INTERGENERATIONAL EFFECTS OF FINANCING PRIVATE INVESTMENTS FOR LOW-CARBON ENERGY TRANSITIONS: AN APPLICATION TO FRANCE

Laura Atarody, University Paris Dauphine-PSL, LEDA [CGEMP], Phone +33 7 83 95 70 06, E-mail: laura.atarody@dauphine.psl.eu

Mourad Ayouz, Electricité de France, E-mail: mourad.ayouz@edf.fr

Frédéric Gonand, University Paris Dauphine-PSL, LEDA [CGEMP], Phone +33 6 82 45 09 52, E-mail: frederic.gonand@dauphine.psl.eu

Overview

This paper investigates the intergenerational welfare impacts of different ways of financing private investments in low-carbon energy transitions. We use an empirical general equilibrium model with fifteen overlapping generations (OLGs) and five economic sectors with different energy intensity. Three scenarios are considered, whether the private investments in the power sector are financed through public debt, in turn reimbursed by a rise in direct taxes on private agents ten years in the future onwards (Scenario 1), or a carbon price signal for companies only (Scenario 2), or a carbon price signal for companies and households (Scenario 3). In the first two scenarios, the intergenerational redistributive effects are relatively more detrimental to the middle aged and older generations mainly because the effect of the shock on capital and labor income dominates the impact on prices. In the third scenario, though, the impact weighs relatively more on young and future generations as the effect on consumer prices dominates. The macroeconomic and intergenerational redistributive effects are more contained when low-carbon investments are financed by public debt - even if it is reimbursed in the medium run by taxes on labor income paid by households and firms - especially when interest rates are low.

Methods

We develop a dynamic general equilibrium model incorporating an OLG framework with fifteen overlapping generations and a relatively detailed energy sector on French data. The general equilibrium framework of the model relies on a production function for the five sectors of the economy (agriculture, industry without energy, energy, construction and services).

In the first scenario, the rise in public investments in the power sector is financed by public debt (in turn financed by a rise in direct taxes on firms and households ten years after the investment shock). In the second scenario, the rise in these investments is financed by a price signal /or a tax on electricity consumption for companies only. In a third scenario, the rise in investments in the power sector is financed by a price signal/or a tax on electricity consumption for both households and companies.

Our model analyses the aggregate effects of the policy depending on the scenario and computes its net effect on households' non-environmental welfare for each cohort. We simulate (not forecast) and aim to analyze the main aggregate mechanisms involved in the long run by increasing energy transition investments. The model allows to obtain for each financing scenario -increase in the price signal or tax for companies, for companies and households or after public debt financed by direct taxes on firms and households in the medium term- a detailed reading for the five sectors and for the fifteen generations of our model.

Results

All scenarios trigger a net detrimental impact on activity in the long-run as compared to a no-reform, baseline case. This jointly mirrors the crowding out effect of low-carbon energy transition investments in the power sector and the increase in the energy price to finance these investments. However, the average negative effect is lower when the rise in low carbon electricity investments is financed by public debt. In fact, in this scenario, the Ricardian equivalence does not fully apply because some households are Keynesians (they cannot smooth out the effect of the shock). A second explanation is that the increase in direct income taxes is implemented later

than the increase in taxes in the other scenarios. The detrimental impact on household consumption is higher in Scenario 3 which involves some taxes on households that are not delayed in the future.

In Scenario 1 (debt) and 2 (carbon price signal on firms only), the middle aged and the older generations are relatively more sensitive to the intergenerational redistributive effects as the impact on capital and labor revenues dominates the effect on consumer prices. In Scenario 3, intergenerational redistributive effects weigh on the (non-environmental) welfare of young and future generations as the consumer price effects dominates. The proportion of Keynesian households among young is relatively high, their propensity to consume is higher, and they are more sensitive to the intergenerational redistributive effects of the policy. On average, the intergenerational redistributive effects are more contained when low-carbon investments are financed by public debt (even if financed in the medium run by some rise in taxes on firms and households as well).

On the supply side, the impact of an increase in investments in the power sector on other economic branches depends on intermediate consumption, sectoral distribution of consumption, relative capital intensity of the branches and technical progress of each branch. On average, the shock weighs mainly on the energy sector, especially in scenario 3 (investments financed by a price signal/or a tax on electricity consumption for both households and companies). The positive effect of an increase in energy investments remains relatively subdued, because of a net crowding effect.

Conclusions

Financing energy transition investments either through public debt or taxes or a carbon price signal triggers significant intergenerational redistributive effects. This is relevant for policymakers to consider, especially when average taxation and the level of public debt are high, as in France. Our paper also suggests that the anticipations about future macroeconomic and redistributive intergenerational effects significantly influence the setting of current financing policies. In case the policymaker is sensitive to intergenerational equality, it may wish to compensate the young cohorts detrimentally affected by these policies. Overlapping generation frameworks enshrined in EG modelling are well suited for studying such issues.

References

Gonand F. and P.-A. Jouvet (2015), "The "second dividend" and the demographic structure", *Journal of Environmental Economics and Management*, 72, pp.71-97.

Gonand F., F.Hasanov and L.Hunt (2019), “Estimating the Impact of Energy Price Reform on Saudi Arabian Intergenerational Welfare using the MEGIR-SA model”, *Energy Journal*, 40(3), pp.25-47.