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Research Brief

Technology Neutral vs. Technology Specific Procurement

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Auctions are increasingly being used to procure renewable energy capacity. How should these auctions be designed? Should regulators use a single technology-neutral auction, separate technology-specific auctions, or a hybrid design? And why or when should regulators resort to auctions instead of price posting? Since these choices involve a clear trade-off between efficiency and rent extraction, one size does not fit all.

A principal (e.g., a regulator or a firm) needs to procure multiple units of a good or service that can be produced with heterogenous technologies. How should she procure these units? Should she procure them by posting separate prices for each technology? Or should she instead run technology-specific or technology-neutral auctions? In answering these questions, what are the trade-offs involved and how do they depend on the nature of the available technologies and the extent of information asymmetry regarding their costs?

This problem is motivated by a fundamental challenge faced by many governments around the world in their efforts to reduce carbon emissions: how to accelerate the deployment of renewable energies (e.g., solar, wind, or biomass) and storage facilities (e.g., pumped storage or batteries) at the lowest possible fiscal cost (Council of European Energy Regulators, 2018).

In practice, several instruments have been used (and continue to be used) for such purposes, e.g., price-based instruments like Feed-in Tariffs and Feed-in Premia, or quantity-based instruments such as auctions or tradeable quota obligations. Some of these instruments have treated technologies separately, whether by type, location and/or scale. Other instruments have been technologically neutral. And yet other instruments have relied on hybrid approaches (so called technology banding), e.g., by deflating the bids associated to some technologies but not others, or by granting relatively more (green) certificates to some technologies.

Whether governments are aware of it or not, these choices involve a clear trade-off between efficiency and rent extraction. On the one hand, as the European Commission (2013) has pointed out, well-designed technology-neutral approaches are more effective in finding the cheapest technology sources, but they may also result in over-compensation. Indeed, by not discriminating among heterogenous sources, the authority may be leaving too much rents with some suppliers, making decarbonization unnecessarily costly. On the other hand, a well-designed technology-specific approach might fail in efficiently discriminating across technologies due to asymmetric information regarding their costs. Without ex-ante knowledge of the costs of the various technologies, setting ex-ante prices or quantities might result in inefficient but also costly allocations given that the quantities allocated to each technology do not adjust ex-post.

This trade-off between efficiency and rent extraction has been central to the regulation and procurement literature (Laffont and Tirole, 1993; Segal, 2003). And although also recognized in the realm of renewable energy procurement (EC, 2013; CEER, 2018), its impact on the preferred regulatory instrument to promote renewables has not been systematically analyzed. Furthermore, following Weitzman (1974)'s seminal work, the regulation literature has assessed the relative performance of prices versus quantities, but it has done so in the case of a single technology or under the assumption that the regulator only cares about productive efficiency, thus leaving no scope for the rent-efficiency trade-off to play a role.

Yet, in the context of the simple linear schemes commonly used in practice, it is not clear whether quantity-based approaches (e.g., auctions) should be preferred over price-based approaches (e.g., feed-in tariffs), and how this choice is affected in the presence of multiple technologies (e.g., solar and wind, or pumped storage and batteries). Furthermore, it is not clear when and why rent extraction concerns (i.e., the risk of over-compensating some sources) may dominate efficiency concerns (i.e., the risk of departing from cost minimization), and to what extent these concerns are best managed through technology banding or technology separation.

This paper provides a sufficiently general framework in which all these questions can be addressed. This framework should prove useful for policy makers by helping them understand, from a purely economic-regulatory perspective, when and why a particular approach should be preferred over another. Our model allows us to conclude that a well-informed regulator should always run separate auctions, with the allocation to each technology chosen in a way to preserve cost minimization. A similar prescription should be followed if the two technologies are subject to similar shocks because cost minimization is not in danger either. As incomplete information mounts, she may reverse her decision in favor of technology neutrality unless the cost for the government of not discriminating is too large. This ultimately depends on the amount of over-compensation to the more efficient suppliers, which depends on how asymmetric their costs are, as well as on the unit price of this over-compensation, i.e., the shadow cost of public funds.

Using data of the ongoing renewable investments in the Spanish electricity market we show that the use of well-designed technology-specific auctions would result in superior outcomes as compared to technology neutrality or technology banding. However, this result may not extend to other settings in which the costs of deploying the various technologies are less asymmetric and are more negatively correlated them, and if the regulator cares less about minimizing firms' rents.

References

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