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A lower vat rate on electricity in Portugal: Towards a cleaner environment, better economic performance, and less inequality☆

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ABSTRACT

This article addresses the budgetary, economic, distributional and environmental impact of increasing the VAT on electricity in Portugal. The analysis is carried out in the context of a new multi-sector, multi-household, dynamic general equilibrium model. Simulation results suggest that a permanent increase from 6% to 23% improves the public budget and, albeit marginally, CO_2 emissions, but it leads to detrimental economic and distributional effects. As the economy in Portugal begins to recover after the Great Financial Crisis, and the budgetary situation becomes less constraining, pressure is mounting for this VAT increase to be reversed. This mixed bag of results is an important element for the debate. Reverting to a lower VAT is desirable, as it would improve economic performance and have positive distributional effects. The question is how to compensate for the loss of tax revenues. To offset the adverse budgetary effects of a lower VAT, we consider several revenue raising strategies. Our simulation results suggest that an offsetting increase in either the general VAT tax rate or the tax on petroleum products would yield more favorable effects from all relevant perspectives – economic, distributional, and environmental while mostly keeping intact the budgetary benefits.

1. Introduction

In late 2011, Portugal increased the statutory Value Added Tax [VAT, hereafter] rate on electricity purchases from 6% to 23%. This increase in the VAT rate on electricity was designed as a revenue-generating measure as part of an extensive austerity plan implemented by the Portuguese authorities in the context of the international bailout, under the auspices of the European Commission, the European Central Bank, and the International Monetary Fund [see International Monetary Fund (2011)].

The standard VAT rate in member states of the European Union [EU, hereafter] varies from 17% in Luxembourg to 25% in Denmark and Croatia. Many countries have reduced rates applied to basic necessities, such as food, heating and electricity, in pursuit of distributional objectives [see, for example, Borselli et al. (2012)]. This is the case of Portugal where a reduced rate applies to goods and services that make up a relatively larger part of the budget for low income households [see Braz and da Cunha (2009)]. In addition, many countries, again including Portugal, have additional fuel charges and carbon levies that reflect, in part, environmental concerns associated with production and consumption of energy products.

The increase in the taxation of electricity and other energy products has frequently been proposed as a policy measure to address climate change concerns. Indeed, the harmful environmental effects of fossil fuel combustion in electricity generation can be addressed by reductions in electricity production – through demand-side measures including incentives for energy efficiency and electricity pricing – changing the way that electricity is produced, or installing end-of-pipe technologies to control air pollutants [see, for example, Goulder and Ian (2008)]. The increase in the VAT tax rate on electricity in Portugal, however, was designed exclusively as a revenue-generating measure and lacked any clear strategy as an energy policy measure.

The choice of addressing budgetary concerns through an increase in the VAT by eliminating the differential tax treatment of specific products is one based on efficiency considerations. Public financing through a VAT may produce smaller distortions in market prices and reduce the burden of the tax system relative to labor taxes [see, for example, Ballard et al. (1987), Boeters et al. (2010), Correia (2010) and Pereira and Pereira (2014a)]. On the other hand, following the foundational work by Ramsey (1927), a great deal of work has supported differential taxation of products on equity grounds [see, for example, Atkinson and Stiglitz (1972, 1976) and Diamond (1975)]. These studies

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highlight how household heterogeneity particularly with respect to income and expenditure patterns may suggest that equity concerns do indeed justify reduce tax rates for goods and services that make up a larger share of low-income household budgets [see Sorensen (2007) for a detailed discussion on these issues].

The increase in the VAT on electricity from 6% to 23% increases the price and cost of electricity to households and to consumers by making electricity more expensive. For the first time ever, the price of electricity in Portugal became more expensive than the EU average, and is currently in the top quartile of prices for both consumers and industries [see Eurostat (2016)]. There are only five countries that have higher statutory VAT tax rates on electricity than Portugal: Croatia, Denmark, Finland, Hungary, and Sweden [see European Commission (2017a)].

Naturally, this austerity measure met with widespread concern and opposition for its potentially negative effects on both economic performance and social justice. On the economic front, the main concerns centered on its potentially detrimental effects on economic activity. On the equity front, the regressive distributional effects were a matter of great concern. Furthermore, some concerns arise that this measure could lead to a shift away from the use of electricity to alternative sources of energy that are less friendly to the environment - a substitution effect. This despite the expectation of a potential overall reduction in emissions resulting from the contractionary effects of the VAT rate increase on electricity - a scale effect.

Six years after this measure was introduced, the country is facing a brighter economic outlook and a more positive outlook for management of its public finances. Indeed, after eight years under close European Commission surveillance, in mid-2017, Portugal successfully abandoned the Excessive Deficit Procedures [see European Commission (2017b)], and regained some policy flexibility in terms of fiscal rules. GDP growth in 2017 was 2.7% and public deficit in 2017 1.3% of the GDP, in both cases much better outcomes than the official projections. Nevertheless, there is still no sign that authorities plan to reinstate the reduced VAT rate for electricity. Accordingly, evaluating the effects of this measure on the public purse – by any reckoning the rationale for its introduction – and to attempt to measure the possible detrimental effects on economic performance, inequality, and the environment is a very pertinent policy question.

In this paper, we identify the economic, budgetary, distributional, and environmental effects of this increase in the VAT on electricity in Portugal. We open the door to the possibility of reverting to a reduced VAT rate and consider alternative revenue generating measures, including a broader increase in the VAT tax rates, an increase in the tax of petroleum products, and an increase in carbon taxation. These policies highlight the conceptual mechanisms underlying the costs of the higher tax on electricity on households, firms and the public sector while simultaneously providing feasible alternative policy measures to maintain the sustainability of the public sector account.

The effects of the increase in the VAT on electricity are analyzed in the context of a multi-sector, multi-household dynamic computable general equilibrium model of the Portuguese economy. From a methodological perspective, this work is based on a newly-developed disaggregated dynamic general equilibrium model that builds upon the aggregate dynamic general equilibrium model of the Portuguese economy, known as DGEP. Previous versions of this model are documented in Pereira and Pereira (2014c), and have been used recently to address energy and climate policy issues [see Pereira and Pereira (2014a) (2014b) (2017a) (2017b) and Pereira et al. (2016)]. This model has a detailed description of the tax system and a relatively fine differentiation of consumer and producer goods, particularly those with a focus on energy products. Household heterogeneity in income and consumption patterns is captured by differentiating among five household groups.

General equilibrium models have been used extensively in the analysis of VAT reform [see, for example, Ballard et al. (1987), Avitsland and Aasness (2006), Boeters et al. (2010), Bye et al. (2012), European Comission (2013), Erero (2015), Bhattarai et al. (2016) and Tran and Wende (2017)] and in the study of energy taxes [see, for example, Nordhaus (1992); Jorgenson and Wilcoxen (1993); Labandeira et al. (2009), Fullerton et al. (2012), Goulder and Marc (2013), Karydas and Zhang (2017), and Annicchiarico et al. (2017)]. For a general survey of applied general equilibrium models in energy studies see Bhattacharyya (1996) and Bergman (2005) and for a discussion of the merits and concerns with this approach see Sbordone et al. (2010) and Blanchard (2016). In general terms, our model follows in the tradition of the early models developed by Borges and Goulder (1984) and Ballard et al. (2009) while in its specifics is more directly linked to the recent contributions of Bye et al. (2012), Goulder and Marc (2013), Bhattarai et al., (2016, 2017), Tran and Wende (2017), and Annicchiarico et al. (2017).

The remainder of this article proceeds as follows. Section 2 provides a brief account of the disaggregated dynamic general equilibrium model. Section 3 presents the budgetary, economic, distributional and environmental effects of the increase in statutory VAT rate on electricity from 6% to 23%. Section 4, considers the effects of several alternative tax policy measures to compensate for the revenues losses implied by the reversion of the VAT tax on electricity to its original level. Finally, Section 5 provides a summary, policy implications, and concluding thoughts.

2. The dynamic general equilibrium model

What follows is necessarily a very brief and general description of the design and implementation of the new multi-sector, multi-household dynamic general equilibrium model of the Portuguese economy. More information is provided in the Appendix [see Pereira and Pereira (2017d) for further details].

2.1. The general features

The dynamic multi-sector general equilibrium model of the Portuguese economy incorporates fully dynamic optimization behavior, detailed household accounts, detailed industry accounts, a comprehensive modeling of the public sector activities, and an elaborate description of the energy sectors. We consider a decentralized economy in a dynamic general equilibrium framework. There are four types of agents in the economy: households, firms, the public sector and a foreign sector. All agents and the economy in general face financial constraints that frame their economic choices. All agents are price takers and are assumed to have perfect foresight. With money absent, the model is framed in real terms.

Households and firms implement optimal choices, as appropriate, to maximize their objective functions. Households maximize their intertemporal utilities subject to an equation of motion for financial wealth, thereby generating optimal consumption, labor supply, and savings behaviors. We consider five household income groups per quintile. While the general structure of household behavior is the same for all household groups, preferences, income, wealth and taxes are household-specific, as are consumption demands, savings, and labor supply.

Firms maximize the net present value of their cash flow, subject to the equation of motion for their capital stock to yield optimal output, labor demand, and investment demand behaviors. We consider thirteen production sectors covering the whole spectrum of economic activity in the country. These include energy producing sectors, such as electricity and petroleum refining, other European Trading System sectors, such as transportation, textiles, wood pulp and paper, chemicals and pharmaceuticals, rubber, plastic and ceramics, and primary metals, as well as sectors not in the European Trading System such as agriculture, basic manufacturing and construction. While the general structure of production behavior is the same for all sectors, technologies, capital endowments, and taxes are sector-specific, as are output supply, labor demand, energy demand, and investment demand.