

Disaggregating electricity in a supply-use framework extended with capital and investment matrices: The Spanish case

Topic: Input-Output Modelling: Energy Policies - I

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Taking the mitigation of the climate change in mind, and knowing the necessity of the electrification of the economy, as well as the need of that electricity to be green, several international treatments are being established to diminish the carbon emissions. Many researchers are interested in studying the effects of policies or measures regarding the energy and electricity sectors on the main socio-economic and environmental variables. Input-output model has been traditionally used to analyze this kind of impacts regarding energy and electricity sectors. However, recently, within the input-output framework, some authors prefer to use the supply and use tables (SUT), following Lenzen and Rueda-Cantuche (2012), since we can obtain a different picture of the same fact depending on which kind of model from those proposed by Eurostat (2008) we use to construct the symmetric table when the shock is applied in the SUTs (Cazcarro et al., 2020).

Taking all of this into account, in a previous work, whose objective was to analyze four electricity self-generation and self-consumption scenarios, we disaggregated the energy and electricity sectors in the supply-use framework, both by sectors and products, into five activities of the production process: generation, distribution, transmission, commercialization, and related activities. At the same time, generation was disaggregated into seven different technologies: Generation of hydropower; Generation of electricity from conventional thermal: coal; Generation of electricity from conventional thermal: oil; Generation of electricity from conventional thermal: gas; Generation of electricity from nuclear; Generation of electricity from wind; Generation of electricity from other types (where solar, biomass, and biogas are included). This was made for the case of Spain for 2016, a similar disaggregation than that made in Langarita et al. (2021).

In this paper, the objective is to extend this SUT framework with capital matrices (KSUT model) to assess the impact of investments, following Schäfer and Lenzen (2020). Following this method, we first estimate capital stocks, flows, and consumption for Spain, using the 2016 supply and use tables, provided by the National Statistics Institute. Then, we disaggregate both the supply and use tables, and also the capital stocks, flows, and consumption according with the disaggregation previously made for the electricity sector.

This completely disaggregated KSUT model will be useful to analyze the impact of several policies and measures regarding energy and electricity sectors, such as future investments on renewable energies and on other priorities for the ecological transition, following the Spanish National Energy and Climate Plan-PNIEC guidelines (MTE, 2019) or some technological shocks implemented in the SUTs, obtaining the multipliers (and hence the associated effects and pressures) directly there with this form of capital endogeneization (on the endogeneization in the symmetric framework, see also Schäfer et al., 2018). Moreover, the dynamization of the model will be very useful to understand the effect of the investments in the next periods.

References

- Cazcarro, I., Langarita, R., Sanchez-Choliz, J., Sarasa, C., 2020. Changes in the electricity sector: Testing different scenarios using supply and use tables for Spain, in: 60th European Regional Science Association (ERSA) Congress.
- Eurostat, 2008. Eurostat Manual of Supply, Use and Input-Output Tables, Methodologies and

working papers, Economy and finance. <https://doi.org/http://ec.europa.eu/eurostat>

Langarita, R., Cazcarro, I., Snchez-Chliz, J., Sarasa, C., 2021. The role of fiscal measures in promoting renewable electricity in Spain. *Energy Convers. Manag.* 244. <https://doi.org/10.1016/j.enconman.2021.114480>

Lenzen, M., Rueda-Cantuche, J.M., 2012. A note on the use of supply-use tables in impact analyses. *SORT-Statistics Oper. Res. Trans.* 36, 139–152.

MTE, 2019. Draft of the National Integrated Energy and Climate Plan (PNIEC) 2021-2030, Ministerio de Transicin Ecolgica = Ministry of Ecological Transition, Gobierno de Espaa.

Sndersten, C.-J.H., Lenzen, M., 2020. A supply-use approach to capital endogenization in input–output analysis. *Econ. Syst. Res.* 32, 451–475. <https://doi.org/10.1080/09535314.2020.1784852>

Sndersten, C.J.H., Wood, R., Hertwich, E.G., 2018. Endogenizing Capital in MRIO Models: The Implications for Consumption-Based Accounting. *Environ. Sci. Technol.* 52, 13250–13259. <https://doi.org/10.1021/acs.est.8b02791>