



NORTH-HOLLAND

# Environmental Tax Reform and Producer Foresight: An Intertemporal Computable General Equilibrium Analysis

Brita Bye, *Statistics Norway, Research Department*

This article analyzes the nonenvironmental welfare costs of an environmental tax reform using a numerical intertemporal general equilibrium model for the Norwegian economy. By exploiting existing tax wedges in the labor market and between consumption and saving, the total nonenvironmental welfare effect of the tax reform is positive. The article also analyzes how imperfect price expectations for the investors in real capital influence the total welfare costs of the tax reform. The welfare effect is the same due to exploitation of initial distortions, but the transitional dynamics are quite different in the two paths. © 2000 Society for Policy Modeling. Published by Elsevier Science Inc.

*Key Words:* Dynamic general equilibrium analysis; Environmental tax reforms; Imperfect expectations.

## 1. INTRODUCTION

By increasing environmental taxes to curb pollution and using the revenues to cut distortionary taxes on income, it may be possible to obtain a “double dividend,” i.e., not only a better environmental standard, but also a less distortionary tax system, thereby improving economic welfare. Goulder (1994) and Christiansen (1996) discuss different interpretations and definitions of the term “double dividend,” and give an overview of the literature.

In recent years there has been increasing concern about the potential contributions of carbon dioxide (CO<sub>2</sub>) emissions to the greenhouse effect and global climate change. A carbon tax, a tax

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*Address correspondence to Brita Bye, Statistics Norway, Research Department, P.O. Box 8131 Dep., N-0033 Oslo, Norway.*

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on fossil fuels—coal, oil, crude oil and natural gas—in proportion to their carbon content, will internalize these externalities associated with fossil fuel combustion. It is clear that the introduction of a carbon tax combined with changes in other taxes will, through their effects on prices and costs, have long-term welfare effects through changing the rate of capital accumulation and economic growth. Hence, the suitable model framework is intertemporal general equilibrium models that generate optimal consumption-savings paths. Intertemporal general equilibrium analyses of such environmental tax reforms for the United States are presented in Jorgenson and Wilcoxon (1993), Goulder (1995), and Bovenberg and Goulder (1995).

Recent Norwegian analyses of environmental tax reforms as Brendemoen and Vennemo (1994), Håkonsen and Mathiesen (1995), and Mathiesen (1996),<sup>1</sup> are all based on static general equilibrium models with exogenous stocks of real and financial capital. Hence, these analyses only consider reallocation effects of the tax reforms, given the resource constraints, and do not consider the effects of the tax reforms on the accumulation of real and financial capital. In addition the models allow for terms of trade gains from domestic tax increases, a property that is much criticized (see, e.g., Norman, 1990). There is a need for additional analyses that take into consideration the dynamic effects of environmental tax reforms and where the tax reforms do not give rise to terms of trade gains. The analyses by Jorgenson and Wilcoxon (1993), Goulder (1995), and Bovenberg and Goulder (1995) all use intertemporal models, but a small open economy as the Norwegian behaves and reacts differently under tax reforms, compared to a large economy as the U.S. This demands another model specification that implies that analyses on the Norwegian economy will give additional insight into measuring and interpreting the effects of environmental tax reforms. Compared to these U.S. analyses, the small open economy framework implies that the interest rate and prices on export are given in the world market. The assumption of internationally mobile capital implies that net savings in financial capital may be uncorrelated with net investment in real capital. In addition, the tax rates in Norway are generally higher. The marginal excess burden of labor taxation is especially high (see Brendemoen and Vennemo, 1996). All these elements may

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<sup>1</sup> See also the Ministry of Finance (1996).

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