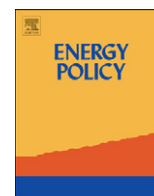




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## Reevaluating the first and the second dividends of environmental tax reforms

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## ABSTRACT

There is increasing global interest in market-based climate change policies following the last elections in the United States. In this context an Exxon Mobil chief executive came out in favour of a carbon tax. This paper is concerned with the welfare analysis of Environmental Tax Reforms (ETR), and takes up the claims for the need of an unambiguous and operative definition of the double dividend both for empirical purposes and political advisement. In this paper, we contest the usual definition of the second dividend and its assimilation to an “efficiency dividend”. We propose alternative definitions by suggesting a different splitting of the total welfare variation between the first and the second dividend in order to isolate the efficiency effects of the ETR. The new definitions become clearly understandable and easy for economic and policy interpretation. Concepts like “weak” and “strong” double dividend turn out to be unnecessary. Finally, we analyze ETR for the US economy to illustrate the advantages of the proposed definitions for policy implementation.

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## 1. Introduction

The United States 2008 elections not only provided a change in the presidency, but they also brought about a change in US environmental policy agenda. Now there may be an opportunity ahead for ratifying new post-Kyoto protocol. As a result there is increasing global interest in market-based climate change policies. Europe has taken the lead during the last two decades by implementing nationally-based green tax reforms (Denmark, Germany, Finland, Norway, Sweden, the Netherlands, and the UK). More recently, in 2005, the EU launched the Emission Trading Scheme (ETS).

Despite its benefits, however, the EU ETS has presented some drawbacks, such as the inability to cope with the “diffuse sectors”, which represents as much as 50% of greenhouse emissions.<sup>1</sup> Senior European Commission official, Jos Delbeke, has announced that EU member states must look seriously at introducing carbon taxation to help cut greenhouse gas emissions; ‘*the taxation debate is not running at EU level because we have chosen a market, but it can run at national level. Indeed it must, because the EU ETS is not going to do everything*’.<sup>2</sup> These drawbacks have increased interest

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in taxation as an additional approach to cutting emissions.<sup>3</sup> The superiority of green tax reforms for environmental protection (see Parry et al., 1999, or Aldy and Pizer, 2009), joined with the fact that energy taxes in non-European countries are relatively low, makes them an attractive policy option outside Europe (Stern, 2007).<sup>4</sup> In this context the Exxon Mobil chief executive Rex Tillerson came out in favour of a carbon tax in a speech at the Woodrow Wilson Center on January 8, 2009.

The appeal of considering environmental taxes is that, additionally, they might play an important role in easing political constraints regarding the reform of suboptimal tax systems. This advantage has been recognized by several authors, such as Bovenberg and Goulder (2002) who assert that “[...] environmental taxes are the lubricating oil that makes possible a tax reform to eliminate particularly bad taxes”, an attractive idea in today troubled times for developed economies (facing a scenario of economic crisis and growing public deficits), where new policy

<sup>3</sup> The 2009 UK Budget contains a limited environmental tax reform (shift of tax from goods to bads). Denmark has moved in the same direction after the collapse in global oil prices. Fuel taxes and other energy taxes will also be increased in Sweden to help reach its 40% emission reduction target (from 1990’s level) by 2020. A similar debate exists in Ireland (Callan et al., 2009).<sup>4</sup> In fact, this motivation might have inspired some recent bills: (i) the Canadian province of British Columbia introduced in 2008 a new carbon tax coupled with reductions to income and business taxes; (ii) there is one proposal in the Major Greenhouse Gas Mitigation Bill in the US 110th Congress (December 3, 2008) for a green tax reform based on an economy wide tax on CO<sub>2</sub> content of fossil fuels coupled with payroll tax rebates (see Aldy and Pizer, 2009); (iii) the draft Energy Tax Bill in Taiwan during the year 2007 included alternative green tax reforms (Bor and Huang, 2010).

strategies must be implemented to recover economic growth rates and stabilize the public budget.<sup>5</sup>

Nonetheless, before taking green tax reforms seriously, a unified theoretical method or criteria is required, prescribing the appropriateness of policies for implementing environmental taxes and, additionally, for recycling their revenues. This requires a clear assignment of costs and benefits to each policy. In this paper, we propose an unambiguous new definition of the double dividend both for empirical purposes and political advisement, relying on welfare analysis.

The case for Environmental Tax Reforms (ETR) is well-rooted in academic research on the double-dividend hypothesis within the so-called “environmental” view (see Tullock, 1967, Terkla, 1984, Lee and Misiolek, 1986, and Pearce, 1991).<sup>6</sup> These authors were mainly interested in the first dividend, assuming that reducing distorting taxes results in a welfare improvement, i.e., a positive second dividend. During the 1990’s a different strand of the literature, usually known as the “public finance” view, placed the discussion into the realm of optimal taxation in the general equilibrium framework previously developed by Sandmo (1975). Taking for granted that setting an environmental tax improves the welfare related to the environment, i.e., a positive first dividend is assumed to be achieved, this line of research was mainly interested in the possibility of attaining Goulder (1995)’s *strong double dividend*,<sup>7</sup> and concludes that a strong double dividend occurs under rather “limited” circumstances.<sup>8</sup>

In our view, such a conclusion may stem from how the standard definitions are characterized in the literature of the double dividend. While the *first dividend* strictly covers the (externality) environment-related welfare changes, the *second dividend* comprises the remaining non-environmental welfare changes, which considers all the non-environmental benefits and costs of fully implementing ETR. These definitions are problematic for two reasons. First, some researchers have established an erroneous straightforward link between the sign of the second dividend and the efficiency costs of ETR.<sup>9</sup> The approach followed in the double dividend literature (see Section 2 in the survey by Park and Pezzey, 1999), may lead to misinterpretations when assessing environmental policies.<sup>10</sup>

Second, many authors have considered a myriad of measurements for implementable and testable purposes to gauge non-environmental welfare changes, such as fiscal benefits<sup>11</sup>;

economic growth in terms of GDP and consumption<sup>12</sup>; increased output and economic welfare<sup>13</sup>; compensating variation adopted from the capital income taxation literature<sup>14</sup>; or a mixture of them.<sup>15</sup> Some empirical researchers, e.g. Patuelli et al. (2005), explicitly recognize the difficulty in undertaking an empirical analysis of the double dividend as long as “there is no ‘standard’ definition of the double dividend (or a standard method of recycling environmental tax revenues) in the literature.” (p. 566–567), and claim for “the choice of an operative definition of the double dividend to be kept constant throughout our [empirical] analyses.” (p. 576)

The main contributions of this paper are the following: first, we point out the normative problems arising from the usual definition of the “double dividend” in the literature on green tax shifts. Second, we propose alternative definitions by suggesting a different splitting of the total welfare variation between the first and the second dividend in order to isolate the efficiency effects of the ETR. Thus, we contest the usual definition of the second dividend and the assimilation of the second dividend to an “efficiency dividend”. The new definitions display important advantages: (i) they avoid any misleading interpretation regarding overestimation of the efficiency costs; (ii) both dividends become clearly understandable and easy for economic and empirical analysis, as well as for policy assessment as they provide information by itself and not as a partial view of the whole picture; and, (iii) concepts like “weak” and “strong” double dividend turn out to be unnecessary. Finally, we analyze ETR for the US economy to illustrate the advantages of the proposed definitions for political implementation.

The paper is organized as follows: Section 2 presents the competing approaches in the double-dividend literature. In Section 3 we demonstrate that the definitions proposed by some researchers belonging to the “public finance” approach entail an overestimation of the efficiency costs of green taxes; then, we propose a definition for the first and second dividends. Section 4 undertakes the empirical research illustrating the differences between the two approaches. Finally, Section 5 summarizes conclusions and policy implications.

## 2. The double dividend of environmental tax reforms

In this section we will analyze the welfare effects of ETR. Consider that there exist  $H$  households in the economy. Despite not being necessary, for the sake of easier exposition we will assume that each household  $h$ ’s preferences can be represented by a continuous utility function that is separable between the consumption of environmental quality ( $E$ ) and the consumption of other goods, such as leisure ( $l$ ) and private goods ( $c$ ),<sup>16</sup> i.e.,  $U^h(c^h, l^h, E) = u^h(c^h, l^h) + v^h(E)$ .

Suppose there is a Public Tax Office, an agency authorized by the central government to tax private agents, which finances some lump-sum transfers to households, i.e.,  $TR^h$  for  $h \in H$ . The tax menu consists of taxes on income ( $\tau$ ), and on pollution ( $t_E$ ). The budget constraint of the public sector is  $\sum_{h=1}^H TR^h + G = t_E E + \tau \sum_{h=1}^H M^h$ , where  $M^h$  is the income received by household  $h$  and  $G$  the public spending.

<sup>5</sup> Interestingly, a special issue in Energy Policy (vol. 34, 2006) was devoted to the social and political responses to ecological tax reform in Europe. This issue is beyond the scope of this piece of research. Furthermore, environmental taxes could raise extra revenues to implement new public programs (i.e. the recent USA national health system debate).

<sup>6</sup> We follow Schöb (1997)’s terminology who has used the terms *environmental* and *public finance approach* to classify the double-dividend literature, terms also suggested by Pezzey and Park (1998, Section 2) among others. Alternatively, it might be more precise to speak about the first intuitions regarding the possibility of a double dividend (or *partial equilibrium approach*) and the double-dividend theory (or *general equilibrium approach*).

<sup>7</sup> That is, whether an environmental tax reform enhances not only the environmental quality but also non-environmental welfare, so that gross efficiency costs are negative after substituting an environmental tax for a distortionary tax (Bovenberg, 1999).

<sup>8</sup> See Goulder (1995), Bovenberg (1999) and Bovenberg and Goulder (2002) for excellent surveys.

<sup>9</sup> For instance, Bovenberg (1999) denotes all gross costs as efficiency costs.

<sup>10</sup> Such as overestimation of the efficiency costs of ETR. In this respect, it is illustrative that Bovenberg and Goulder (2002) have to state, to avoid misleading interpretations, that “these distortions in consumption patterns or input choice (primary costs) are desirable on environmental grounds” (p. 1501). They also recognize that “the failure of the double-dividend claim does not imply that green tax reforms are inefficient.” (p. 1502).

<sup>11</sup> For example, Morris et al. (1999).

<sup>12</sup> See Garbaccio et al. (1999).

<sup>13</sup> See Jorgenson and Wilcoxon (1993).

<sup>14</sup> See Fernández et al. (2010) and Glomm et al. (2008).

<sup>15</sup> Bovenberg and Van der Ploeg (1998) or Chiroleu-Assouline and Fodha (2005).

<sup>16</sup> This assumption is common in the literature, since without additive separability it is hard to agree on how to decompose the effect of a revenue-neutral emission tax into an environmental dividend and a second dividend from reduced tax distortion (see Park and Pezzey, 1999, p. 175). Loosening this assumption, however, is not problematic for the definitions proposed in this work.

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