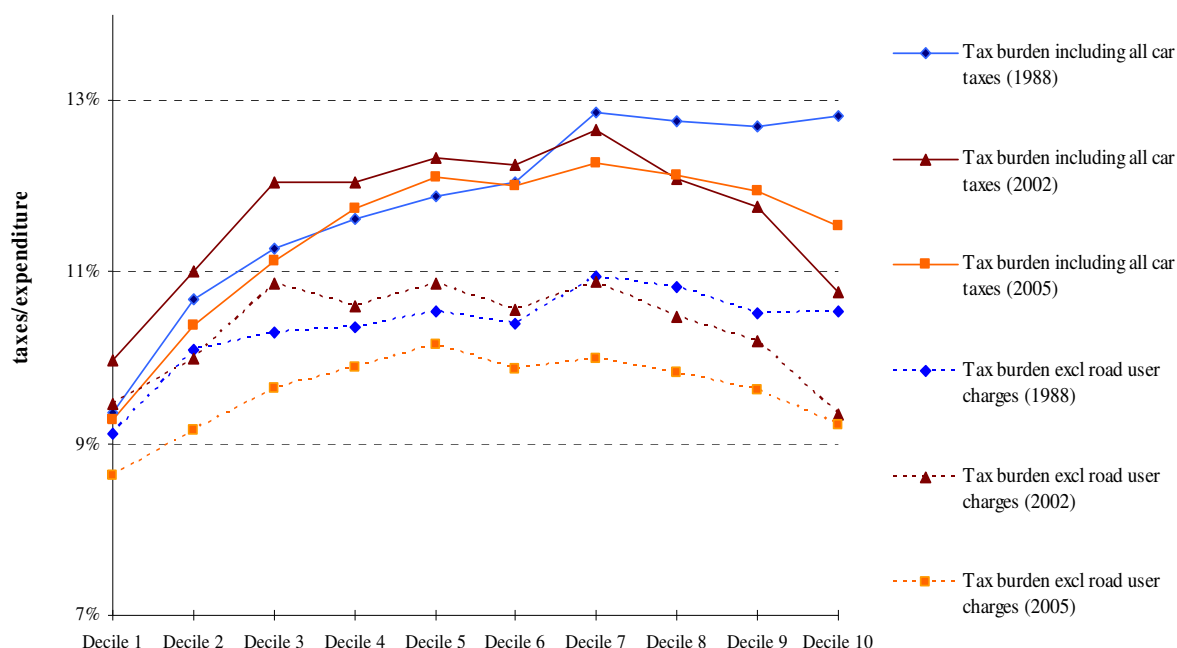
Having established the importance of car taxes in overturning the regressive nature of the indirect tax system, it would be important to have a better understanding of their effect. According to one line of arguments some part of road taxes (i.e. car purchase taxes, annual transport dues and fuel taxes) should be viewed as road user charges rather than pure taxes (Walters, 1968; Dewees, 1979; Harrison et al, 1986; Newbery 1988, 1996, and 2002; HMSO, 1993; Newbery and Santos, 1999). If road use could be priced through congestion charges (as in London since 2002), then a large part of the case for other taxes on fuel and vehicle purchase would disappear, although a small part of fuel tax could be justified as an environmental tax (Newbery, 2002).

A good approximation for the road user charge element assumes that there is a constant road user charge per car, equal to the minimum of the car purchase tax and the annual

transport dues recorded in the HES, while the balance is the redistributive part.⁶ To the minimum of car purchase taxes and transport dues we add the proportional taxes on car use, mainly road fuel tax. The resulting household tax burden excludes the assumed road charge (but includes the VAT on the road user charge). As Figure 6 reveals, once the road user charge is removed, the progressive shape in 1988 and the inverted U-shape in 2002 and in 2005 disappears and the indirect tax system becomes more uniform.

FIGURE 6

Effects of Car Taxes on the Progressivity of Indirect Taxes, 1988-2005



This raises the question whether changes in car ownership are linked to the redistributive features of the Greek indirect tax system, even if all car taxes are treated as pure taxes. Car owners are systematically wealthier than non-car owners.⁷ Furthermore, the number of passenger cars per thousand inhabitants in Greece is much lower than the EU-25 average.

Figure 6 shows the tax share in expenditure (including road-user charges) for non-car-owning (lines B1, B2 and B3) and car-owning (C1, C2 and C3) households for the three years (1=1988, 2=2002, 3=2005), and for each decile of the total household sample. The average over all households is shown by the lines A1, A2 and A3. Line A1 is a weighted average of

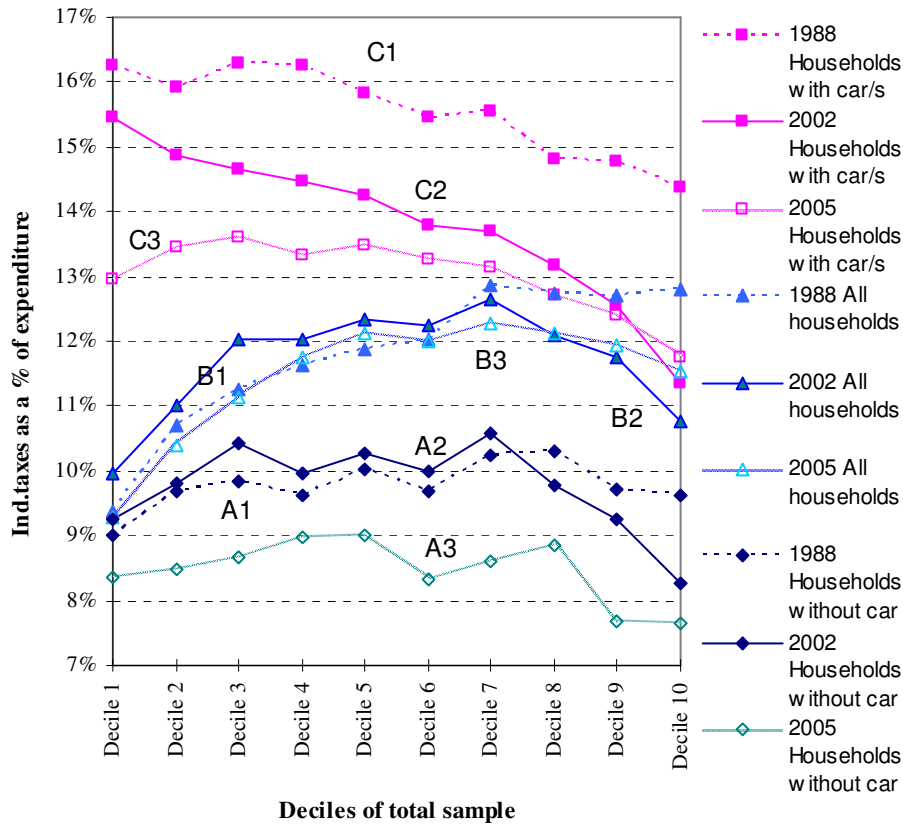
⁶ Two other measures of road user charges gave essentially the same results.

⁷ The null hypothesis that mean expenditure is higher for households with cars than for households without cars could not be rejected at the 0.01 significance level for several different expenditure measures both in the three years under consideration.

lines B1 and C1, the weights changing over deciles depending on share of car and no-car owners within each decile (and similarly for A2 and A3).

FIGURE 6

Difference in the Indirect Tax Burden between Households with and without Cars



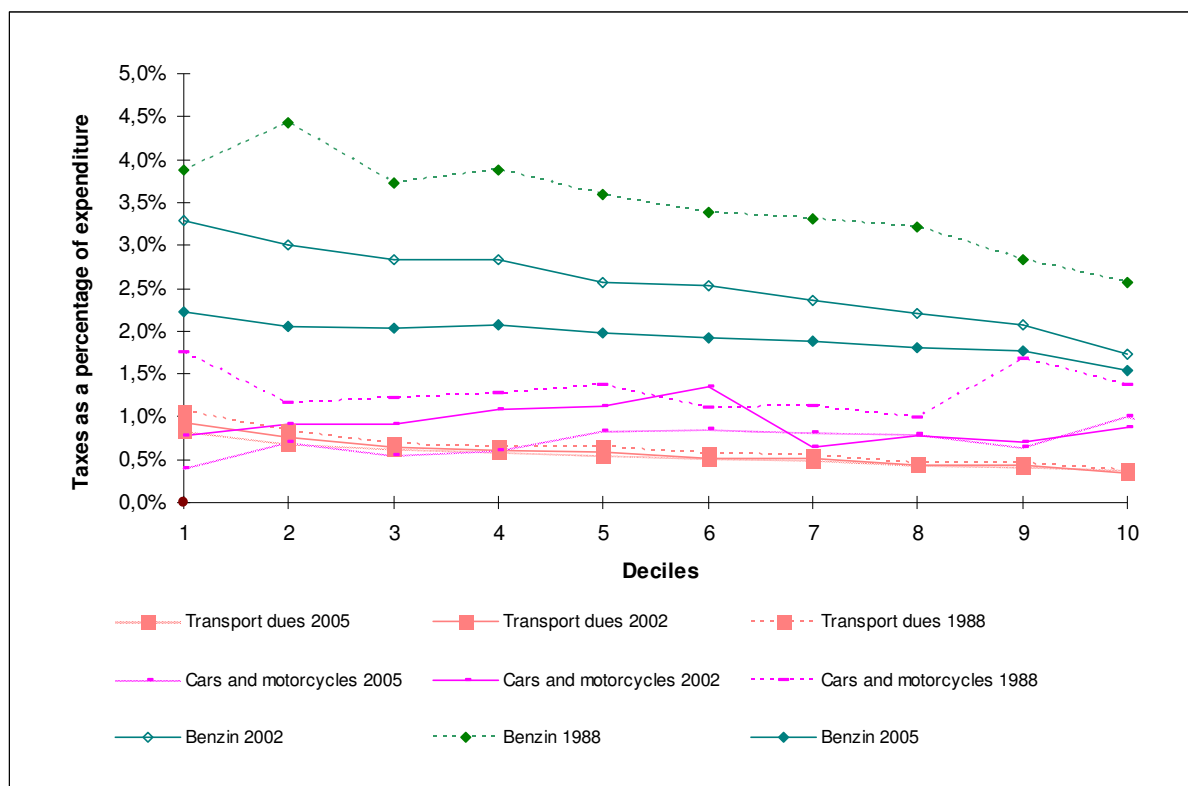
The shape of lines A1, A2 and A3 is the result of two effects working in opposite directions. On one hand, the relative number of households with car/s increases across deciles, pulling lines A towards lines C. On the other hand, lines C1, C2 and C3 are themselves sharply downward sloping. Households owning cars face indirect taxes that are sharply regressive. This regressivity becomes more apparent in the indirect tax burden of the whole sample as we move to the higher more-car-owning deciles. The former effect dominates in the first half of the income distribution, while the latter dominates towards the top end of the income distribution.

The difference between 1988 and 2005 is that indirect taxes among car owners are both considerably lower and more regressive in 2005,⁸ while among non-car owners they are about at the same levels, though slightly more regressive at the upper end in 2002 and 2005. At the same time the number of car owners has almost doubled between 1988 and 2002 and tripled

by 2005. These differences explain both why the indirect tax burden of the total population in 2002 and 2005 increases faster in the lower deciles and why it decreases faster among wealthier deciles.

It is interesting to note that the taxes on cars and their use, which seem to shape the progressivity elements of the whole indirect tax system, are in fact regressive when we isolate car owners (see Figure 7). With the exception of taxes on car purchase, which are broadly proportional, the taxes on car use (benzin and transport dues) are clearly regressive in all three years.

FIGURE 7
Progressivity of car taxes – households with cars



The effect of indirect taxes on inequality

One way to assess the effect of indirect taxes on inequality is to measure the change in inequality induced by the existing tax system vis-à-vis a tax system of uniform equal-yield

⁸ This is due to the fact that between 1988 and 2002, car purchase taxes and transport dues significantly decreased and were made less progressive and the tax rate on motor fuel slightly decreased.

taxes applying to all goods and services.⁹ We employ several inequality measures, i.e. the well-known Gini index (Gini, 1912), the Atkinson indices for values of inequality aversion ϵ of 0.5, 1 and 2 (Atkinson, 1970), and the two Theil indices, T and N (Theil, 1967, also Shorrocks, 1980).

It should be noted that all these indices respect the desirable principles of anonymity, income scale independence, population and the weak principle of transfers (see Kakwani, 1980 and Cowell, 1995).¹⁰ Different inequality indices reflect different value judgements about the relative importance of the welfare of people in different parts of the distribution. The Gini index is more sensitive to changes in the middle of the distribution, the first Theil index (T) to changes at the top of the distribution, the second Theil index (N) focuses on the lower tail of the distribution. The weighting scheme is made explicit in the Atkinson indices with $\epsilon \rightarrow \infty$ approaching the Rawlsian case, Atkinson (1970). A higher value each of the inequality measures indicates more inequality.

Table 2 presents by how much inequality increases or decreases as a result of the indirect tax system in 1988, 2002 and 2005 compared with a uniform (hence distributionally neutral) equal-yield tax.¹¹ The 1988 indirect tax system appears to have minor distributional benefits over the uniform tax (see the top part of Table 2), since inequality declines by 2%-4%. The simplification of the indirect tax system which took place since then seems to have had adverse redistributive effects. By 2002, the indirect tax structure led to a more unequal distribution of welfare compared to the uniform equal-yield tax. Nevertheless, the increase in inequality is very small and not supported by all inequality indices – indeed, at high levels of inequality aversion ($\epsilon = 2$) inequality decreases. In fact, if one plotted the relevant Lorenz curves, they would cross, so that neither distribution dominates the other. Some redistributive power was regained by the reforms introduced in the indirect tax system since 2002. The most influential reform in this aspect has been the strong decrease in the heating oil excises in 2003, which is one of the most regressive taxes.

The lower part of Table 2, shows the changes in inequality induced by the indirect tax system in the three years if we ignore taxes on durables and apply the uniform tax on non-

⁹ In the case of the uniform equal-yield tax and in the absence of detailed information on price elasticities, we implicitly assume own price elasticities equal to (-1) for all commodities and zero cross-price effects. In this way, the household budget constraint is not violated.

¹⁰ For details of the calculation of summary statistics and a review of the voluminous literature on the comparison and ranking of different distributions, see Cowell (1995).

¹¹ To be consistent with the previous analysis, the distribution of expenditure is derived by assigning the value of expenditure per equivalent adult (using the OECD scale) to each equivalent adult in the household.

durable commodities only. Here the results are much more unfavourable in all cases. The distributional advantages of the 1988 indirect tax system over the uniform tax would be only marginal, while the adverse distributional effect of the 2002 system becomes stronger for all inequality measures shown and the distributional benefits of the 2005 system over the uniform tax appear to be lost.

TABLE 2
Change in inequality induced by the actual tax system vis-à-vis a uniform equal-yield tax

Inequality measure	1988 (1)	2002 (2)	2005 (3)
<i>All commodities</i>			
Gini coefficient (G)	-1.8%	0.3%	-0.8%
Atkinson ($\epsilon=0.5$) $A_{0.5}$	-3.5%	0.0%	-1.8%
Atkinson ($\epsilon=1$) A_1	-3.7%	0.6%	-1.8%
Atkinson ($\epsilon=2$) A_2	-3.3%	-0.3%	-1.9%
Theil index (T)	-3.8%	1.0%	-1.8%
Theil index (N)	-3.9%	0.3%	-1.9%
<i>Non- durable commodities</i>			
Gini coefficient (G)		-0.6%	1.6% 0.6%
Atkinson ($\epsilon=0.5$) $A_{0.5}$		-1.3%	2.4% 1.2%
Atkinson ($\epsilon=1$) A_1		-1.4%	2.6% 0.8%
Atkinson ($\epsilon=2$) A_2		-1.8%	1.1% 0.1%
Theil index (T)		-0.6%	3.6% 1.6%
Theil index (N)		-1.2%	2.5% 0.9%

4. DISTRIBUTIONAL EFFECT OF REAL RELATIVE PRICE CHANGES

1. Marginal Tax Reform Theory and the Distributional Impact of Relative Price Changes

Between 1988 and 2002 and again between 2002 and 2005, the Greek government raised a different total amount of revenue from indirect taxes, but this additional revenue was not raised in a proportional manner from all commodities, since changes in indirect tax rates were both large and variable across commodities. From a welfare perspective, tax reforms

with selective changes of tax rates can be analysed using as a benchmark a proportional change in all indirect tax rates yielding the same revenue. The difference of welfare between the two alternatives is the effect of being selective, that is of changing the relative prices of commodities, rather than spreading the revenue change proportionally on all tax rates.

In this section we apply the theory of marginal tax reform (Feldstein, 1972; Ahmad and Stern, 1984; Stern 1987), as adapted by Newbery (1995), to study the distributional impact of price changes induced by changes in indirect tax rates during the period 1988-2002. The theory of marginal tax reform in turn proposes a more modest alternative to optimising the tax structure by considering only small policy changes from the existing position.¹² Changes in indirect tax rates cause changes in the relative prices and this methodology assesses whether these relative price changes have a distributionally adverse effect on the population. This approach neutralises the revenue effect of an indirect tax reform and isolates the distributional impact caused by the resulting changes in real relative prices. Newbery (1995) developed this approach to analyse the distributional effect of price changes in Hungary during the transition to a market economy. More recently, Liberati (2001) and Kaplanoglou and Newbery (2004) used this approach to study the distributional impact of recent indirect tax reforms in Italy and Greece respectively.

Within the framework of a government that ranks distributional outcomes according to a Utilitarian or Benthamite social welfare function $W(V^1, \dots, V^h, \dots, V^H)$, where the utility of agent h depends on total expenditure c^h , it can be shown that the impact on social welfare of a change in consumer price p_i , caused by a change in the tax, t_i is equal to:

$$(1) \quad \frac{\partial W}{\partial p_i} = -\bar{\beta} d_i X_i, \text{ where } d_i \equiv \frac{\sum \beta^h x_i^h}{\beta X_i} .$$

Here β^h is the social marginal utility of increasing expenditure of agent h by one unit, $\bar{\beta}$ is its average, X_i is aggregate consumption of i and d_i is Feldstein's (1972) *distributional characteristic* of good i , so that d_i is a measure of how concentrated the consumption of good i is on the socially deserving (those with high social marginal values of consumption, β^h).

We further need to isolate the welfare effects of changes in indirect tax rates from welfare effects of changes in the distribution of money incomes. For this reason, we calculate the distributional impact of real *relative* price changes caused by changes in the tax rates of

commodities (for a detailed derivation, see Kaplanoglou and Newbery, 2004). The general idea is that we abstract from changes in households' expenditures by assuming that the latter vary proportionally to the general price index and define the real relative price of commodities in terms of the general price index. Defining the individual utility function and the social welfare functions in terms of real prices allows us to approximate the total change in social welfare caused by changes in real relative prices. It can then be shown that the welfare change, normalised by the initial level of welfare, W , is given by a generalisation of (1) to multiple price changes, as follows:

$$(2) \quad \frac{\Delta W}{W} \approx - \frac{\sum_i d_i \omega_i \Delta \pi_i}{\sum_i d_i \omega_i},$$

where ω_i is the budget share of commodity i , $\Delta \pi_i$ is the change in the real relative price of commodity i and d_i is the distributional characteristic of commodity i defined as before.

Information on household expenditure and relative prices at a disaggregated level is available from the HES, so (2) can be estimated if we find a method to calculate the welfare weights, β^h . It would be preferable to employ welfare weights that would allow us to experiment with differing value judgements about the importance of distributional considerations. The simplest and most easily parameterised approach is given by the additive iso-elastic social welfare function, $W = \sum u^h$, where $u^h = (c^h)^{1-\varepsilon}/(1-\varepsilon)$, ($\varepsilon \neq 1$), $u^h = \log c^h$, ($\varepsilon = 1$), where c^h is real consumption per equivalent adult, and ε is Atkinson's (1970) coefficient of inequality aversion.

For this social welfare function, $\beta^h = (c^h)^{-\varepsilon}$. The higher is the value of ε , the more concerned the government is with inequality. Thus, if $\varepsilon = 1$, transferring one euro to someone at double the living standard of another has a social value of only one-half that of the reference person. A value of zero indicates no inequality aversion with β^h the same for all households, while at the other extreme, a value of 5 approaches the Rawlsian "maxi-min" principle in which only the impact on the poorest counts (where 1 euro is worth $2^5 = 32$ times the value of 1 euro to someone with twice that real income).

2. Empirical Results

One distributional aspect of the indirect tax system is how well it is targeted in favour of the socially deserving. Table 3 shows the correlation coefficients between the

¹² Optimal tax theory is set out in Diamond and Mirrlees, (1971a and b); Sandmo, (1976); Atkinson and

distributional characteristics of commodities and the tax rates they bear for 1988, 2002 and 2005 (commodities have been weighted by their budget share). From an equity perspective, goods with higher distributional characteristics should be associated with lower tax rates, so that negative values of the coefficient are desirable (Stern, 1990). The values of the correlation coefficient are negative in 1988 for all values of ε and positive in 2002 at least for moderate values of the inequality aversion parameter, suggesting that the targeting of indirect taxes worsened during that period. Reforms introduced between 2002 and 2005 improved somewhat the targeting of the tax system at least for moderate values of ε . However, none of these coefficients is statistically significant at the 5 per cent level, which implies that in general indirect taxes do not seem to serve any distributional aims.

TABLE 3
Pearson Correlation Coefficients between Distributional Characteristics and Tax Rates: how Well is the Indirect Tax System Targeted?

	$\varepsilon=0.5$	$\varepsilon=1$	$\varepsilon=2$	$\varepsilon=5$
1988 indirect tax system*	-0.052 (0.377)	-0.065 (0.272)	-0.087 (0.139)	-0.101 (0.085)
2002 indirect tax system*	0.072 (0.153)	0.044 (0.384)	0.000 (0.399)	-0.102 (0.053)
2005 indirect tax system*	0.031 (0.078)	0.015 (0.161)	-0.017 (0.072)	-0.061 (0.197)

*Commodities have been weighted by their budget share.

Significance probability that the statistic is 0 in parenthesis. None are significantly different from 0 at 5% in level.

The results in terms of social welfare are shown in Table 4 both as a sequence of changes (1988-2002, 2002-2005) and for the whole period (1988-2005).

TABLE 4

Stiglitz, (1980); Auerbach, (1985); Mirrlees, (1986); and Ray, (1997).

Welfare Impact of Relative Price Changes

Period	<i>percentages</i>			
	$\varepsilon=0.5$	$\varepsilon=1$	$\varepsilon=2$	$\varepsilon=5$
(1) 1988-2002	-0.14	-0.29	-0.62	-1.59
(2) 1988-2002 - without taxes on cars and their use	-0.08	-0.18	-0.38	-0.89
(3) 2002-2005	0.14	0.12	0.06	-0.24
(4) 2002-2005 -without heating oil	-0.30	-0.36	-0.48	-0.83
(5) 1988-2005	-0.10	-0.21	-0.53	-2.22

Indirect tax reforms having taken place between 1988 and 2002 had an adverse redistributive impact, since the proportional change in welfare is negative for all values of ε and increasing in it. According to Newbery (1995), the effect of the real relative price is equivalent in social welfare terms to a proportional variation in expenditure of each household, which in the present case is equal to -0.14% if $\varepsilon = 0.5$, but increases for increasing values of ε to reach -1.59% for $\varepsilon = 5$.¹³

Having already established the importance of car taxes and the way they were reformed between 1988 and 2002, it would be important to check the welfare effects of relative price changes if we ignore the changes in the taxation of car purchase.¹⁴ The negative redistributive impact of price changes almost halves, implying that the fact that car purchase taxes both decreased and were made less progressive accounts for about half of the negative welfare change.

Reforms introduced between 2002 and 2005 had a positive effect on social welfare which is however decreasing for increasing values of ε and in fact turns negative for extreme values of the inequality aversion parameter. The main reason for that, as shown comparing

¹³ The 1988 budget shares and distributional characteristics have been used in the computation of results reported in Table 4, but results are remarkably similar if 2002 budget shares and distributional characteristics are used.

¹⁴ Note that car purchase taxes were both decreased and made less progressive over the 1988-2002 period.

the results of rows (3) and (4) of Table 4, is the decrease in the heating oil excise tax as heating oil ranks at the top of the distributional characteristics ranking. Once we abstract from heating oil, the welfare effect of indirect tax reforms introduced between 2002 and 2005 (mainly the increase in all VAT rates and the decrease in real terms of the benzine excise tax) is clearly negative and increasing in increasing values of the inequality aversion parameter. Considering the whole 1988-2005 period (welfare effects do not add up due to different base year used), the welfare change is generally negative and in fact increases as one becomes more inequality averse.

V. CONCLUSIONS

Exploring the distributional impact of the reforms of the Greek indirect tax system during the last 20 years allows several interesting conclusions to be drawn. The share of household expenditure absorbed by indirect taxes has remained remarkably stable, but the change in the distribution of the indirect tax burden among households over this period appears to have benefited wealthier groups. Households at the lower end and the middle of the welfare distribution pay about the same proportion of their total expenditure in indirect taxes compared with 20 years ago, while richer households have gained in relative terms during the same period. Taxes on cars and their use emerge as the main variable explaining the patterns of tax payments during this period.

Concentrating on measures of aggregate change in inequality, it turns out that while the 1988 tax structure decreased overall inequality in comparison with a uniform tax, its simplification by 2002 led to a tax system which in fact increased inequality when compared to a uniform tax. Reforms introduced after 2002 contributed to the regain of some redistributive power.

If we abstract from changes in the underlying welfare levels and isolate the welfare changes caused by movements in the relative prices of commodities we find evidence that the indirect tax system has lost some redistributive power as a result of the reforms introduced between 1988 and 2005. Results seem to be more unfavourable the more concerned we are about inequality. One striking result emerges when we consider only the 2002-2005 period. In terms of indirect tax reforms introduced, this period witnessed a large drop in the heating oil excise tax in 2003 followed by an extensive fiscal consolidation package involving an increase in all VAT rates and some excises in 2005. In welfare terms, it turns out that the beneficial effect of the drop in one clearly regressive excise tax by far outweighed the

negative welfare effect of the more extensive tax reform affecting the tax rate of most commodities. This indicates that a well targeted reform may have very powerful effects in the presence of distributional concerns and provides useful insights to Greek policy makers. The specific case of heating oil is even more important in light of the recent alignment of the heating oil excise tax with the motor fuel excise tax in an attempt to control evasion in this field of taxation.

Looking at the evolution of the whole indirect tax system in Greece since 1988, one should not underestimate the fact that the reforms introduced substantially simplified the indirect tax structure, thus reducing the administrative and compliance cost of the tax system, which in Greece is perceived to be especially high (see Rapanos, 1997; TRC, 2002).¹⁵ Considering the small ‘cost’ in terms of distributional fairness found in this paper, these reforms can be judged favourably.

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¹⁵ Another dimension along which we could judge the indirect tax system is efficiency. This aspect is explored in Kaplanoglou and Newbery (2003).

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