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Gone with the wind: an empirical analysis of the renewable energy rent transfer

EPRG Working Paper 1701

Cambridge Working Paper in Economics 1701

Matti Liski and Iivo Vehviläinen

Who bears the costs of climate policies in the end? If industries have to pay a lion's share of the costs, businesses may relocate, potentially undermining the acceptability of climate policies. The electricity sector produces the bulk of the carbon emissions and is among the first sectors facing policy-determined penalties on using fossil fuels. By familiar tax incidence arguments, these costs are further passed on to the consumer side if the consumer demand is inelastic, as is typically the case in electricity markets.

We show theoretically and empirically that the cost incidence is reversed if, instead of pricing emissions, policies provide support for clean technologies: the electricity producers, rather than the consumers, end up paying a major part of the final cost of the new technologies. Subsidies to technologies that, once installed, operate with zero marginal costs — such as wind and solar power— lead to reduced final prices for outputs. If incumbent technologies earn scarcity rents and, in addition, cannot evade the policies that lower the output prices, part of the rents are transferred to the consumers. The rent transfer can be so complete that the climate policy cost falls entirely on the incumbents.

In our empirical case, we estimate the reduction in consumer prices attributable to the entry of wind power in an electricity market where the transition away from fossil-fuels has progressed exceptionally far — the Nordic market. This market has at least two advantages, making it suitable for demonstrating the rent transfer. First, the market effectively pools together the available sources of hydroelectricity which, on average, covers 50% of annual consumption and provides a counterbalance for intermittent sources of supply. Without such a pre-existing counterbalance, scaling up the share of intermittent technologies can present a serious challenge to the current ways of organizing transmission, distribution, and production of electricity. Second, the Nordic setting is clean since it allows us to focus on the wealth transfer: the efficient dispatch of technologies is not significantly distorted by subsidies. This is because the most expensive units to run are also the ones with the highest emissions intensity. The entrant technologies thus replace those incumbent technologies that should be replaced.

Keeping these special features in mind, we report quantitatively quite important impacts on surplus sharing in the market. With 5 % share of annual consumption, we estimate that the entry of wind power eliminates 25 % of the consumers' electricity market expenditures. With 10 % market share for wind, consumers' expenditures decline by one-half. Expenditures decline but the other side of coin is that consumers must cover part of the investment costs of the new entrants through subsidies. We find that the consumers' estimated willingness to pay for subsidies to entry, defined through their impact on expenditures, exceeds the actual paid subsidies in this market.

Why are these results relevant for more generally? A first reason is that the incidence of subsidy costs is an efficiency issue if climate policies do not have a global coverage so that policies may lead to relocation of industries. Theoretically, the climate cost burden across sectors that are differently exposed to competition should be differentiated. Since the electricity sector itself is not exposed to competition from other regions, the cost share of electricity generators should be relatively high. According to our results, the rent shifting from generators to the exposed industries is quantitatively too important to be ignored in the transition towards cleaner technologies.

A second reason for relevance is that the distributional effect that we have quantified is related to the results on "stranded assets", that climate policies lead to inefficient asset destruction. The problem with the asset destruction arguments is that the distributional and efficiency ramifications of policies remain indistinct. We see that out results present a challenge to future impact quantifications in other markets: the pure wealth transfer part of the policies should be isolated from the part of the asset destruction that is inefficient. Otherwise, the quantitative basis for evaluating the costs of policies implementing the energy transition remains unclear.

Finally, the results provide some insights on technology complementarities that are likely to shape future electricity markets — storage technologies combined with intermittently available sources of supply. We quantify the returns on storage, and find that a significant part of the social value in energy storage may arise from the ability to turn predictable but temporally available energy into a natural resource. This differentiates energy storage from standard commodity storage.

Contact matti.liski@aalto.fi
Publication January 2017
Financial Support Aalto Energy Efficiency Program and the Academy of Finland program New Energy