Too good to be true? How time-inconsistent renewable energy policies deter investments

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Overview

Our core research questions are: ***With increasing shares of renewable energy deployment, what incentives do governments have to sustain renewable energy support? How can regulators design policies to create enabling long-term investment environments that are consistent even in the case of technological learning? Why did some countries - e.g. Spain, then a frontrunner in wind power deployment - retrospectively cut their support payments, whereas countries like Germany, another frontrunner, did not?***

Investments into renewable energies are globally facilitated through some different kind of regulatory support. Governments back renewable energy investments by promising investors certain policy frameworks and remuneration beyond the level of the electricity price. In a simplified single-period model, governments interested in renewable energy announce high remuneration levels to be paid via levies on electricity, based on which investors reply by investing into new capacity. However, governments then simply deviate, not paying out any remuneration, benefiting from both the now-existing renewable energy capacity and the low costs of electricity. Firms anticipate this opportunistic behavior and do not invest in the first place. In more complex games with both previous investments and potential future investments and with limited commitment, governments' and firms' behaviour depend on a variety of parameters and policies, analyzed previously in other applications of time-inconsistency and here applied to renewable energy investments.

The degree to which such ex-post financial adjustments are possible differs between renewable policies. Where regulators are able to conduct such adjustments, rational investors will foresee this time-inconsistent regulatory behaviour at the investment stage. Consequently, investments are not undertaken or require substantial risk premia, rendering the renewable energy deployment targets more expensive in the first place.

In this paper, we provide a simple analytical model to illustrate the time-inconsistency problem. We then parameterize the model for Spain and Germany in 2012. The model is able to explain why Spain bailed out of its previous commitments towards investors, whereas Germany stuck to its promises. While Spain has a higher discount rate and a policy framework that enable some adjustments to support levels, Germany had generally very low discount rates and a regulatory framework that aimed to prevent retrospective changes.

Methods

Our paper is two-fold: First, an analytical model analyzes the potentially-arising time-inconsistency of regulatory incentives regarding renewable energy policy. Second, an applied piece evaluates the prevalence of this phenomenon, parameterizing the analytical piece using Spanish and German data from 2012.

Our model comprises the investment behaviour of a renewable energy investor and the optimal regulation by the policymaker. The model is based on Lafont and Tirole (2006) and Chiappinelli and Neuhoff (2017) and consists of two stages: Before the first stage, the regulator announces a renewable energy support policy. In the first stage, the investor decides whether or not to invest, taking the announced policy into account as it determines the revenues levels in case of investment. Next, in the second stage, the regulator sees the investments and decides anew about the support policy for the existing installations.

Under (credible) commitment, the first-best solution can be identified: The regulator commits to a support policy which remains in place for the two periods. Investments are made at low risk, and the regulator leaves the policy in place in the second stage. Without commitment, the policymaker will bail out of its previously-announced support level, as has been discussed extensively for other environmental problems (cp. Helm et al., 2003). The regulator benefits from both low electricity prices and the previous investments, as these have already occurred in any case.

However, the firm foresees this opportunistic regulatory behaviour and does not invest in the first place, such that without commitment, no investments can be triggered.

A number of additional elements are analysed in extensions of the simple model: Governments can have supranational deployment targets like the European 2020 targets, according to which each country must reach some renewable energy share by 2020. Target fulfilment is monitored by the EU Commission. Depending on how far each country is on its path to its target, and how promising alternative renewable energies are in the country, these targets can provide incentives for long-term sustained commitment. On the one hand, countries like Romania grow their renewable energy share mostly through biomass, such that other renewables are less important, and consequently a favourable investment environment for these other renewable energies matters less. On the other hand, countries like Germany that are still well below their 2020 targets, but have few viable technologies (or very ambitious targets) highly depend on sustaining favourable investment environments.

We parameterize the model using Spanish and German data of 2012 on their demand of electricity, renewable energy production, future installation trajectories, EU 2020 target achievement, discount rate, costs of renewable energies, induced merit order effect, and renewable energy policy. We test in how far the regulators' pay-offs between commitment and opportunistic behaviour differ.

Results

In repeated games, the investment level and whether it can be sustained even in the absence of commitment, depends on the pay-offs under commitment and opportunistic behaviour for the regulator. Under commitment, some long-term investment trajectory is enabled. Under opportunistic behaviour, the regulator gains a high one-off payoff, benefiting from the period's investment and cheap electricity, but is afterwards punished by the firm as it does not invest any longer. Thus, in all following periods, electricity is cheap, but no more renewable energy is installed.

We find that feed-in tariffs leave least space for expropriation, while sliding feed-in premia having slightly less commitment, as balancing cost arrangements can be adjusted. Additionally, it matters under these policies in how far the regulator promises specific remuneration levels or rather general "profitability" of their investments. Tradable green certificate schemes leave key parameters at the regulator's disposal and thus face the strongest commitment problems.

We find that in Spain, deviating from previous regulatory commitments was more attractive than commitment by about €10 billion. A major reason are the higher discount factors applied at the time in Spain due to financial pressure during its financial crisis. Consequently, the future benefits from new renewable energy investments matter little in comparison with the costs of old investments, which exist right away. As past investments have already been undertaken, only their support costs remain, as their environmental benefits materialize in any case. Contrary, in Germany, commitment was more attractive by about €8 billion due to very low discount rates. Applying low discount rates implies that both the expected future cost reductions of renewable energies and the 2020 renewable energy target play a prominent role in the regulator's welfare optimization, rendering commitment the favourable option.

Conclusions

Renewable energy policies are key for a low-cost transition towards renewable energies. Our analytical model demonstrates that renewable energy policies are prone to opportunistic regulatory behavior, eventually rendering investments more costly where banks and investors foresee regulatory opportunism. The model can explain why countries like Spain (high discount rate) and Romania (attractive alternative renewable energy source, biomass, to reach EU 2020 target) have retrospectively cut their support, while some others like Germany (low discount rate and well below its EU 2020 target with few viable alternatives) keep up support. We show that renewable policies with little space for ex-post adjustments are able to prevent regulatory opportunism and keep financing risk premia low.

References

Chiappinelli, O., Neuhoff, K., 2017, Time-Consistent Carbon Pricing, DIW Discussion Paper # 1710

Helm, D., Hepburn, C., Mash, R., 2003. Credible carbon policy. Oxford Rev. Econ. Policy 19, 438–450. doi:10.1093/oxrep/19.3.438

Laffont, J.-J., Tirole, J., 1996. Pollution permits and compliance strategies. J. Public Econ. 62, 85–125. doi:10.1016/0047-2727(96)01575-7