CGE Analysis and Economic Reasoning: Reply to Gliesmann and Ruocco

STEFAN FELDER* and RETO SCHLEINIGER

The paper on which GLIESMANN and RUOCCO (GR) comment was written for a conference on trade, organized by the Swiss Association for Statistics and Economics in Geneva, 1995. The paper aimed at investigating how the inclusion of trade features in the original BOVENBERG/DE MOOIJ (1993) general-equilibrium model affects the scope for a double dividend in environmental policy. It started from the JENSEN (1994) model, which extended the BOVENBERG/DE MOOIJ model with a non-traded, energy-intensive commodity and added stepwise foreign labor supply and internationally immobile capital. These two extensions resulted in intuitively appealing results, such that the foreign labor's share in the tax burden increases by the environmental tax reform, when the real wage rate for foreigners increases. Another result was the rather surprising finding that taxing energy in production can work as an implicit subsidy on capital. Consequently, rents on (fixed) capital supply are not taxed and no double dividend occurs. This finding implies that energy and capital are non-cooperative production factors (i.e. their cross price elasticity is positive since the substitution effect outweighs the output effect), a case that is explicitly excluded by BOVENBERG/DE MOOIJ (1995).

GR's comment does not consider these trade issues but concentrates solely on the JENSEN model. First, GR claim that the benchmark equilibrium is not consistent. Now, if the numbers in Table 2 of GR are rounded to one decimal place, one ends up with the numbers given in Table 1 of FELDER and SCHLEINIGER (1995), except for K_D where the difference is 0.1. We cannot see any use in presenting five decimal places as GR do. The data set we used is that of JENSEN, which is (contrary to what GR claim) an extension of the BOVENBERG/DE MOOIJ model based on the input output table for the Netherlands.

GR write «When trying to replicate the numerical results as given in Table 2 in FS, it turned out that they consider a 50 or 100 per cent increase in the gross (i.e. tax inclusive) prices of the dirty commodity on the one hand, the energy input on the other»[1] (p. 179). We have to concede that we did not declare our tax reform correctly: we did in fact simulate a 50 and 100 percent increase in the gross price, as introduced by BOVENBERG/DE MOOIJ (1993).

In footnote 5, GR criticize our using percentage changes in utility and not the equivalent variations as we claimed. Now, given the properties of the utility function

* Institut füt empirische Wirtschaftsforschung, Blümlisalpstr. 10, 8006 Zürich.

1. The wording of this sentence is strange, to say the least, as GR had the MPSGE-code of our model when they started to work on their comment. The computer code makes it quite clear what kind of tax reform we performed.

(weak separability between leisure and consumption, homothetic), the percentage change in utility equals the percentage change in the equivalent variation (VARIAN, 1984): expenditure function for the CES utility function, p. 130; definition of the EV, p. 264).

After having dealt with these miscellaneous points, which – uncontended – could have given the reader the impression that we did a poor job when writing the paper, we would like to address GR's main point: CGE analysis and economic reasoning.

GR criticize us of a somewhat naive handling of the BOVENBERG/DE MOOIJ (1994) result in the AER that the double dividend claim fails. In our paper, we just quoted from their paper; hence, we cannot be «simply wrong» (GR, p. 177). It is quite clear that there is scope for a double dividend in environmental policy. The AER article of BOVENBERG/DE MOOIJ may in fact be misleading because it gives the wrong impression that a double dividend is generally not possible. Since BOVENBERG/DE MOOIJ preoptimise the tax structure (a wage tax, which is equivalent to a uniform consumption tax, is second best when the utility function is homothetic and leisure is weakly separable from consumption), any tax reform within their model must involve a welfare loss. Whenever the existing tax structure is not second best, the possibility arises that an environmental tax increases welfare. Often, however, the environmental tax is a third best instrument only, which works as a dummy in a situation where the direct route to achieve an efficiency improvement is blocked. It is therefore fair to state that the literature initiated by the BOVENBERG/DE MOOIJ AER article has considerably narrowed the domain for the double dividend.

We explained the simulation results referring to the incidence of tax reforms. We did so not least because too often – and not only in practice – economic reasoning on tax reform ignores the question who finally bears the burden of taxation (see PEARCE, 1991). Whenever a tax change reallocates the tax burden such that it remains with an economic agent who reacts inelastically, the possibility of a welfare gain arises. In our simulation, a tax increase on the dirty consumption good increases the consumer price index, thereby lowering real transfer income. Thus, since the nominally fixed transfer income bears a higher tax burden, the efficiency of the tax system increases. An increase in the tax on energy input in production, on the other hand, while only slightly increasing the price of composite consumption, substantially lowers energy demand. This, in turn, reduces the marginal product of labor and lowers labor demand. In this scenario, the tax burden on elastically supplied labor increases, and the overall distortion in the tax system rises.

GR propose instead an economic reasoning based on the «optimal taxation literature». We feel that the two approaches do not contradict each other but should be seen as complementary.[2] In some cases, however, the tax incidence approach appears to be

2. Besides, GR are not immune from a naive use of optimal taxation rules. Their claim «that there is no room for any input taxation in a second best framework» (p.181) remains on the assumption that there are no pure profits in production. When capital is immobile and its supply fixed (as in model extension 1 of our paper) a 100 percent profit tax is optimal.

superior. As an example, consider the taxation of consumer goods in the BOVENBERG/DE MOOIJ model. The benchmark tax rates for the clean and dirty commodities are 15 and 21 percent. GR note that the optimal consumption tax rates should be uniform. In a simulation experiment, GR calculate the uniform (second-best) tax rate to be 76 percent (see Table A3). When the labor tax rate and the tax rate on the clean commodity are fixed at their respective benchmark levels, the optimal (third-best) tax rate on the consumption tax is 104 percent (see Figure 1). Apparently, the optimal tax rule of uniform consumption tax rates is of no use when some tax rates are fixed. We would explain the high tax rate on dirt consumption in the third-best scenario with its incidence on transfer income (taxing consumption works as an implicit tax on transfer endowments).

Finally, GR deplore the paper's lack of a sensitivity analysis. The purpose of our paper was not to test the sensitivity of the results with respect to key parameters, but to investigate how extensions to the original BOVENBERG/DE MOOIJ model affect the welfare results of environmental tax reform. We therefore welcome GR's contribution not least for providing a sensitivity analysis of our paper's base model.

REFERENCES

BOVENBERG, LANS A. and RUUD A. DE MOOIJ (1993), Environmental Policy in a Small Open Economy with Distortionary Labour Taxes, Research Memorandum 9304, Research Centre for Economic Policy, Erasmus University Rotterdam.

BOVENBERG, LANS A. and RUUD A. DE MOOIJ (1994), Environmental Levies and Distortionary Taxation, *American Economic Review* 94, 1085–1089.

BOVENBERG, LANS A. and RUUD A. DE MOOIJ (1995), Environmental Taxation and the Double Dividend: The Role of Factor Substitution and Capital Mobility, Ministry of Economic Affairs in the Netherlands, Working Paper Series II, Nr. 258.

FELDER, STEFAN and RETO SCHLEINIGER (1995), Domestic Environmental Policy and International Factor Mobility: A General Equilibrium Analysis, *Swiss Journal of Economics and Statistics* 131, 547–558.

GLIESMANN, CHRISTIAN and ANNA RUOCCO, Computational General Equilibrium Analysis and Economic Reasoning, *Swiss Journal of Economics and Statistics* 133 (2/1).

JENSEN, JESPER (1994), Carbon Taxes and the Double Dividend in a Small Open Economy: A Theoretical and Applied Analysis, Master Thesis, University of Colorado at Boulder.

PEARCE, D.W. (1991), The Role of Carbon Taxes in Adjusting to Global Warming, *Economic Journal* 101, 938–948.

SANDMO, AGNAR (1974), A Note on the Structure of Optimal Taxation, *American Economic Review* 64, 701–706.

VARIAN, H.R. (1984), *Microeconomic Analysis*, 2nd edition, Norton: New York, London.

ZUSAMMENFASSUNG

Die Replik räumt eine Reihe von Missverständnissen aus. Sie verteidigt das ökonomisches Argumentieren auf der Grundlage der Inzidenzanalyse gegenüber einer ökonomischen Intuition, die sich ausschliesslich auf die Theorie der optimalen Besteuerung stützt. Sie begrüsst den Beitrag von Gliesmann und Ruocco, insbesondere deren Sensitivitätsanalyse, als eine wertvolle Ergänzung zur Literatur der doppelten Dividende.