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Picking Our Environmental Battles: Removal of Harmful Subsidies or Carbon Taxation?

Alfredo Marvão Pereira | Rui Marvão Pereira

Gabinete de Estratégia e Estudos do Ministério da Economia
Office for Strategy and Studies of the Ministry of Economy
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Picking Our Environmental Battles:
Removal of Harmful Subsidies or Carbon Taxation?

Alfredo Marvão Pereira [1], Rui Marvão Pereira [2]

Abstract

In this paper, we compare the effects of removing harmful fossil fuel subsidies with the replacement of the energy taxation by a carbon tax in Portugal. Since energy taxes focus on the energy content of the different energy products eliminating these provisions only brings their prices in line with their energy content. On the other hand, replacing the energy tax system with a tax on the emissions content of the energy products aligns the fossil fuel prices with their emissions content. We show that while replacing the energy with a carbon tax is a policy of a magnitude about eight times as large as the removal of the harmful subsidies, the effects of emissions are twenty times larger and the adverse economic and distributional effects only about twice as large. Accordingly, replacing the energy tax with a carbon tax is a much more cost-effective way of reducing emissions. This may suggest that focusing on the removal of harmful fossil fuel subsidies may be an environmental red herring.

JEL Classification: C68, E62, H23, Q43, Q48.

Keywords: Energy taxes; Perverse Fossil Fuel Subsidies; CO2 Taxation; Macroeconomic Effects; Distributional Effects; Dynamic Computable General Equilibrium; Portugal.

[1] Department of Economics, William & Mary, Williamsburg VA 23187, ampere@wm.edu

[2] Department of Economics, William & Mary, Williamsburg VA 23187, rmpereira@wm.edu

1. Introduction

There is a wide gap between intentions and actions when it comes to environmental policies. This is due to the difficulty in getting “fossil fuel prices right”, i.e., having the prices of fossil fuel reflect their environmental externalities [Parry et al. (2014), and Coady et al. (2018)].

In the path toward getting “fossil fuel prices right” there are two critical issues. The first is the inadequacy of current energy taxation systems to do the job due to the focus on energy content and not on emissions content and even more so the widespread existence of environmentally perverse fossil fuel subsidies. [Sovacool (2017), Rentschler and Bazilian (2017), and Monasterolo and Raberto (2019)]. The second are the mechanisms to get “fossil fuel prices right” by environmental standards, in particular, through carbon taxation. [Marron and Toder (2014), Williams (2016), and High-Level Commission on Carbon Prices (2017)].

In Portugal, the main energy taxation exists under the so-called ISP, a broad tax on petroleum and other energy products, which represents about 1.8% of the GDP. This tax is designed mostly, although not exclusively, to reflect the energy content of fuels rather than their emissions content. In addition, it provides a large number of exemptions and subsidies for the use of different fossil fuels in transportation, agriculture, industrial processes, and electricity generation. In 2018, such provisions amounted to 430 million euros or about 0.22% of the GDP.

Faced with the recent IPCC targets [IPCC (2018)] and EU directives [EC (2019}], Portugal, has recently approved the Roadmap for Carbon Neutrality 2050 [APA (2019)]. In this roadmap, the decarbonization targets are duly incorporated and specific pathways presented to achieve such targets. Yet the difficulties in the political process to create the consensus necessary to enact meaningful policies are daunting. The problems are many and the immediacy of the issues so pressing that there is little clarity on how to proceed to address the myriad of environmental challenges. The inevitable outcome of the political process has been apathy and inertia.

In this paper, we argue that in the face of so many difficulties we have to choose our battles carefully. We can try to fight the political inertia to remove the myriad of harmful fossil fuel subsidies. We can also try to fight the political apathy to introduce a meaningful carbon tax. The questions remains if we need to fight both battles in order to achieve the desired goals.

We address this issue in the context of a multi-sector, multi-household dynamic computable general equilibrium model of the Portuguese. Previous versions of this model addressed several energy and climate policy issues [Pereira and Pereira (2014a, 2014b, 2017a, 2017b) and Pereira et al. (2016)]. The current version of the model has a detailed description of the tax system including energy taxation. It features a fine differentiation of consumer and producer goods, particularly energy products. It captures the heterogeneity in income and consumption patterns by considering five differentiated household groups. Conceptually and thematically this approach is related to the recent contributions of, for example, Jorgenson et al. (2015), Bhattarai et al. (2016), Williams (2016), Annicchiarico et al. (2017), and Kirchner et al. (2019).

2. The Dynamic Computable General Equilibrium Model

What follows is a very brief description of the dynamic computable general equilibrium model of the Portuguese economy [see Pereira and Pereira (2017c) 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. There are four types of agents in the economy: households, firms, the public sector and a foreign sector. All agents face financial constraints that frame their choices. All agents are price takers and have perfect foresight.

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 capital stock to yield optimal output, labor demand, and investment demand. 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 EU-ETS 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 EU-ETS 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. The public sector and the foreign sector evolve in a way that is determined by the economic conditions and their respective financial constraints.

All economic agents interact in different markets. The general market equilibrium is defined by market clearing in product markets, labor markets, financial markets, and the market for investment goods. The equilibrium of the product market reflects the national income accounting identity and the different expenditure allocations of the output by sector of economic activity. The total amount of a commodity supplied to the economy, be it produced domestically, or imported from abroad, must equal the total end-user demand for the product, including the demand by households, by the public sector, its use as an intermediate demand, and its application as an investment good.

The total labor supplied by the different households, adjusted by an unemployment rate that is assumed exogenous and constant, must equal total labor demanded by the different sectors of economic activity. There is only one equilibrium wage rate, although this translates into different household-specific effective wage rates, based on household-specific levels of human capital which obviously differ by quartile of income. Different firms buy shares of the same aggregate labor supply. Implicitly, this means that we do not consider differences in the composition of labor demand among the different sectors of economic activity, in terms of the incorporated human capital levels. Saving by households and the foreign sector equal the value of domestic investment plus the budget deficit.

The evolution of the economy is described by the optimal change in the stock variables – household-specific financial wealth and sector-specific private capital stock, as well as their respective shadow prices. The evolution of the stocks of public debt and of the foreign debt act as resource constraints in the overall economy. The endogenous and optimal changes in these stock variables – investment, saving, the budget deficit, and current account deficit – provide the link between subsequent periods.

The intertemporal path for the economy is described by the behavioral equations, the equations of motion for the stock and shadow price variables, and the market equilibrium conditions. The model can be conceptualized as a large set of nonlinear difference equations, where flow variables are determined through optimal control rules. We define the steady-state growth path as an intertemporal equilibrium trajectory in which all the flow and stock variables grow at the same rate while market and shadow prices are constant.

2.2 Numerical Implementation, Calibration and Reference Scenario

The dynamic general equilibrium model is fully described by the behavioral equations and accounting definitions, and thus constitutes a system of nonlinear equations and nonlinear first order difference equations. No objective function is explicitly specified, on account that each of the individual problems (the household, firm and public sector) are set as first order and Hamiltonian conditions. These are implemented and solved using the GAMS (General Algebraic Modeling System) software and the MINOS nonlinear programming solver.

The model is calibrated with data for the period 2005-2014 and stock values for 2015. The calibration of the model is designed to allow the model to replicate as its most fundamental base case, a stylized steady state of the economy, as defined by the trends and information contained in the data set. In the absence of any policy changes, or any other exogenous changes, the model's implementation will just replicate into the future such stylized economic trends. Counterfactual simulations thus allow us to identify marginal effects of any policy or exogenous change, as deviations from the base case.

The reference scenario provides a trajectory for the economy through 2050. The reference scenario embodies several assumptions regarding climate policy, which are super-imposed on the steady state trajectory used in the calibration of the model. The main assumptions in our reference scenario are as follows. First, we assume that the current levels of carbon taxation persist through 2050. Second, we assume that the major coal fired power plants cease operations at the end of their life span and no additional coal capacity is installed. Third, we assume that fossil fuel prices follow forecasts given by the International Energy Agency.

3. On the Effects of Removal of Fossil Fuel Subsidies

The first counterfactual scenario, CF1, corresponds to the removal of all fossil fuel subsidies. The magnitude of this policy is approximately 0.22% of the GDP. We present summary simulation results in Tables 1 -4.

The removal of all fossil fuel subsidies leads to an increase in energy prices of 0.17%, which leads to a decrease of energy demand of 4.36%. The price of domestic electricity generation increases by 2.82%, which leads to a 2.90% decrease in domestic production and a 0.61% decrease in net imports. Overall electricity demand declines by 2.86%. Accordingly, the share of electricity in final energy demand decreases by 1.17%. From an environmental perspective, the removal of all fossil fuel subsidies tax leads to a reduction in CO_2 emissions of 1.40%., which means that emissions by 2030 would be at 98.4% of the 2010 levels.

The macroeconomic effects of the removal of all fossil fuel subsidies are naturally adverse. GDP declines by 0.51% linked directly on the supply side to the reduction in investment by 0.15% and of employment by 0.27% and on the demand side by a reduction in private consumption of 0.06%. The CPI increases by 0.17%. In turn, foreign debt increases by 0.30%. Finally, there is, by construction, a reduction of 1.59% in the public debt.

The reduction in economic activity observed at the aggregate level hides some interesting industry effects. The industry that is the most adversely affected is electricity generation as expected. Other industries adversely affected include textiles, wood, chemicals, rubber, basic metals, equipment, and transportation. These are all energy-intensive sectors that produce internationally traded goods. On average, the loss of these seven sectors is just under twice as large as the national average. Accordingly, the removal of these harmful subsidies affects international competitiveness adversely.

Overall, there is an aggregate household welfare loss of 0.05%. Across the different household income groups, this loss occurs in a regressive manner. The lowest income group suffers a loss of 0.10% while the highest income group loses just 0.02%. The factor of regressivity is 5.

4. On the Effects of Replacing the ISP with a CO2 Tax

In the second counterfactual scenario, CF2, we replace the ISP taxation with a carbon tax. Accordingly, this is a revenue neutral experiment. The carbon tax necessary to do so is 114 euros per ton of CO_2 and leads to tax revenues that are about 1.85% of the GDP. Therefore, the magnitude of this policy is about 8 times larger than the simple removal of environmentally harmful fossil fuel subsidies. Again, we present summary simulation results in Tables 1 -4.

Energy prices increase by 0.55% and energy demand declines by 4.36%. The price of electricity generation increases by 7.31%, which leads to a reduction of 5.37% in production. The production from renewables increases 7.83% and imports by 9.20%. Overall, the share of electricity in final energy demand declines by 0.80%. Compared to CF1, results under CF2 are about two to three times larger. The most important differences are the increase in electricity production from renewable sources and the lower decline in the share of electricity in final demand.

In turn, under CF2, CO_2 emissions decline by 28.26%. This means that emissions by 2030 represent 60.2% of emissions in 2010. Accordingly, reductions in emissions are substantially larger under CF2 compared to CF1 than indicated just by comparing the relative magnitudes of the two policies. This reflects the fact that the energy tax is mostly a tax on the energy content of the fossil fuels and not on their emission content. Accordingly just removing the harmful subsidies has a much lower effect of emissions than taxing emissions directly.

The substitution of the ISP with a CO_2 tax leads to a decline in GDP of 1.19% with private investment remaining essentially unchanged and employment declining by just 0.56%. The CPI shows a small increase of 0.38% and private consumptions a marginal decline of 0.12%. Foreign debt increases by 0.64% while naturally the public debt by definition is just marginally affected - an increase of 2.26% due to the reduction in economic activity. Overall, compared to CF1 we observe adverse macroeconomic effects, which are just about twice as large.

In terms of the sectoral effects, the production of the refining sector increases, albeit only marginally. This reflects the switch in the focus of taxation of the sector but not a meaningful net increase of the tax burden on the refining sector with the replacement of the ISP taxation. Along the same lines, transportation services show also an increase production. The industries that are adversely affected are the same as under CF1 but with larger effects under CF2, in particular the cases of textiles, wood, chemicals, and basic metals. Overall, the effects on the same seven industries producing internationally traded goods we considered above is about 3.5 times the national average. This means that the effects on international competitiveness are now more severe although still not as much as would be implied by the relative magnitude of the two policies. The exception is actually the sector that produces rubber, plastic and ceramics which loss is very severe under the carbon taxation.

Under CF2, the adverse household welfare effects are a loss of 0.10%. The same patterns of regressivity can be observed as the lowest household income group sees a loss of 0.22% and the highest income group of less than 0.08%. The factor of regressivity is 2.7. Compared to the removal of the harmful subsidies the adverse welfare effects are now about twice as large and with a much lower factor of regressivity.

5. Concluding Remarks.

In this paper, we compare the effects of removing harmful fossil fuel subsidies and exemption under the ISP taxation with the replacement of the whole ISP taxation by a carbon tax. We do so in the context of a dynamic disaggregated computable general equilibrium model of the Portuguese economy.

Our simulation results show, that replacing the whole ISP with a carbon tax is a much more promising and pragmatic alternative than just removing the myriad of harmful fossil fuel provision. Since the ISP is a tax on the energy content of the different energy products, eliminating these provisions only brings effects proportional to such energy content. On the other hand, replacing the ISP with a universal carbon tax, a tax on the emissions content of the energy products aligns the fossil fuel prices with their emissions content. Furthermore, the universal carbon tax would, by construction, implicitly remove all fossil fuel subsidies.

Our simulation results show that while replacing the ISP with a carbon tax is a policy of a magnitude about eight times as large as the removal of the harmful subsidies, the effects of emissions are twenty times larger and the adverse economic and distributional effects only about twice as large. Accordingly, replacing the ISP with a carbon tax is a much more cost-effective way of reducing emissions in term of the macroeconomic and distributional costs of doing so.

We should mention that, such a replacement of the ISP with a carbon tax would not in and of itself reduce emissions to the IPCC 2018 target levels. It would not reverse the adverse macroeconomic, international competitiveness, and distributional effects either. Accordingly, replacing the energy tax with a carbon tax would be just a first step in a strategy toward decarbonization. This step would have to be follow by further carbon taxation to reach the emissions targets and careful recycling of the extra carbon tax revenues to address the macroeconomic, competitiveness and distributional issues.

Finally, and although this is an energy policy paper applied to the Portuguese economy and its policy implications directly relevant for the Portuguese case, its interest is far from parochial. The quest for decarbonization is universal as is the issue of carbon pricing and carbon taxation. The existence of energy taxation incorporating harmful fossil fuel subsidies is widespread. The concerns over the macroeconomic and distributional effects of environmental policies are unavoidable. The multitude of problems and their immediacy demand clarity and simplicity. It requires us to pick our battles carefully. In this case, we leave open the possibility that focusing on the removal of harmful fossil fuel subsidies may be an environmental red herring.

References

1. Annicchiarico, B., S. Battles, F. Di Dio, P. Molina, and P. Zoppoli. 2017. "GHG mitigation schemes and energy policies: A model-based assessment for the Italian economy," *Economic Modelling* 61:495-509.
2. APA – Agência Portuguesa do Ambiente (2018). "Roteiro para a Neutralidade Carbónica/ Roadmap for Carbon Neutrality," Agência Portuguesa do Ambiente, Lisboa;
3. Bhattarai, K., J. Haughton, D. Tuerck. 2016. "The economic effects of the fair tax: analysis of results of a dynamic CGE model of the US economy," *International Economics and Economic Policy* 13(3): 451-466.
4. Coady, D., I. Parry, and B. Shang, 2018. "Energy Price Reform: Lessons for Policy Makers," *Review of Environmental Economics and Policy* 12(2): 197-219.
5. EC - European Commission, 2019. "*Clean Energy for All Europeans*" Luxembourg, Publication Office of the European Union.
6. High-Level Commission on Carbon Prices, 2017. *Report of the High-Level Commission on Carbon Prices*, Carbon Price Leadership Coalition, World Bank, Washington DC.
7. IPCC, 2018: Global Warming of 1.5°C.An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.)]. In Press.
8. Jorgenson, D., 2014. Time to Tax Carbon: Enhancing ENvironmentala Quality and Economic Growth," *Harvard Magazine* 117(1): 53-79
9. Jorgenson, D., R. Goettle, M. Ho, P. Wilcoxen, 2015. Carbon Taxes and Fiscal Reform in the United States," *National Tax Journal* 68(1): 121-138.
10. Kirchner, M., M. Sommer, K. Krantena, D. Kletzzan-Slamanig, and C. Kettner-Marx, 2019. "CO2 Taxes, Equity and the double Dividend – Macroeconomic Model Simulation for Austria," *Energy Policy* 126: 294-314.
11. Marron, D., and E. Toder, 2014. "Tax Policy Issues in Designing a Carbon Tax," *American Economic Review: Papers and Proceedings* 104(5): 563-568.
12. Monasterolo, I. and M. Raberto, 2019. "The Impact of Phasing out Fossil Fuel Subsidies on the Low Carbon Transition," *Energy Policy* 124: 355-370.
13. Parry, I., D. Heine, E. Lis, and S. li, 2014. *Getting Energy Prices Right: From Principle to Practice*, International Monetary Fund, Washington DC.
14. Pereira, A., and R. Pereira, 2014a. "Environmental fiscal reform and fiscal consolidation: The quest for the third dividend in Portugal," *Public Finance Review* 42(2): 222-253.
15. Pereira, A., and R. Pereira, 2014b. "On the environmental, economic and budgetary impacts of fossil fuel prices: A dynamic general equilibrium analysis of the Portuguese case," *Energy Economics* 42(C): 248-261.

16. Pereira, A., and R. Pereira, 2017a. “The economic and budgetary impact of climate policy in Portugal: Carbon taxation in a dynamic general equilibrium model with endogenous public sector behavior,” *Environmental and Resource Economics* 67: 231-259. \
17. Pereira, A., and R. Pereira, 2017b. “On the relative roles of fossil fuel prices, energy efficiency, and carbon taxation in reducing carbon dioxide emissions,” *Journal of Environmental Planning and Management* 60 (10), pp. 1825-1852.
18. Pereira, Alfredo and Rui Pereira, 2017c. The Role of Electricity for the Decarbonization of the Portuguese Economy – DGEP Technical Report, https://mpra.ub.uni-muenchen .de/id/eprint/84782
19. Pereira, A., R. Pereira, and P. Rodrigues, 2016. “A new carbon tax in Portugal: A missed opportunity to achieve the triple dividend?” *Energy Policy* 93: 110-118.
20. Pizer, W., and S. Sexton, 2019. “Distributional Impacts of Energy Taxes,” *Review of Environmental Economics and Policy* 13(1): 104-123.
21. Renner, S., J. Lay, and H. Greve, 2018. “Household Welfare and CO2 Emission Impacts of Energy and Carbon Taxes in Mexico,” *Energy Economics* 72: 222-235.
22. Rentschler, J., and M. Bazilian, 2017. “Principles for Designing Effective Fossil Fuel Subsidy Reforms,’ *Review of Environmental Economics and Policy* 11(1): 138-155.
23. Sovacool, B., 2017. Reviewing, Reforming and Rethinking Global Energy Subsidies: Toward a Political Economy Research Agenda,” *Ecological Economics* 135: 150-163.
24. Williams III, R., 2016. “Environmental Taxation,” NBER WP 22303.

Table 1 Long Run [2030] Effects: Energy Markets and Emissions

Percent Change from Baseline

	CF1	CF2
Carbon Tax	6.85	114
Energy Price	0.17	0.55
Electricity Price	2.85	7.31
Electricity Production	-2.90	-5.37
Thermal Generation	-2.39	-20.18
Renewable Energy Systems	-2.17	7.83
Net Electricity Imports	-0.61	9.20
Energy Demand	-1.71	-4.36
Electricity Demand	-2.86	-5.13
% Electricity in Final Energy Demand	-1.17	-0.80
Carbon Dioxide – CO_2	-1.40	-28.26

Table 2 Long Run [2030] Effects: Macroeconomic Performance

Percent Change from Baseline

	CF1	CF2
GDP	-0.51	-1.19
Private Consumption	-0.06	-0.12
Investment	-0.15	0.02
Employment	-0.25	-0.56
Foreign Debt	0.30	0.64
Public Debt	-1.59	2.26
CPI	0.17	0.38

Table 3 Long Run [2030] Effects: Output by Industry

Percent Change from Baseline

	CF1	CF2
Total	-0.51	-1.19
Petroleum Refining	-0.46	0.64
Electricity	-2.90	-5.37
Biomass	-0.02	2.29
Agriculture	-0.51	-1.50
Mining	-0.91	-0.96
Manufacture of food products, etc	-0.23	-0.28
Textiles	-0.70	-5.04
Wood, pulp and paper	-0.82	-4.66
Chemicals and pharmaceuticals	-0.61	-2.67
Rubber, plastics and ceramics	-0.83	-9.09
Basic metals and fabricated metal products	-1.01	-4.12
Equipment manufacturing	-1.47	-1.62
Water, sewage and waste management	-0.12	-0.71
Construction	-0.17	-0.21
Wholesale and retail trade	-0.47	-0.25
Transportation	-0.76	0.75
Accommodation and food services	-0.20	-0.41
Information technology	-0.16	-0.42
Finance and insurance	-0.21	-0.45
Real estate	-0.02	-0.12
Professional services	-0.32	-0.57
Public administration	-0.07	-0.42
Education	-0.04	-0.18
Health	-0.06	-0.37
Other	-0.20	-0.43

Note: We have highlighted the main sectors producing internationally traded goods.

Table 4 Long Run [2030] Effects: Welfare Effects

Percent Change from Baseline

	CF1	CF2
All Households	-0.05	-0.10
First Quintile (lowest income)	-0.10	-0.22
Second Quintile	-0.07	-0.12
Third Quintile	-0.05	-0.09
Fourth Quintile	-0.04	-0.09
Fifth Quintile (highest income)	-0.02	-0.08

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