Green tax reform in Belgium:
Combining regional general equilibrium and microsimulation

Work in progress

This paper provides a general equilibrium analysis of a revenue-neutral tax reform in a spatial setting with various levels of government. A Computable General Equilibrium (CGE) model is used to generate numerical results for the case of Belgium and its three regions. We simulate a revenue-neutral environmental tax reform by increasing energy-related taxes and decreasing social security contributions on the employer’s side. We show how different regional sectoral compositions alter the impact of a (federal or regional) tax reform. Furthermore, we investigate the potential for strong, weak and employment double dividends. Next, we construct a top-down link with a non-behavioural microsimulation model (EUROMOD) to analyse redistributive and poverty effects.

Keywords: Regional Policy Analysis, General Equilibrium, Microsimulation, Double Dividend

JEL Codes: C68; D3; D58; D60; H23 ; H31 ; H77; R13
Extended abstract

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Introduction and overview

A continuous debate exists on the optimal tax revenue scheme in a federal state. Recent country recommendations of the European Commission, for instance, include the advice to shift taxes from labour to environmental taxes². A regional Computable General Equilibrium (CGE) model can provide an interesting tool to analyse and quantify the effects of alternative ways to organise revenue raising and spending authorities within a union or a federal state. Furthermore, this type of model enables us to investigate the impact and incidence of policy measures at the regional level.

Environmental tax reforms and work on the double dividend - the idea that a tax shift from other distortionary taxes to environmental taxes can generate both environmental benefits and an increase in non-environmental welfare - has mostly been analysed in a general equilibrium framework (Goulder (1995), Bovenberg (1999)). Recently, general equilibrium models are increasingly used for regional policy analysis (Andre et al. (2005); Partridge and Rickman (2010); for an earlier overview see Partridge and Rickman (1998)). These multi-regional models provide the possibility of an analysis of the impact of regional policy measures within and across jurisdictions. This paper uses a regional CGE model for Belgium and its regions to analyze the impact of alternative taxing schemes in the federation. We study the effects of increasing energy-related taxes and reducing the social security contributions. We will study the potential for a weak, strong and employment double dividend.

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Often concerns are raised on the redistributive impact of the reform under study in this paper. Pensioners, for instance, do not benefit directly from the reduction in social security benefits. In addition, the poor usually spend a higher fraction of their income on necessities as heating, so they may be affected disproportionately by an energy tax. A microsimulation model, due to its high level of detail compared to a CGE model, is particularly well-suited to study the impact on different households and thus on redistribution. We establish a link between the CGE and the microsimulation model EUROMOD to investigate the potential regressive nature of the tax reform.

**The General Equilibrium Model**

This paper develops a regional CGE model for Belgium and its regions. We expand the GEM-E3 model by including the regions Flanders, Wallonia and Brussels separately. To this end, we use regional input-output tables, household accounts, regional government accounts and regional energy balances as data inputs. Belgian’s regions provide a significant degree of heterogeneity in sectoral composition. For instance, Brussels is more service-oriented, Flanders has a relatively more important share of consumer goods industries and heavy industries (e.g. metal) play a more important role in Wallonia. This regional differentiation is taken into account by the data used.

Furthermore, the regions are strongly connected via the labour market: on a daily basis, the capital region of Brussels attracts approximately 237000 commuters from Flanders and approximately 133000 workers from Wallonia. In our model, labour is mobile between sectors and regions. Since migration is absent from the model, this labour mobility boils down to interregional commuting flows. Capital is also mobile between sectors and regions, but the total capital stock is fixed within one period of time.

In addition, the regional and federal governments are strongly interlinked via the public finances, embodied in the Special Financing Act. The fiscal arrangement between federal and regional governments, encompassing the allocation and redistribution of (federal) funds, is modelled explicitly.

These interregional dependencies and differences make Belgium an interesting case to analyse.

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3 For a more detailed discussion see Decoster (1995) or, more recently, Rausch et al. (2011).
4 http://www.ecmodels.eu/index_files/Page552.htm
Our CGE model is of the Shoven and Whalley (1972) type. A representative consumer maximises intertemporal utility (Stone-Geary utility function) under an intertemporal budget constraint. He therefore chooses the amount of time he wishes to spend on leisure activities, how much to consume and how much of his income he desires to save. We model 13 consumption categories, 2 of which are durables. The conventional Armington assumptions apply. Within Belgium, we assume there is a common goods market.

Firms’ production technology is modelled by a nested CES (constant elasticity of substitution) specification. Labour and capital are the primary inputs. In addition, energy and materials serve as inputs for the production process. The stock of capital is fixed within a period, but capital is mobile between sectors and regions. Firms attain the desired stock of capital in next periods by investing. Therefore the model is dynamic through accumulation of capital stock over time. The Belgian economy is aggregated into 18 industry sectors.

Government behaviour is largely exogenous. However, both federal and regional governments face their individual budget constraints and dispose of separate tax instruments, which reflects fiscal reality in Belgium (including the Special Financing Act, as mentioned above).

Analysis

The green tax reform analysed in this paper entails an increase in energy-related taxes. In particular, we raise taxes on energy as an input in the production process one the hand; on the other hand, we also increase the tax on consumption of energy by the households, that is linked to durables (energy for transport and heating). This energy tax increase can be simulated at the federal or the regional level. The additional tax revenue is recycled through a decrease in social security contributions on the employer’s side. We study the mechanisms and channels through which the federal tax reform propagates to the regional level and why the outcome might differ between regions. We also look into the effects of a regional tax reform across jurisdictions.

Simulating various scenarios enables us to quantify and understand the impact and propagation of the measure in the regions. When comparing and discussing scenario outcomes, specific attention goes to the effects on wages, labour costs and labour demands. Furthermore, we investigate the impact on regional output, factor allocation across regions and sectors, changes in the number of commuters, fiscal flows between government levels,
regional welfare levels and inequity between regions. In addition, changes in the federal grant system can be simulated in order to alter the incidence of the tax reform.

Furthermore, we look into the effects on inequality and poverty by linking with a microsimulation model. In particular, we establish a top-down link with a non-behavioural microsimulation model (EUROMOD) for distributional effects. The approach followed in linking the two models is the (non-behavioural) one suggested by Hérault (2010).

In summary, the analysis will encompass an empirical study of a tax reform in a spatial setting with various levels of government. The potential for various types of double dividend will be studied. A link with a microsimulation model enables us to look into effects on distributional changes.
References


