

A note on "Distributional effects of the Ecological Tax Reform in Germany: an Evaluation with a Microsimulation Model"

By Silvia Tiezzi, University of Siena, Italy.

(Prepared for the OECD Workshop on "The Distribution of Benefits and Costs of Environmental Policies: Analysis, Evidence and Policy Issues." OECD headquarters, Paris, 4-5 March 2003).

I will try to develop my discussion along 4 main lines: first of all I will briefly summarise the results of the Microsimulation study. Then I will make some observations on the actions that could be taken to tackle the adverse distributional effects. I will also try to make some comparison between the German case and the Italian case with which I am more familiar. Finally I will stress the importance of taking into account the way people react (even in the short run) to fiscal reforms, i.e. the importance of behavioural responses.

1. The main results of the Microsimulation study can be summarised as follows: a) when no Revenue Recycling is undertaken, the reform appears to be only slightly regressive and the only energy tax that does not have a regressive effect up to the income bracket 25.000 to 30.000 Euro is the Motor Fuel Tax, among those considered by the German reform; the tax on heating oil, on the other hand causes a very high burden on the lowest income households, higher than the tax on fuels (see table 4 of the Bork paper); b) when Revenue Recycling (RR henceforth) is undertaken, in the form of a reduction in Social Security Contributions, the Regressive effect is intensified (table 10); c) the chosen type of RR mostly favours the middle and upper income classes; d) at very low income levels RR does not decrease AT ALL the financial burden of the Environmental Tax Reform (ETR henceforth) (see table 10 income bracket up to 15.000 euro); e) when compensation measures are introduced (a progressive income tax reform and increases in child benefits) people in very low income classes are the only ones to bear a burden, whereas people in the middle and upper income classes obtain a net gain from the reform (see again table 10); f) the introduction of compensation measures worsens the relative distribution of income (differences among households in different income classes) although it improves the income levels, but not for the very poor people; g) the poor

are less poor after the introduction of the compensation measures, but they are still poorer than before the ETR; h) on the other hand, people in the middle and upper income classes are better off after the introduction of the compensation measures, better than before the ETR. Overall, both the chosen RR and the compensation measures increase inequality.

i) Looking at the effect of the reform and the compensation measures in more detail (i.e. across different households' dimensions) shows that the net losers from the reform are those in the weakest social position: pensioners, unemployed and students in low income classes; l) when looking at the dimension "age of the head of the household" we find that the oldest (>65 years of age) head of households are the only ones losing from the reform (figure 12); m) the compensation measures increase inequality more than the RR, although they decrease the burden of the reform for all the income groups; n) the poor are less poor after the introduction of the compensation measures but the gap between the rich and the poor becomes wider.

These results show that the design of the RR and of the compensation measures does not take into account differences among households. These measures seem to be thought for a unique, mean type of household.

2. Efficiency versus Equity issues. Pure efficiency issues: when designing Environmental Taxation policy makers have traditionally focused on the likely efficiency effects of the ETR which entails gross costs (abatement expenditures and price distortions between goods, for instance) that can be compensated for by two types of benefits: a) an environmental dividend (very difficult to calculate); b) a second dividend that may be obtained through a special sort of RR. This dividend can take the form of a saving in the gross cost of the reform (an efficiency gain) that can be gained using the tax revenue to substitute for existing distortionary taxes. The relevant literature draws a distinction between a WEAK double dividend and a STRONG double dividend (Goulder, 1995). There is a weak double dividend when the gross cost of the ETR combined with lump-sum transfers of the revenues is greater than the gross cost of the ETR accompanied by cuts in distortionary taxation. To make the ETR convenient on efficiency grounds in presence of a weak double dividend one should know the dimension of the Environmental Benefit produced. One gains a STRONG double dividend, instead, when the second dividend is even larger than the gross costs, so that the ETR implies a net efficiency gain. In this case the exact knowledge of the Environmental Benefit produced is unnecessary in order to justify the environmental tax. However the literature shows that the strong double dividend can occur only under strict and rather unlikely assumptions about the functioning of the economy, therefore the weak double dividend notion should be the relevant one to policy makers.

Equity issues: when equity effects are taken into account even the generally accepted idea

of a weak double dividend can fail due to equity effects (Proost and Van Regemorter, 1995). Proost and Van Regemorter notice that the efficiency gains from the ETR are usually a small fraction of the total environmental tax revenue collected. Each social group pays for increased taxation, especially when the taxed good is a necessary good and its demand is unelastic, but the distribution of the efficiency gains is not so widespread. In the German case study for instance, unemployed, pensioners and students in low income classes are those mostly hit by the reform, however the efficiency gains of the reform accrue only marginally to them, because they do not pay social security contributions. They probably do not benefit from the compensation measures either, at least as far as child benefits are concerned. We know nothing about the distribution of environmental benefits. On the other hand those are probably the social groups whose demand for transport and, especially, heating fuels is more rigid and they therefore bear the highest burden from the reform.

The design of the German ETR and the associated RR and compensation measures is thought for an average type of household without taking into account income distribution. When households are all of the same type there is no conflict of interest in the RR decision: all efficiency gains accrue to all consumers. In fact, for each social group there is more at stake in the income distribution aspect of the tax recycling decision than in the total efficiency effects of the different recycling options (Proost and Van Regemorter, 1995, p. 4).

Quoting again Proost and Van Regemorter (1995, p. 8) "*introducing income distribution concerns requires that the gross costs, the environmental benefits and the recycling benefits are all weighted by the welfare weights of the different economic agents affected. In this case even the weak form of the double dividend proposition no longer necessarily holds*". In this context increasing lump-sum welfare payments may even be more appropriate than reducing distortionary taxes mainly borne by the rich even if the latter strategy entails clear efficiency gains. Proost and Van Regemorter develop a dynamic (two period) Applied General Equilibrium (AGE) model for a small open economy (Belgium) and compare two alternative domestic tax reform policies for two macroeconomic regimes: flexible wages and fixed wages at home. They introduce a measure of inequality aversion in their model and compare the welfare variation obtained when no inequality is taken into account with the case in which inequality aversion is taken into account. When income inequality aversion is considered, the gross costs are much smaller than when no inequality aversion is taken into account and recycling the revenues through lump-sum transfers generates a small positive total welfare effect. The second dividend, on the other hand, is strongly negative as recycling through lowered Social Security Contributions (SSC) has no efficiency gains but has adverse equity effects. Reducing SSC as

a way to recycle the tax revenues benefits much more the rich than the poor. Of course these results rely heavily on the hypothesis of the model. However the lesson to be learned is that in order to test for the double dividend hypothesis researchers should broaden concepts to include income distribution dimensions and one might find that the efficiency effects of recycling may be dominated by equity effects.

In this case policy makers could maybe incorporate income distribution issues both in the *taxation design*, in the *revenue recycling* and in the *compensation measures design*.

Taxation design: Motor Fuel Taxes seem to be an instrument of environmental policy that combines efficiency and equity issues. The Microsimulation study shows that, the Transport Fuels Tax is the only one to be progressive among the group of 4 products taxed (electricity, natural gas, heating oil, motor fuel). It is true that transport fuels are highly taxed in Germany (see table 2 of the Bork paper), but the case study also shows that people mostly hit by the reform: pensioners, students and unemployed, are those that are less likely to own a car and to use it every day for instance and, therefore, an increase in taxation of car fuels, or even on car ownership, is likely to hit them relatively less. A study by Smith (2000) on Motor Fuel Taxes in Britain shows that people in the lowest expenditure groups are likely not to own a car and when only car owning households are taken into account the tax turns out to be regressive, whereas when this distinction is ignored, the distributive effect is reversed. Moreover, the transport sector is deemed to be the one most responsible for, at least, some kind of greenhouse gas emissions and thus, should the demand for transport fuels be not so unelastic, that measure is also likely to produce a strong environmental benefit.

Revenue Recycling: increasing lump-sum welfare payments may be more appropriate than reducing existing distortionary taxes mainly borne by the rich.

Compensation Measures: these should be addressed to the social groups mostly hit by the reform. In this respect the simulation of first order financial effects of an ETR is very useful in order to identify the groups most affected by the reform. In the German case the compensation measures could take the form of increased unemployment benefits; increased pensions for people in the lowest income groups; increased benefits for students at low income levels.

I would perhaps reduce the number of households dimensions across which the financial burden is calculated and I would use the same model to simulate alternative designs of the reform and of the compensation measures that build on the results already obtained.

3. My work on the welfare and distributive effects of carbon taxation in Italy only calculates gross welfare costs without taking into account any sort of Revenue Recycling, though this is

considered by the Italian Law that has introduced the Carbon Tax. This is equivalent to the Fiscal Revenues from the reform being discarded and helps identifying the crude distributional impact of the tax. The reform hits mainly transport fuels and heating fuels, through increases in the excise rates of these products to be achieved with a smooth transition from 1999 to 2005. Heating fuels are taxed relatively less and, in addition, the additional revenues generated are partly recycled by compensating households living in climatically disadvantaged regions for the increased burden of taxation.

Transport fuels were already heavily taxed in Italy prior to the reform and heating fuels were also taxed at very high levels. The welfare gross cost of the reform calculated for 5 households types and 5 expenditure levels does not appear to be regressive as, for each household profile, the welfare loss increases with income. This might be due to the fact that the reform has mainly hit transport fuels. If households in the lowest expenditure levels do not own a car the tax burden might be progressive as noticed by Smith (2000). Moreover price responses play an important role in the Italian case: the price and income elasticities for transport fuels, calculated at the sample mean, are very high. This could be due to the fact that alternative transportation options are available. In Italy cars have been for a long time a Status Symbol rather than a necessary means of transportation; public means of transportation are diffused and rather efficient and distances are much shorter than, for instance, in the United States where the demand for fuels is more unelastic (West and Williams, 2002, p. 7, find that the price elasticity of demand for gasoline is in the range -0.5, -0.7 except for the top quintile of the income distribution).

These responses are incorporated in the calculation of the Italian welfare loss that is obtained through the Compensating Variation, an exact measure of welfare change that takes into account demand responses (Deaton and Muellbauer, 1980). One may also observe that the tax burden seems to affect mainly households with one or two adults and decreases for larger families. This could be explained by the fact that the tax burden due to car widespread use, for instance, is more distributed as the number of households increases, because the number of car owned and used does not increase linearly with the number of households members.

Thus, the way people react to policy changes seems to be crucial.

4. The calculation of first order financial effects is a useful first step towards the assessment of the distributional effects of environmental policies. It may help, *ex ante*, to shape both the taxation design and the type of RR. However it does not take into account the fact that people react to policy measures, and the resulting effect may be different from what can be inferred from the calculation of straightforward first order financial effects. The author himself

recognizes that he probably overestimates the regressive effect because behavioural responses are not included (Bork, 2002, p. 22). As West and Williams (2002, p. 19) point out in their welfare calculations for the United States: *"Omitting demand responses may lead one to substantially overstate the welfare cost of the gas tax. Omitting demand responses also makes the gas tax appear more regressive. Own price gas demand elasticities are relatively similar across most of the income distribution, but gas demand for the top quintile is substantially less elastic. Thus the relative burden of the top quintile is larger under measures that include demand responses making the tax more progressive."*

When information on the expenditure function of households is available (i.e. when data on total expenditure in the time interval considered; expenditures on the goods among which the demand system is divided and prices for the same goods are available) the calculation of exact measures of welfare change, such the Compensating or Equivalent variation, is fairly easy and gives more reliable information on the welfare changes and on the distribution of the burden of a price change. It is now much easier to estimate complicated demand systems that are explicitly derived from utility maximization and from which the parameters of the expenditure function (necessary to calculate the CV or EV) can be derived directly.

References

- [1] Bork, C. (2003) Distributional Effects of the Ecological Tax Reform in Germany - An Evaluation with a Microsimulation Method. Prepared for the OECD workshop on the Distribution of Benefits and Costs of Environmental Policies; Paris, 4-5 March 2003.
- [2] Deaton, A. and J. Muellbauer (1980) Economics and Consumer Behaviour. Cambridge University Press, 1980.
- [3] Goulder (1995) Environmental Taxation and the Double Dividend: a reader's guide. International Tax and Public Finance, 2, pp.157-183.
- [4] Proost, S. and D. Van Regemorter (1995) Double Dividend and the Role of Inequality Aversion and Macroeconomic Regimes. FEEM Working Paper n. 95/56.
- [5] Smith, Z. (2000) The Petrol Tax Debate. Briefing Note n. 10/2000. The Institute for Fiscal Studies, London, UK.
- [6] West, S. and R.C. Williams (2002) Estimates from a consumer demand system implications for the incidence of environmental taxes. NBER Working Papers 9152.