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Support policies for renewables

Instrument choice and instrument change from a Public Choice perspective

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Abstract: This paper frames the transition towards clean energies as a sequential process of instrument choice and instrument change. First, regulators decide how to initiate the transition away from fossil energies. Here, support policies for renewable electricity are politically convenient because they face low resistance from fossil energies' interest groups. In the second stage, regulators need to adapt support policies for renewables to challenges arising along the transition pathway. We empirically substantiate our arguments by tracing the development of support policies in Germany. Against the backdrop of this analysis, we point towards small-step policies that could foster the transition process.

Keywords: instrument change, instrument choice, renewables, rent management, support policies
JEL classification: D72, D78, H25, Q42

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1 The energy transition as a political challenge

In order to limit the risk of climate change, mankind needs to initiate the transition away from fossil towards clean energies now—delaying mitigation would imply 'much more rapid scale-up of low carbon energy' over the period 2030 to 2050 if any chance is to remain of restricting global warming to 2° Celsius (IPCC 2014: 24), or even less (COP 2015: 2), compared to pre-industrial levels. From an economic point of view, consequently, postponing policy interventions that facilitate the transition is costly (Acemoglu et al. 2012; Kalkuhl et al. 2012). However, timely and rigorous policy efforts to curb fossil energies are hampered by vested interests, institutional inertia, and the intergenerational nature of the problem, which may induce strategies of procrastination (e.g. Gardiner 2006; Helm 2010; Spash 2010).

Against this backdrop, Germany's energy transition is a particularly fertile research topic. Germany has set itself very ambitious transition goals that would, inter alia, completely restructure the electricity system around renewable energy sources (RES) by the middle of this century (Bundesregierung 2010). So far, the German transition pathway closely follows the envisaged trajectory as regards RES electricity expansion.[1] The RES share, measured against gross electricity consumption, has almost quadrupled from 7 per cent in 2000 to 27.8 per cent in 2014 and will increase up to 80 per cent by 2050 (BDEW 2015: 15). Strong international attention is focused on the transition process—it has been referred to as the 'possibly globally catalytic "*Energiewende*"' (Stirling 2014: 87). There are three reasons a successful transition in Germany might serve as a leading international example. First, Germany represents a highly industrialized economy (industry's share at gross value added was 25.5 per cent in 2013 as compared to the European Union [EU] average of 19.1 per cent).[2] Second, the starting position for the transition has not been particularly good, with only 4 per cent of gross electricity consumption being renewable electricity during the 1990s. Third, similarly ambitious long-term goals are not common in many other nations so far.

When initiating the energy transition, which policies did German regulators choose and for what reasons? The theoretical framework that we employ to address this question is the Public Choice perspective: it holds that policy choices derive from the self-interest driven behaviour of political stakeholders (e.g. McCormick and Tollison 1981; Niskanen 1971; Olson 1971; Stigler 1971; Tullock 1967). The transition towards clean energy is no different in this respect: energy policy choices also involve 'rent management', that is, (re)distribution of resources among stakeholders (Schmitz et al. 2013). In consequence, the internalizing of climate and other environmental externalities from conventional energies (e.g. nuclear risks, leaking gas pipelines, local air pollution) might not be feasible in a direct and timely way. The first objective of this paper, therefore, consists in explaining why specific instrument choices initiating the energy transition have been made in Germany and why they have turned out to be successful so far.

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[1] Outside the electricity sector, the transformation does not unfold equally rapidly. To the contrary, progress in transforming transport and heating is rather slow (cf. Monopolkommission 2013): within the heating sector, at least some transformation efforts are present, while the transport sector displays strong inertia. The variety of both stakeholders and policy instruments across the different sectors is considerable. Hence, a detailed comparison between the different sectors lies beyond the scope of this paper, which focuses on the electricity sector.

[2] See:

http://ec.europa.eu/eurostat/statistics-explained/index.php/File:Gross_value_added_at_basic_prices,_2003_and_2013_%28%25_share_of_total_gross_value_added%29_YB15-de.png

Yet, increasing the share of RES is not sufficient to achieve the sustainable transformation of the electricity system. For instance, the reduction of energy consumption via efficiency measures and altered consumption patterns constitutes a complementary measure. Furthermore, the rise of RES brings along new challenges, such as controlling the costs of RES deployment, the need to adapt the system to fluctuating feed-in from wind and solar energy or the mitigation of environmental impacts from RES generation. In consequence, 'first-generation' RES policies should evolve into 'next-generation integrated power system policies' (Miller et al. 2013). From the regulator's perspective, however, this task is fraught with uncertainties related to, inter alia, RES generation costs, patterns of technological change, external environmental and system integration costs associated with RES deployment, or the response of RES investors to public policies (Purkus et al. 2015). These uncertainties imply that RES policy decisions taken today may turn out to be erroneous in the future, as new information becomes available to regulators.

The second objective of this paper, therefore, consists in shedding some light on the question of how the chosen support instrument can be adapted to the manifold uncertainties of the transition. While this sounds like an unequivocal call for political flexibility, potential trade-offs arising from reduced policy stability need to be acknowledged. Stability is a key ingredient of successful economic policy (Eucken 1952; Weingast 1993) since uncertainty may lead to inefficiently low private investment (Dixit 1992; Hepburn 2006). Moreover, the adaptation of instruments over time may be impaired by the fact that they inevitably create technological and institutional path dependencies. Accordingly, instruments have to keep up with changed circumstances in order to avoid carbon lock-in (Unruh 2000) merely being replaced with a new RES lock-in.

We are thus faced with a challenging and rather complex set of requirements for policy intervention to facilitate the transition towards clean energies: substantial transition policies need to be launched right away to ensure timely climate mitigation; the emerging policy framework should be flexible enough to enable adaptation to unforeseen challenges (for example, technological surprises) but it should also be stable enough not to curb the deployment of clean RES. Even for a 'benevolent dictator', this task would be far from trivial.

Summing up, we frame the overall challenge of 'how to facilitate the transition towards clean energies' as a two-stage Public Choice problem applied to the case of Germany's *Energiewende*. The first stage represents the *instrument choice* problem of a regulator addressing climate and environmental externalities of energy use in the electricity sector. We demonstrate that support policies for RES better conform to the Public Choice framework than alternative policy options. An overview of the introduction and development of Germany's support scheme for RES corroborates the theoretical predictions. The second stage concerns the problem of *instrument change* regarding necessary adaptations of the RES support scheme: in the long run, fundamental changes are inevitable to promote market and system integration of RES. One crucial question here is which possible solutions the Public Choice framework offers for the trade-off between political stability and flexibility (i.e. rigidity vs. uncertainty; see Acemoglu et al. 2008; Rodrik 1996): the design of transition policies, or 'green industrial policies', as they have been called, needs to take the self-interested motivations of political stakeholders into account—otherwise, policy recommendations may well turn out to be practically irrelevant (see Rodrik 2014; Schmitz et al. 2013). Certainly, the Public Choice perspective is only one among a number of possible ways to frame the transition towards clean energies; yet it brings with it the particular merit of highlighting the politico-economic restrictions for any transition strategy.

The remainder of this paper is organized as follows. In Section 2, the problem of instrument choice is analysed against the background of Germany's support scheme for RES. Section 3 addresses the problem of instrument change: how to adapt existing RES support schemes to

enable market and system integration of RES. In Section 4, we discuss our findings from the German case and draw conclusions for the global challenge of clean energy transitions.

2 Support for renewables as a solution to crucial climate and energy policy challenges

2.1 The problem of instrument choice

In principle, policy makers could choose a range of instruments to initiate the phase-out of fossil energies. As Table 1 illustrates, these instruments differ with respect to their rent management potential, redistributing resources in a targeted way by 'providing (and withdrawing) opportunities for above-average profits and investment' (Schmitz et al. 2013: 5). For instance, a carbon tax might be considered the most direct way to internalize climate damage; yet carbon taxes trigger strong resistance by emitting industries who generally prefer cap-and-trade schemes, because they provide more possibilities to extract rents (e.g. grandfathering of emission permits; see also Spash 2010). In other words, getting the carbon prices right might prove to be impossible because of the bargaining power of emitting industries: carbon pricing puts abatement costs directly on those stakeholders represented by well-organized interest groups.

From a Public Choice perspective, then, regulators can be expected to choose those instruments that maximize stakeholder support by enabling the most targeted distribution of rents: politicians act as transfer brokers, redistributing welfare between different stakeholders so as to maximize their chances of electoral success and their personal income (McCormick and Tollison 1981). Eventually, the best organized interest groups extract rents by steering regulation in their favour (Olson 1971; Stigler 1971; Tullock 1967). This perspective implies strong restrictions on the feasibility of textbook climate and energy policy instruments: climate policy essentially constitutes a 'carbon pork barrel' that waits to be distributed among stakeholders (Helm 2010), all of whom strive to obtain the largest possible share. Once a policy instrument has been chosen, its implementation offers another possibility of rent-seeking: bureaucracies also follow their special interests, such as budget maximization, and therefore may use any discretionary power over regulatory details in their favour (Gawel 1995; Niskanen 1971). In sum, the *instrument choice* problem, as framed through the Public Choice lens, reads: how can regulators meet the demand for transition policies in a way that maximizes stakeholder support?

Against this backdrop, support policies for RES promise two main political benefits. First, by encouraging the switch away from fossil fuels without directly increasing the emitters' abatement burden, they face less political resistance from organized fossil interest groups. Instead, the burden of the transformation is to be borne by less organized groups (e.g. electricity consumers). Within the EU emissions trading scheme, RES support lowers the allowance price and therefore makes stricter emission caps even easier to negotiate (Gawel et al. 2014). Second, RES subsidies constitute rents to be distributed; hence, they extend the 'rent management' (Schmitz et al. 2013) potential of decision makers. In addition to these political benefits, support for RES may also increase the overall efficiency of energy provision insofar as such energy sources help to address other environmental externalities beyond climate change, for which direct policy instruments with burdening effects may not be politically feasible (Sijm et al. 2014).

Table 1: Transition instruments and their rent management potential—schematic overview

Categories of instrument design	Characteristics of transition instruments	Theoretical prediction: targeted redistribution of rents	Empirical observation in Germany
Internalizing instruments: Carbon tax, emissions cap-and-trade			
Price and/or quantity regulation	Price regulation (tax) vs. quantity regulation (emissions cap)	Quantity regulation more susceptible to regulatory capture than price regulation	No general CO_2 tax, only sector-specific (e.g. gasoline), emissions trading scheme on EU level
Differentiation and exemptions	Auctioning or grandfathering of emission permits, tax discounts	Cap-and-trade with grandfathering	Cap-and-trade with initial grandfathering and loopholes (e.g. Clean Development Mechanism credits)
Support instruments for clean energy: Tax credit, feed-in tariff, feed-in premium (fixed or flexible), quota scheme, tender scheme			
Support level	RES production costs as benchmark	Production cost plus mark-up to enable rent management	Production cost plus mark-up
Exposure to market risks	From low (feed-in tariff) to high (tender schemes) exposure	RES groups favour no exposure to market risk	1991–2012: feed-in tariff (no market risk); from 2012 on: phasing out of feed-in tariff (slow increase in market risk)
Differentiation within finance mechanism	Financing source (e.g. public budgets or levy on electricity prices) and differentiation within eligible group	Lobby groups aim at minimizing their constituents' contribution, politicians aim at concealing costs	RES levy on electricity prices; generous exemptions for energy-intensive industries
Command-and-control instruments: Emission standards, technical standards			
Performance and/or behaviour regulation	Mandate a certain standard (e.g. prohibition of incandescent light bulbs, emission limits for car engines)	Efficiency standards (performance) instead of consumption quotas (behaviour)	No consumption quotas; successful lobbying against strong emission standards for cars

Source: authors, based on a review of Public Choice literature (e.g. McCormick and Tollison 1981; Schmitz et al. 2013) and previous original work (e.g. Gawel et al. 2014).

Overall, there is a wide variety of ways to organize RES support. The annual Global Status Reports on RES development catalogue all pertinent instruments applied worldwide (see Sawin et al. 2015: 99ff.). As demonstrated in Table 1, the decision to support RES also needs to be accompanied by a series of more specific instrument design choices—for instance, regarding the level of support granted to RES or the financing mechanism. For all of these specific choices about RES support, the targeted distribution of rents provides a major design incentive. In the following, we will take a more specific look at the characteristics of Germany's RES support framework for RES as it has emerged over the last 25 years.

2.2 Germany's support policies for renewables

Until 2012, RES support was exclusively based on a feed-in tariff, complemented by prioritized feed-in for RES-generated electricity. This implied a very high degree of investment security for RES producers in two respects. First, they received a fixed remuneration for every kWh produced over 20 years. Second, even when the electricity produced was 'superfluous' (such as in times of negative prices on the spot market, or if looming grid overload necessitates disconnection of a wind generator from the grid), the RES producers have been (and still are being) compensated. Efforts recently initiated to adapt this scheme will be addressed in Section 3.2 on *instrument change*, while this section focuses on the introductory phase of *instrument choice*.

At first glance, it might seem puzzling that RES support has been introduced at all (see Strunz et al. 2015 for a more detailed account of the following argument). Industry interest groups are mostly better organized than environmental interests (Kirchgässner and Schneider 2003), and therefore they enjoy excellent access to policy makers. This asymmetry in political clout has also paid off in financial terms: conventional energies have benefitted from cumulative subsidies that amount to several times the cumulated RES subsidies (1970–2014: €327 billion for hard coal, €219 billion for nuclear power, €102 billion for RES; Küchler and Wronski 2015: 7). So why did or could conventional utilities not prevent the rise of a competing RES industry? When RES first received direct (non-R&D) subsidies under a support scheme in 1991, they were only minor niche technologies. Hence the 'big four', the oligopoly of conventional utilities that dominated the German electricity market, underestimated the long-term threat posed by RES. Conventional interest groups felt very secure in their dominant position, misjudging RES as being incapable of substantially contributing to electricity supply and probably hoping in vain for government changes during the general elections of 2002 and 2005. Legislators, in turn, by positively supporting RES (and thus bringing purchasing power to the benefitting sectors at the public expense) rather than heavily taxing fossil resources (and thus cutting rents for powerful pressure groups), could circumvent the opposition of well-organized conventional industry groups.[3] Thus, the RES support represented a seemingly harmless, symbolic way of currying favour with the environmental movement that had been growing since the 1980s in Germany.

Yet the extension of RES support in 2000 crucially affected economic and subsequently political dynamics. The RES share, measured against gross electricity consumption, has risen from 7 per cent in 2000 to 27.8 per cent in 2014 (BDEW 2015: 15). In economic terms, the increased financial subsidies for RES contributed to relative price changes to the disadvantage of conventional energy. As a result, the conventional utilities' profits have plummeted in recent years, whereas the sums distributed by the RES scheme are continuously increasing. Over time, self-reinforcing dynamics emerged (see Strunz 2014): RES support created RES constituencies that benefit from and rely on the support scheme: 'green jobs' in the RES industry, small-scale RES producers such as PV (photovoltaic) homeowners, and so on. Consequently, the political leverage of the RES sector now rivals the influence of the conventional industry, which serves to perpetuate RES subsidies (see Section 3). But while the RES industry has developed into an important political player (Sühlsen and Hisschemöller 2014), the 'big four' are struggling to survive within a fundamentally changed business environment (Kungl 2015). For instance, in a decision, whose symbolic meaning was not lost on national and international observers ('E.ON and E.OUT', *The Economist* 2014), the company e.on, one of the four leading conventional utilities, recently aimed at splitting the company in two, so as to outsource the traditional fossil-nuclear activities into some kind of 'bad utility', analogous to the 'bad banks' set up to deal with toxic assets during the financial crisis.[4]

As regards the specific design of RES support policies, the Public Choice framework points to a very clear incentive structure: the more differentiated a support scheme is, the more the associated rents may be distributed in a targeted way. Hence, regulators have an incentive to devise a highly differentiated scheme that allows for active rent management. We maintain that

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[3] Consider also the 'ecological tax reform' of 1999, which turned out to be a paper tiger: 'extensive tax reductions and rebates in favour of energy-intensive industries, as provided by the tax reform, substantially water down its cost-effectiveness. […] From a political economy perspective the exemptions can be explained by voters' low willingness-to-pay for the environment and the sectoral concentration of adjustment costs' (Böhringer and Schwager 2003: 211).

[4] However, in response to legislation stipulating that financial responsibilities for the dismantling of nuclear power plants will have to be borne by the plants' former owners, regardless of such 'outsourcing' efforts, e.on decided to keep the nuclear plants alongside the new RES-based part of the company.

Germany's feed-in tariff results from such rent management: in contrast to quota schemes and feed-in premiums, which do not guarantee a targeted allocation of a fixed and secure level of rents, feed-in tariffs enable targeted rent management, thereby maximizing stakeholder support (see Table 1). What is more, the feed-in tariff is further differentiated along three dimensions: technology, spatial scale, and financing of the scheme.

First, technology differentiation ensures that support not only reaches the cheapest RES at a given point in time, but all the technologies of the desired portfolio. In other words, green industrial policy may be actively differentiated into several strands. Indeed, Germany's feed-in tariff is highly differentiated with respect to technology. Differentiation occurs not only between technologies (PV, wind, biomass, geothermal energy) but also within technologies: the tariff distinguishes, for instance, between on- and offshore wind, or between small PV installations and large PV installations. Hence, the basic set-up allows for pinpoint distribution of rents to separate constituencies. A major benefit for RES industries from such a differentiated scheme is that it prevents competition between RES technologies. The structural impacts of this 'green industrial policy' may be sizeable: in 2011 there were 128,000 jobs within Germany's PV industry (BSW Solar, cited in Hoppmann et al. 2014: 1430).

Second, in Germany's federally organized system, regional differentiation may cater to spatially heterogeneous interests. Although no formal differentiation takes place (the scheme is implemented uniformly at the national level), there exist indirect ways to account for regional stakes by affecting consecutive reforms of the RES scheme (see Strunz et al. 2015). In particular, the German *Länder* seize every opportunity to promote regional development through RES deployment without impacting on their own state budgets. Conversely, in cases where regional costs exceed regional benefits—this may materialize in the form of NIMBY protests—the *Länder* aim at altering or affecting national policies in favour of the constituencies concerned. Consider the example of Bavaria, which recently introduced strict guidelines for the placement of wind parks at state level and successfully lobbied for amendments to the federal grid expansion plan—both in reaction to local NIMBY protests.

Third, regarding the financing mechanism, differentiated consumer surcharges may shield well-organized interests from fully contributing to the scheme—at the expense of less organized groups. This is precisely the situation with Germany's feed-in-tariff: it is financed via a levy on electricity prices characterized by generous exemptions for energy-intensive industries (cf. Gawel and Klassert 2013). Due to the energy-intensive industries' organizational advantage compared to dispersed consumers/voters, the former succeeded in steering regulation in their favour. In fact, high-volume users are all but exempt from paying the RES levy: while they represent only 4 per cent of all companies, their respective electricity share, which is burdened with a minor fraction of the full levy (as low as 1 per cent), accounts for 41 per cent of all electricity consumed within the industry sector (BDEW 2015). The official criterion for the 'special exemption' from the RES levy refers to 'high exposure to international competition'. In practice, however, the energy-intensive industries have fully captured the scheme in this respect by transferring the burden to small- and medium-sized companies and household consumers (Gawel and Klassert 2013).

The gist of this *instrument choice* overview: specific instrument design choices within Germany's *Energiewende* project follow the presumptions of Public Choice theory as laid out above. Continuous lobbying efforts by affected stakeholders (such as energy-intensive industries, the

states) with heterogeneous interests and bargaining power account for the observed characteristics of a highly differentiated RES support scheme.[5]

3 The long-run perspective: how to integrate renewables in energy markets?

3.1 The problem of instrument change

The widespread deployment of RES means that they have grown out of their niche existence (cf. Geels 2002). This success yields new challenges. These, in turn, open up the problem of how to adequately adapt RES support over time—what North (1990, 1995) refers to as 'adaptive efficiency'. There are two main reasons, why the energy transition requires adaptations of the policy framework (see Table 2). First, multiple technological changes, and possibly surprises, have characterized the energy sector and will continue to do so. This concerns not only the most imminent aspect of RES production costs but also prospective developments of storage options and demand-side management, as well as developments in the fossil energy sector (see the shale gas boom). So, beyond the question of how to adequately account for RES cost decreases in RES remunerations, the issue of how RES can be aligned with complementary technologies needs to be addressed. This leads to the second point, namely that RES support policies cannot stop at the single aim of increased deployment of RES (see Miller et al. 2013). Immature niche technologies might necessitate a narrow policy focus on capacity increases, but as RESs mature, new priorities emerge: market and system integration. With increasing shares of RES, volatile feed-in from wind and photovoltaic power, as well as cumulating expenses for RES support are to be dealt with. In the long run, volatile RES must guarantee security of supply, which is not merely a technological issue but also one of incentives—at some point in time, RES producers will have to face price and quantity risks. Consequently, RES support needs to evolve beyond simple deployment of RES by fixed feed-in tariffs, considering all relevant systemic repercussions (both from a technological and a socioeconomic point of view).

Table 2: Schematic overview of major transition challenges beyond RES deployment

Time horizon of transition challenges Categories	Short run	Long run
Economic	Cap expenses for RES deployment	Market integration: expose RES producers to market risks
Systemic	Avoid grid congestion	System integration: adapt to technological innovations; ensure security of supply with volatile RES
Political	Avoid lock-in, maintain capacity to adapt	Find the right balance between stability/rigidity and flexibility/uncertainty

Source: authors, based on a review of energy transition literature (e.g. Miller et al. 2013).

In other words, the danger arises that energy transition policies replace the 'carbon lock-in' (Kalkuhl et al. 2012; Unruh 2000) with a RES lock-in. At the same time, however, political stability constitutes an important factor for ensuring successful economic policy in general (Eucken 1952; Weingast 1993) and technology policy in particular (Grubler et al. 2012). While avoiding lock-ins, political flexibility gives rise to political uncertainty and may lead to

[5] This is not to say that that the Public Choice assumptions exclusively explain all aspects of empirically observed RES support schemes. The variety of specific instrument configurations in the EU demonstrates that country-specific factors, such as natural conditions or political culture, may also bear a substantial impact.

inefficiently low private investment (Dixit 1992; Hepburn 2006). Thus, a trade-off holds, similar to the discussion about discretionary vs. rule-based approaches in monetary policy (see Lohmann 1992; Rogoff 1985; Taylor 2011). Optimally, the RES support scheme would be flexible enough to account for unexpected developments concerning technologies and market structures, but also stable enough so as not to undermine private investors' contributions to the transition process via including RES in their portfolios.

This 'adaptive efficiency' perspective needs to be linked with the Public Choice framework. Politicians are primarily motivated to win elections, so their incentive to conceive of a coherent mix of systemic and anticipatory policies (see Sovacool 2009) is low compared to the overwhelming incentive to secure instantaneous stakeholder support. Given that the status quo of RES support represents a balanced compromise resulting from careful political brokering of different interests, path dependency looms. Furthermore, politics generally responds to challenges in an ad hoc way because it is intently fixed on the media attention cycle. Consequently, challenges are not met according to the objective risk they carry but according to the actors' capacities to respond to the media-induced level of stress (see Prittwitz 1990). As regards the transition challenges, the advisable 'integrated power system policy' (Miller et al. 2013) remains elusive. In sum, one important prediction of the Public Choice framework is that some degree of path dependency of the main RES policy characteristics can be expected.

Yet, interestingly, it is, even in principle, unclear what the optimal policy solutions to the above outlined challenges of market and system integration would be. For instance, can spatial issues such as system-friendly allocation of new wind parks be adequately addressed *within* the framework initially set up for launching RES or does this require a wholly new support scheme? In the following, we analyse the German RES scheme with respect to its history of adaptation. On this basis, we set out future regulatory options that take restrictions of political feasibility into account.

3.2 Adapting Germany's support policies for renewables

Since the introduction of the current feed-in tariff for RES in 2000, it has been regularly updated and reformed. Overall, the observed reform process confirms the Public Choice framework's predictions. The chosen policy pathway is highly inert in that changes to fundamentally different policy regimes are not politically feasible. For instance, a switch from the feed-in tariff to a quota scheme, as repeatedly recommended by some economists (e.g. Hübner et al. 2012; Monopolkommission 2013), seems to be all but ruled out in practice. Furthermore, although recent reforms have been advertised as important breakthroughs with respect to increasing the cost efficiency of the scheme (in a narrow, short-term sense), they do not expose RES producers to market risks in any significant way.

Consider the 'market premium' approach to encourage direct marketing by RES producers, which was initially introduced in 2012 as an option (cf. Gawel and Purkus 2013). From 2012 to 2014, RES producers could choose between the fixed feed-in tariff and a sliding feed-in premium. The latter was calculated as the difference between the average value of the electricity (monthly spot market averages) and the tariff level. In addition, participating producers received a so-called 'management premium' to compensate for costs incurred through market participation. As a consequence, RES producers made significant windfall profits but overall market and system integration was hardly improved.

The latest policy overhaul of the support scheme occurred in 2014 (see Gawel 2014; Gawel and Lehmann 2014 for a more detailed analysis). While the reform was boldly labelled as the Renewables Support Act 2.0 (Gabriel 2014), no far-reaching or even game-changing innovation

has occurred. Among the innovations are target corridors for PV and wind deployment and a prototype PV tender to gather experience with tendering schemes. Moreover, the 'management premium' has been repealed and tariffs for new installations have been reduced. The association of RES producers has scorned the reform and warned that it might 'choke' the further deployment of RES (BEE 2013). This is clearly exaggerated. Most likely, the direct effect of these reforms will be minor as regards the overall trajectory of the transition. The prototype tender may, in the long run, constitute one possible avenue for deeper market integration of RES. It is important to note, in this respect, that the EU Commission is increasingly pushing for tenders as standard for RES support schemes (European Commission 2014).

Thus reforms of the RES support scheme proceed only incrementally. Drastic policy changes, such as the harsh retroactive cuts in Spanish RES support in 2011–13 in reaction to the financial crisis and the change to a conservative government, are not conceivable within Germany's political culture—unless there was some major shift in the economic environment. In particular, retroactive cuts to RES support are all but ruled out because the principle of *pacta sunt servanda* (agreements must be kept) enjoys inviolable status. This might also be seen from the fact that even a rather soft form of 'disguising' rather than rescinding old contractual RES remuneration obligations has met sharp public criticism: some politicians had put forward the idea of a partly debt-financed fund to cover all old support grants. However, due to the public outcry, this proposal to essentially transfer costs into the future has not been implemented (see Gawel and Lehmann 2014).

In conclusion, the experience of past reforms suggests a narrowly restricted future for any reform efforts in Germany. Generally, every policy change implies a redistribution of rents and therefore needs to be implemented against the protest of the losing stakeholders. At the same time, politicians clearly feel the need to display reactive capacity and self-assertion—even if via symbolic measures only (see Edelman 1964). Against this backdrop, how might the reiterative process of lobbying and policy making unfold? Two countervailing forces affect the long-run adaptation process. On the one hand, beneficiaries of the conventional energy system still attempt to slow down or even derail the transition towards RES. For instance, there have been successful efforts of political agenda-setting, as demonstrated by recent public discussions about an alleged 'cost-tsunami' due to the expenses for PV power (Frondel et al. 2010). On the other hand, as described above, positive feedback, arising from the feed-in tariff scheme distributing financial benefits to a sizeable portion of the electorate, makes the RES support scheme politically resilient (cf. Strunz 2014).

The uncertainty over the best way to fully integrate volatile RES in the electricity market (e.g. Kopp et al. 2012; Winkler and Altmann 2012) while phasing out fossil and nuclear electricity provides new opportunities to extract rents. For instance, the alleged increased risk of black-outs due to volatile RES is brought forward as an argument for capacity markets—an instrument to the particular benefit of conventional power stations, whose introduction would, however, constitute an essentially irreversible act from a Public Choice perspective (Lehmann et al. 2015). A related example of vested interests' regulatory impact can be seen in recently failed efforts to introduce a 'climate levy' to be borne by Germany's oldest lignite power stations. Since the EU emissions trading scheme sends only insufficient decarbonization signals (due to the huge oversupply of emission permits), Germany's lignite industry has enjoyed an upturn in the first half of the 2010s. In consequence, so as to ensure that Germany's greenhouse gas emission reduction target for 2020 will not be missed, a climate levy had been proposed. However, through a concerted lobbying action by industry associations and unions, the *polluter pays* principle was converted to *polluter profits* in that the planned levy was replaced by 'capacity payments' which will be awarded to owners of the oldest lignite plants in exchange for taking

their plants off the grid while keeping them in some kind of strategic reserve—in other words, a classic 'golden handshake' (see Gawel and Strunz 2015).

So at every incremental transition step, rent-seeking by affected stakeholders will impact on the process. As long as none of the crucial stakeholders succeeds in full regulatory capture, this need not damage the process as a whole. Rather, one might conceive of the process as a selection between several possible scenarios: technologically, there might be both centralized and decentralized ways to engineer a fully RES-based system. Yet it is primarily a question of economic power and political influence within a highly dynamic environment that determines which of the scenarios materializes. Schmid et al. (2015) identify necessary conditions that would bring different actors within Germany's energy sector into a dominant position so as to steer the overall process in a more (de)centralized direction. Specifically, while communal utilities and private RES producers would prefer a decentralized scenario, large utilities would prefer a centralized scenario (e.g. high shares of offshore wind).

3.3 Systemic challenges

The energy transition does not only require RES deployment but also the integration of newly built RES with other elements of the electricity system such as remaining conventional production capacities and storage options. Yet the most prominent related aspect concerns transmission grids. Rising RES shares put pressure on the existing grid, particularly as regards electricity generated in wind parks along the North Sea coast that needs to be transported to consumption centres in southern Germany. Bottlenecks loom and the transmission system operators increasingly need to 're-dispatch' power in order to prevent grid overload (Bundesnetzagentur 2014: 16). The precise relations between RES deployment and grid extension are, however, debated in both an academic context and the public domain. In fact, Nordensvärd and Urban (2015) claim that Germany's energy policy already suffers from a lock-in that diverts investment away from the pivotal issue of grid extension and retrofitting. In particular, they argue that the feed-in tariff for wind prioritizes upscaling of production capacities 'at the expense of investments' in an 'aging and under-performing grid'; thus, they conclude that 'German wind energy policy needs to move beyond the singular feed-in-tariff lock-in thinking' (2015: 164). While they may be correct in emphasizing the grid issue as pivotal for the overall transition (but see also Gerbaulet et al. 2013), they fail to acknowledge that grid extension itself is a Public Choice issue. Their argument that wind support is responsible for delays in grid extension seems much too narrow. Instead, the stakeholder interests involved in grid adaptation need to be accounted for.

Although from a systemic point of view grid extension and RES deployment are complementary, the distributional effects of upgrading and enlarging transmission grids are complex: 'expanding and interconnecting grids typically works against the interests of some producers, by eroding the ability of incumbents to extract rents. It also gives politicians less scope to interfere with their national and local energy systems' (*The Economist* 2015: 10). One case in point seems to be Bavaria's efforts to prevent new transmission lines crossing into this southernmost state. Instead, the Bavarian government aims to increase biomass and gas capacities—thereby obviously favouring the local distribution of rents and backtracking on previous agreements (Hecking 2015).

Yet while the above citation suggests that new transmission lines only disadvantage the incumbents (insofar as the new lines serve to transport electricity from RES), they may also serve the incumbents: a heated discussion in Germany as to whether new connections to the south from eastern Germany, where a lot of electricity is generated from wind but also from lignite, attests to this point. Gerbaulet et al. (2013) reject the idea that the new lines promote the

transition, as the Federal Network Agency holds, and argue that they would rather foster lignite production in the eastern states. Sure enough, local NIMBY activists who oppose these new lines jumped upon this argument. Whether an objective answer to this dispute exists, remains doubtful. Each stakeholder naturally uses those arguments that serve to back up his private interests.

These issues indicate a crucial insight: the market and system integration of RES cannot be treated as a purely technical problem for which an efficient policy solution needs to be found. On the contrary, stakeholder interests, systemic requirements, and policy options are intertwined. Only very broad formulations of that *instrument change,* which is needed, may find consensus. It is clear that the fixed tariff scheme, combined with prioritized feed-in, has been very effective in ramping up RES deployment *without regard to systemic consequences*. While this is exactly what niche support is all about, with RES becoming a major pillar of the electricity system, the systemic effects of RES deployment need to be addressed. Beyond this general statement, the issue becomes one of Public Choice rather than technology.

Given this assessment, what might realistic reform pathways look like? In order to illustrate, let us consider the spatial allocation of new wind farms. The existing feed-in tariff includes a small element of spatial regulation in that less windy locations receive remunerations that are a bit higher than their more windy peers: hence, there is a small incentive not only to build wind farms in the north but also in the more southern back country. Now a range of options might lend themselves to mitigating bottlenecks on the north–south axis: market splitting (different price zones in the north/south to incentivize capacity building in the high-price zone), grid extension, even higher differentials for windy/less windy locations, or exposure of RES producers to quantity risks. The latter option could mean, for instance, that RES producers receive no compensation when wind farms have to be taken off the grid to ensure grid stability. This would incentivize RES producers to search for storage options and/or to locate new installations only in areas that are not prone to grid overload. Certainly, stakeholders would protest against a decrease in the expected value of their payoff. However such a policy adjustment would be broadly in line with the overall requirement of our framework: it would not fundamentally alter but only incrementally change the existing support scheme. Furthermore, it would align with what is envisaged in the EU Commission's latest State Aid Guidelines (2014 C 200/01). In case of negative spot market prices occurring more often due to high RES feed-in (cf. Bundesnetzagentur 2014: 123), the stakeholders' argumentative leverage against such measures would also decline.

4 Conclusion

In this paper we have framed the transition towards clean energies as a two-stage Public Choice problem of *instrument choice* and *instrument change*. Both stages of the transition involve active rent management to reconcile the interests of different stakeholders. The first stage—instrument choice—concerns the question how to incentivize substitution away from conventional fossil energies. From the regulator's perspective, support policies for RES bring a twofold political benefit as compared to taxing conventional energies or capping emissions: most importantly, RES support creates new rents for (new) power producers, rather than reaping existing rents of incumbent producers. Thus the transition faces less opposition from conventional energies' (or, more generally, emitting industries') lobbying protests and stakeholder support is maximized. Moreover, RES support reduces abatement costs within existing cap-and-trade schemes, which further improves the regulator's negotiation position against the conventional energies' lobbies (Gawel et al. 2014). An analysis of the introduction, specific set-up, and development of Germany's RES support scheme corroborates the main premises of the Public Choice

framework: the empirically observed, highly differentiated support scheme enables targeted rent distribution to a variety of stakeholders.

The second stage—instrument change—addresses the adaptation of the chosen policy framework in line with new transition challenges. One important issue is how to integrate high shares of volatile RES into an existing system without compromising security of supply. Adapting the RES support scheme might prove difficult due to path dependencies: the beneficiaries of RES support constitute political stakeholders who would lobby against any change of the support scheme leaving them worse off. Indeed, our investigation of Germany's current efforts to foster the market integration of RES shows that policy adaptations have been rather symbolic so far. Moreover, RES support establishes a specific technological transformation pathway (i.e. the system is adapted to the needs of these technologies), which, in turn, disadvantages potential technological alternatives. In consequence, the *Energiewende* trajectory exhibits self-stabilizing tendencies. Despite the risks of path dependencies, one might argue that there is also a positive aspect to this inertia in that the transition pathway becomes more resilient (Strunz 2014).

Acknowledging that under normal circumstances instrument change proceeds incrementally does not imply predictability. In the case of exogenous shocks or major political shifts, windows of opportunity may open and facilitate rapid policy change—Germany's nuclear phase-out in reaction to the Fukushima disaster in 2011 is a case in point.[6] Overall, one might thus conclude that policy change unfolds erratically, rather than in a planned and purposeful way, and depends both on windows of opportunity and politicians' capacity to seize them (see Prittwitz 1990). What are we to infer from this for the transition process? The answer, crucially, depends on our reference point. Judging single policy decisions against the standards of static and adaptive efficiency would yield a bleak picture. Yet, should stakeholder rent-seeking be framed as an aberration or rather, more realistically, as an essential characteristic of pluralist democracies? There exists no silver-bullet against regulatory capture—even deliberative accounts of democracy, which strongly value public debates on an egalitarian footing, cannot get around addressing self-interest and power (see Mansbridge et al. 2010). Hence, the important criterion for judging transition policies simply reads: does the transition succeed? In the long run, the crucial issue is not whether the transition follows some hypothetical ideal path,[7] but whether the challenges are addressed in a way that enables the transition to proceed.

What policy advice can be drawn from this analysis for the specific task of adapting Germany's RES support scheme? Having already passed the first stage of niche development (cf. Geels 2002), the 'next generation' transition challenges become more prominent (see Section 3.1; also Miller et al. 2013). Germany needs to increasingly expose RES producers to market risks (even if only incrementally so). One next step within a pragmatic rent management strategy could make RES producers bear quantity risks: so far, RES producers are compensated even when installations have to be taken off the grid in order to avoid system overload. Exposing RES producers to the risk of remaining uncompensated in times of negative electricity prices would reward system-friendly strategies (e.g. it offers an incentive to store electricity locally). By keeping the overall policy framework of technology-differentiated feed-in tariffs intact in general, such a policy might avoid strong resistance from concerned RES industry stakeholders. As long as the

[6] To be sure, the anti-nuclear movement has a long history in Germany and a first nuclear phase-out law had been implemented in 2000. However, Chancellor Merkel had previously watered down the old phase-out and performed a political U-turn in response to Fukushima.

[7] We have repeatedly emphasized that the surrounding uncertainty cannot be resolved ex-ante, so the 'optimal' transition path remains elusive.

effects are not concentrated regionally, it would also be compatible with Germany's federal organization, which constrains every legislative proposition.

While the paper has focused on Germany as an empirical case study, other EU member states face very similar challenges because of the EU's 'Roadmap 2050', its common long-run decarbonization pathway. What is more, feed-in tariff schemes in favour of RES have spread internationally, and so has the need for market and system integration of renewables, which are expanding worldwide. This does not only hold for high-income countries; in fact, 62 per cent of low-income countries have implemented some form of RES policy (as compared to 82 per cent of high-income countries; see Sawin et al. 2015: 91). Thus, the framework of instrument choice and instrument change might also be fruitfully applied to other contexts than that analysed here. Extending the Public Choice perspective to the international arena brings in new aspects. For instance, regulatory competition between nations may affect national transition policies—as with all politico-economic issues, this interplay may turn out to either foster or inhibit global transformation as Rodrik (2014: 489) observes:

> In the second-best setting of green growth, what ultimately matters is whether the global supply of green technologies expands (good) or contracts (bad). From a global standpoint, it would be far better if national competitiveness concerns were to lead to a subsidy war than a tariff war. The former expands the global supply of clean technologies while the latter restricts it. So far, that is largely what we have been getting.

While the international dimension lies beyond the scope of this paper, the conclusion to be drawn from the above statement is, therefore, the same as with our analysis: RES policies should be judged according to their ability to facilitate the transition. They should not be measured against some hypothetically efficient policy within idealized first-best settings (the practical importance of cost-efficiency considerations notwithstanding). For instance, this implies that the mantra 'support policies for RES impair the efficient functioning of emissions trading schemes' may not be particularly meaningful in a setting where policy instruments deviate from ideal textbook models due to numerous politico-economic constraints (cf. Gawel et al. 2014). The regulators' task in both instrument choice and instrument design is to manage rents in a way that initiates and fosters the transition. In this respect, the example of Germany's *Energiewende* demonstrates to a certain extent an 'adequate' choice of instruments. For the transition to succeed, continuous adaptations need to follow.

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