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Green taxes and double dividends in a dynamic economy

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Abstract

This paper examines a revenue neutral green tax reform along the lines of the double dividend hypothesis. Using a dynamic general equilibrium model calibrated to the US economy, we find that increasing gasoline taxes and using the revenue to reduce capital income taxes does indeed deliver both types of welfare gains: from higher consumption of market goods (an efficiency dividend), and from a better environmental quality (a green dividend), even though in the new steady state environmental quality may worsen. We also find that, given the available evidence on how much households are willing to pay for improvements in air quality, the size of the green dividend is very small in absolute magnitude, and much smaller than the efficiency dividend.

JEL classification: H23; J90; E62

Keywords: Green tax; Dynamic economy; Double dividends

1. Introduction

Green tax reform has become a major policy issue in the OECD countries. A number of countries such as Sweden, Denmark, the Netherlands, the United Kingdom, Finland, Norway, Germany and Italy all have implemented explicit environmental tax reforms.

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The stakes are large. Tax revenues raised from green taxes average about 2% of GDP, but exceed 4% of GDP in some OECD countries. According to Baker and Elkins (2003), the estimates of the impact on US GDP by complying with the Kyoto Protocol vary between a decrease of about 2.5% and an increase of 3% of GDP. The Intergovernmental Panel on Climate Change (in IPCC, 2001) asserts that, in order to comply with the prescribed limits of the Kyoto Protocol, the carbon tax required in the US would be associated with a .45–1.96% decrease in GDP by the year 2010.

Results from a poll conducted in the US in 1998 indicate that revenue recycling, that is, using new revenues from green taxes to decrease pre-existing distortionary taxes, may make green taxes politically feasible (see International Communications Research, 1998). Revenue recycling raises the possibility that green tax reform may yield a double dividend. The double dividend hypothesis is nicely exposited in Goulder (1995a) and Bovenberg (1999). Apart from increasing welfare due to lower pollution externalities, a 'green' dividend, environmental taxes raise revenue that can be used to lower other pre-existing tax distortions, resulting in welfare gains from a smaller deadweight loss of the tax system, or 'efficiency' dividend. Because of its appealing nature, environmental tax reform has been labeled a 'no regret option.' This paper examines the effects of a particular environmental tax reform in the US along the lines of the double dividend hypothesis.

For policy purposes there are two strands of literature that are of direct relevance to this paper, one is normative, the other is positive. The first strand is concerned with what is the optimal tax structure. In particular, it examines whether in the presence of preexisting distortions, the optimal environmental tax lies above its Pigovian level. Here, the distortionary effect of increasing green taxes above the level at which the marginal pollution damage is internalized should be compared to the efficiency gains from reducing other taxes. In an influential paper, Bovenberg and de Mooij (1994) find that, although environmental quality improves, the efficiency dividend does not materialize. This important result has become a stepping stone, and has proved robust to a number of extensions, including capital accumulation dynamics (e.g. Bovenberg and Goulder, 1996; Lans Bovenberg and Smulders, 1996). A second strand of this literature is positive in nature. It asks what are the specific economic effects of a particular, perhaps hypothetical, policy reform. In a very influential paper in macroeconomics, Lucas (1990) finds that shifting capital income taxation completely to labor income taxation has negligible effects on long-run economic growth in a model of endogenous growth which is calibrated to the US economy.

In environmental economics, the papers that fall in this category are Jorgenson and Wilcoxen (1993a) and Jorgenson and Wilcoxen (1993b). Jorgenson and Wilcoxen (1993a) estimate a model for the US using post war data. Simulations from this model suggest that a carbon tax would have qualitatively different impacts on long-run GDP depending on the preexisting taxes that are reduced. The authors also note that the costs of keeping CO_2 emissions below predetermined standards would increase with higher levels of GDP growth. A similar possibility was already mentioned by Koskela and Schob (1999), and considered in more detail by Bayindir-Upmann and Raith (2003), who showed that, in a distorted labor market, substituting green taxes for labor taxes would increase employment and output and eventually produce a detrimental effect on the environment. Goulder (1995b) used a calibrated model to consider different tax recycling policies after a carbon tax was imposed, and found that green tax reform will invariably reduce the efficiency of the tax system. Zhang (1998) uses a dynamic general equilibrium model to assess the macroeconomic effects of reducing carbon dioxide emissions in China.

The current consensus of the effects of green tax reform is summarized by Bovenberg in his preface to de Mooij (2000), "Whereas the second dividend may be in doubt, the first dividend (i.e. a cleaner environment) remains a powerful reason for the introduction of pollution taxes." This claim is strengthened by a report by the OECD (2001), in which in 65% of all simulations