Policy convergence: a conceptual framework based on lessons from renewable energy policies in the EU

Strunz, Sebastian; Gawel, Erik; Lehmann, Paul; Söderholm, Patrik

Veröffentlichungsversion / Published Version
Arbeitspapier / working paper

Zur Verfügung gestellt in Kooperation mit / provided in cooperation with:
Helmholtz-Zentrum für Umweltforschung - UFZ

HELMHOLTZ
ZENTRUM FÜR
UMWELTFORSCHUNG
UFZ

UFZ Discussion Papers

Department of Economics

14/2015

Policy convergence: A conceptual framework based on lessons from renewable energy policies in the EU

Sebastian Strunz, Erik Gawel, Paul Lehmann, Patrik Söderholm

November 2015

Publisher:
Helmholtz-Zentrum für Umweltforschung GmbH – UFZ
Permoserstr. 15
04318 Leipzig

ISSN 1436-140X

Policy convergence: A conceptual framework based on lessons from renewable energy policies in the EU

Sebastian Strunz[1,], Erik Gawel[1,2], Paul Lehmann[1], Patrik Söderholm[3]*

[1] *Helmholtz Centre for Environmental Research – UFZ, Department of Economics, Permoser Str. 15, 04318 Leipzig, Germany*

[2] *Leipzig University, Institute for Infrastructure and Resources Management, Grimmaische Str. 12, 04109 Leipzig, Germany*

[3] *Luleå University of Technology, Economics Unit, 97187 Luleå, Sweden.*

[*] *corresponding author: sebastian.strunz@ufz.de*

Keywords: economic convergence, policy convergence, renewable energy sources, support policies

Abstract

The literature on policy convergence has identified numerous aspects and possible causal drivers of convergence. We classify and condense these into a comprehensive framework, which is operationalized for support policies for renewable energy sources in the EU. Our analysis advances the conceptual discussion in two ways. First, we demonstrate that conceptual specifications of convergence (e.g., whether to focus on policy targets, instrument design or policy outcomes) rely on normative assumptions. Second, we argue that theories of economic and political convergence processes complement each other: studies of economic convergence are apolitical as they do not aim to explain why states choose or should choose the same policies to solve a given problem. At the same time, economic convergence yields a necessary condition for successful policy convergence. The empirical evidence, in turn, suggests conditional convergence of support policies and renewables shares in the EU, but does not hint at absolute convergence.

1. Introduction

"[A]dvanced industrial states are facing similar problems and are tending to solve them in similar ways" (Bennet 1991: 218). This, in a nutshell, is policy convergence. Alas, we need not go far to see this simple rationale shattered – to some, for instance, the EU appears as a system of differentiated integration (cf. Leruth and Lord 2015); others ask, more sharply, "how much distrustful divergence the European Union can contain without degenerating into ineffectiveness and fragmentation" (Hayward and Wurzel 2012: 1). Against this backdrop, we analyse how the concept of convergence, understood as the increase of policy similarity over time (cf. Kerr 1983, Drezner 2001, Holzinger et al. 2008b), can be framed and productively employed within a contested empirical context: support policies for electricity from renewable energy sources (RES)[1] in the EU.

Energy policy in the EU has been scolded as too fragmented and in need of "Europeanization" (e.g., Tagliapietra 2014). In particular, national (i.e., unilateral) policy approaches towards RES are criticized and advocated to be replaced by more coordinated RES support on EU-level (e.g., Hübner et al. 2012, Teyssen 2013, Unteutsch and Lindenberger 2014). At the same time, the actual status of EU energy policy cooperation is evolving rather slowly. On the one hand, the EU Commission launches proposal after proposal in the hope of bolstering Member States' cooperation. For instance, following increased tensions between the EU and Russia, the Commission published "a framework strategy for a resilient Energy Union with a forward-looking climate change policy" (EU Commission 2015) that puts an emphasis on the coordination of RES policies. On the other hand, Member States have repeatedly displayed their willingness to retain their sovereignty over energy and climate policy (Callies and Hey 2013), and have largely abstained from exploiting the opportunities provided by the RES cooperation mechanisms (e.g., joint projects, joint support schemes or statistical transfers, see Klinge Jacobsen et al. 2014).[2]

The main economic arguments for more coordination of RES policies concern economies of scale and spill-over effects: existing RES targets could be met more cost-effectively if administered on an EU-wide scale because of a more efficient geographical allocation of RES installations (Böckers et al. 2013). Furthermore, the impact of intermittent RES such as wind and solar PV on security of supply is not limited to national borders. For example,

[1] Throughout the paper „RES" stands for electricity from renewable energy sources.

[2] Moreover, Member States sometimes employ separate policy instruments in addition to what has been agreed on the EU level, as, for instance, the UK's carbon floor price as add-on to the EU emissions trading scheme demonstrates.

intermittent RES generation in Germany may impair grid stability in neighboring countries. At the same time, an EU-wide coordination of security of energy supply policies could help to smooth regional and national imbalances, and might render purely national capacity mechanisms unnecessary (cf. Meyer and Gore 2015). This also points to economies of scope from organizing energy policy in a larger area with common rules. The extent to which a homogenized approach would be preferable, however, is unclear. National RES policies may be better suited to reflect the potential heterogeneity of preferences among EU Member States as well as local externalities from energy generation (Gawel et al. 2014; Strunz et al. 2014). So while there may be a need for more energy policy coordination across the EU, complete homogeneity might not be desirable either (Tews 2015).

Furthermore, it is unclear at which political level – EU or Member States – energy policy convergence can actually be promoted effectively. In the long-run, significant "practical" reasons may render bottom-up processes a more likely pathway towards EU integration than coercive top-down harmonization: Legal constraints and politico-economic incentives make Member States' politicians averse to sovereignty transfer (Strunz et al. 2015). For instance, RES are often nationally promoted as a vehicle for regional development and job creation and/or as a way to reduce regional environmental impacts, which could not be guaranteed in case of an EU-approach. Thus, bottom-up processes may be the most feasible coordination pathway. Also, from a normative point of view, the "laboratory federalism" argument (Oates 1972, 1999) points to the advantages of experimental learning arising from decentralized search for solutions as compared to centralized problem-solving. In practice, a smaller group of countries may take the lead and a more harmonized approach could then evolve as the core group expands. Obviously, bottom-up processes may also result in policy divergence – and the emerging heterogeneity may yield political tensions as well as economic efficiency losses, so there is no a priori reason to assume that bottom-up processes promote policy coordination. In addition, convergence is not necessarily "good" in the sense of diffusing the optimal policies. Alignment processes may also entail the widespread adaption of suboptimal policies.

Thus, numerous theoretical and empirical ambiguities abide. Astonishingly, the relevant literature is rather dispersed: there is a long trail of political science literature, including empirical studies on convergence of environmental policies (e.g., Holzinger et al. 2008a) as well as specific case studies on RES policy convergence (e.g., Jacobs 2012, Kitzing et al. 2012). Rather independently, economists have thoroughly investigated (both theoretically and empirically) the general mechanisms of economic (growth) convergence (for overviews see

Rodriguez and Rodrik 2001, Islam 2003), and its relationship with environmental pollution convergence (e.g., Brock and Taylor 2010). Moreover, econometric studies assess international convergence along various environmental indicators (e.g., Camarero et al. 2013, Pettersson et al. 2014). But as Plümper and Schneider (2009) observe, there exists a gap between theoretical and empirical work on convergence because compared to the many theoretically proposed drivers of convergence, the empirical evidence is rather weak. We point to one hitherto neglected possible reason for this gap: the complementarity of economic and political processes of convergence. Often, economic convergence forms a necessary condition for successful policy convergence. For instance, the troubles with Europe's monetary union probably result from insufficient economic convergence yet fully harmonized monetary policies (see early warnings from e.g., Björksten and Syrjänen 2000, Eichengreen 1998 and the recent analysis of Streeck and Elsässer 2015). Then again, theories of economic convergence may in part be apolitical: they may explain why states are facing the same problems but they cannot account for why states should employ the same solutions to address these problems. What seems to be lacking, therefore, is a systematic combination of theories of both economic and political convergence.

Against this background, the paper's first objective is to disentangle and systemize the different conceptual strands of convergence. Applied to the example of RES policies in the EU, this means a number of conceptual specifications, starting with the basic definition of policy convergence. For instance, while a narrow definition refers to bottom-up processes only, a broader definition includes top-down processes as well. Thus, we show how the contested status of RES policies in the EU is mirrored by conceptual complexity: in particular, different normative views on RES support (and RES market integration) translate into different conceptual framings. Once these conceptual specifications are made, the paper's second objective concerns the integration of separate theoretical approaches. We argue that theories of economic and political convergence processes complement each other in explaining successful policy convergence.

The rest of this paper is organized as follows: in Section 2, we explicate specific aspects of policy convergence so as to match the concept with a given empirical context. Subsequently, we explore in Section 3 under what conditions and for what reasons convergence may occur, combining conceptual literature from both economics and political science. We then review the empirical evidence for economic convergence in general and RES policy convergence in the EU more specifically. Finally, our findings are summarized and discussed in Section 4.

2. What is policy convergence?

Most commonly, policy convergence is understood as the "increase of policy similarity over time" (Holzinger et al. 2008b: 24). However, the notion of policy convergence has left a considerable trail in the literature and a variety of definitions could be brought forward. In the following, we, therefore, review and systemize the different conceptual choices that need be made so as to arrive at a precise concept of policy convergence. Again, in order to contextualize an otherwise abstract discussion, we use the case of RES policies as an example.

2.1. The object of policy convergence

Figure 1 provides a stylized overview on the development and implementation of public policies. Needless to say, it is not meant to be a comprehensive and an entirely realistic representation of politics.[3] Rather, the scheme will be helpful for relating different concepts of convergence to specific stages of the policy process.

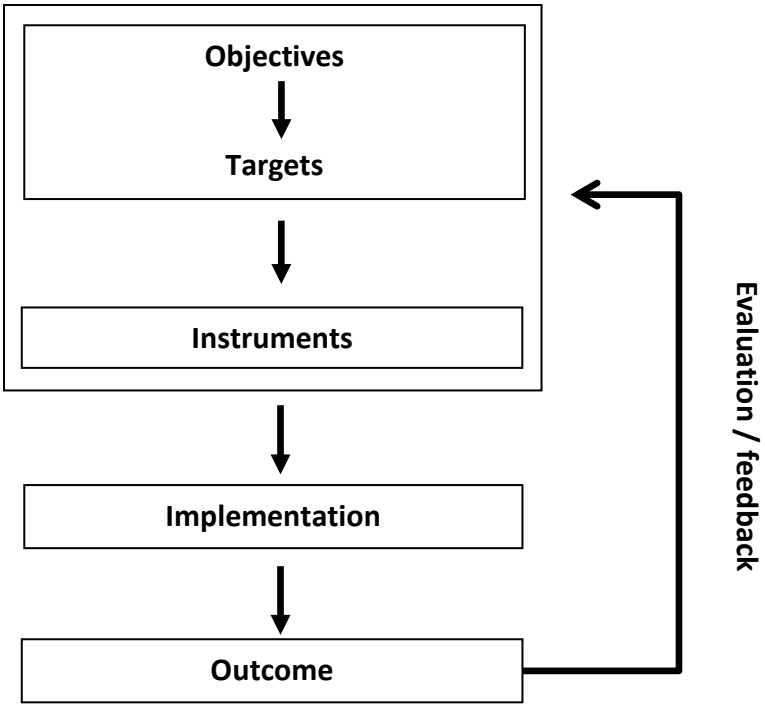

Figure 1: Stylized overview of the different stages of the policy process

[3] For instance, Figure 1 does not elaborate on the role of stakeholder involvement in policy formulation.

Compared to rather general notions of convergence such as "the tendency of policies to grow more alike, in the form of increasing similarity in structures, processes, and performances" (Kerr 1983: 3, cited in Drezner 2001: 53), we obtain more specific concepts of convergence when focusing on particular stages of the above scheme. Similarly, Bennet (1991) argues that policy convergence may relate to the aspects of *objectives, content, instruments, outcomes* and *style* of policies. The following discussion demonstrates that the question on which policy aspect/stage to focus on is closely related to normative questions on why convergence might be desirable.

First, objectives are of interest in the context of policy convergence only insofar as the long-term trajectory of policies is concerned. For instance, one might explore whether all EU Member States conform to the main objective of the EU Roadmap 2050 towards a decarbonization of European energy provision or whether some Member States aim at maintaining a relatively high fossil-fuel share also in the long run. Policy targets, which typically represent quantified values that shall be attained in a certain period of time, may be analyzed to acknowledge distributional aspects: next to economic reasons (see below), "fair burden sharing" may be seen as a cornerstone of an EU-wide energy transition. For instance, consider a hypothetical scenario where RES targets are *diverging*: if the level of ambition with respect to RES deployment generally seems to increase in heterogeneity, this may hamper overall progress in that relatively more ambitious Member States may come under internal pressure to slow down RES deployment ("why should we push forward if other Member States do not follow and do their bit?").

Second, convergence of policy instruments is of particular interest from the normative perspective of (narrow) economic efficiency. Subsidizing RES deployment in the EU will be least costly – in terms of minimizing RES generation costs only – if the geographical allocation of RES facilities closely follows natural conditions. Such a deployment pattern, in turn, could be achieved via a harmonized scheme of RES support instruments in the EU (Unteutsch and Lindenberger 2014). Thus, a range of benefits, including economies of scale in RES production, might be realized. Yet this line of argument implicitly assumes that convergence of RES instruments also brings along convergence of *support levels*. If, in contrast, there is convergence of support instruments along with sustained diversity of support levels, the cost-savings vanish. In other words, instrument alignment *per se* is not sufficient for cost-effectiveness (in terms of overall generation costs). Accounting for country-specific

benefits of RES, in turn, questions the economic desirability of converging instruments/support levels in the first place (cf. Söderholm 2008a).

Third, convergence may refer to outcomes. Yet, the policy outcomes may be more due to other factors rather than being intended policy effects. For instance, RES shares are importantly affected by the cost of these technologies relative to the price of conventional energy sources. The latter, in turn, is influenced by a number of exogenous variables, such as the world market prices for coal and natural gas. Thus, outcome convergence appears as a weak proxy for policy convergence, as it may be primarily driven by strong global factors. Then again, one interesting question is whether policy manages to "even out" differences in natural conditions so that convergence in observed outcomes obtains despite structural differences. In the context of climate policy, however, empirical analyses have found that per capita carbon dioxide emissions firmly depend on country-specific characteristics such as climate and resource endowments (Pettersson et al. 2014), and at the global level there is little evidence of carbon convergence. A major rationale to look at outcome convergence may be distributional aspects. The reasoning here is exactly the same as in the case of policy targets (fair burden sharing).

In conclusion, it is important to acknowledge that policy convergence of a particular aspect (cf. Figure 1: objectives-targets-instruments-outcomes) may not align with convergence in terms of another aspect – in fact, convergence of policy instruments may actually be directly responsible for *diverging* outcomes. To see this, consider the case of Sweden and Norway who merged their quota schemes by establishing a common market for RES certificates in 2012. The aim of such a common market is not to achieve identical RES shares. In fact, the scheme can be "expected to promote increased wind power in Norway rather than Sweden" due to Norwegian comparative advantages (Söderholm 2008b: 2061). In the same vein, the calls for a uniform quota scheme in the EU (Hübner et al. 2012, Böckers et al. 2013) actually tend to promote diverging RES shares across the EU following optimal geographical allocation of RES installations: wind farms along North European shores, photovoltaic energy in Southern Europe and, conversely, less RES production in Central Europe's centres of population and industrial production.

Hence, different means of measuring policy convergence are related to various normative concepts of why convergence may be desirable: converging policy support levels may be desirable in terms of achieving minimum generation costs of RES deployment. In this respect, converging outcomes or targets would actually not be desirable but detrimental from a narrow

perspective of economic efficiency that focuses on RES generation costs only. In case a wider economic perspective, which also addresses the benefits of a decentralized, heterogeneous policy pattern (that is, better matching of policies and preferences, see Gawel et al. 2014, Strunz et al. 2015), is applied, convergence of policy instruments may not be desirable. Taking outcome convergence as a proxy for policy instrument convergence would disregard and confuse the different normative rationales.

In sum, the **first necessary conceptual specification** concerns the **object of policy convergence** (cf. Bennet 1991) and it is to be solved via clarifying the normative rationale behind the analysis. Applied to the case of RES this means that, according to a normative focus on either "efficiency in terms of RES generation costs" or "distributional justice", the analysis would choose between:

- *policy objectives/targets (e.g., RES-objectives/targets),*
- *policy instruments (e.g., RES-policies),*
- *policy outcomes (e.g., RES-shares).*

2.2. The benchmark of policy convergence

Having related outcome convergence and distributional justice, one problem becomes obvious: differences in economic convergence should be reflected in what we regard as a just distribution of RES shares (as a measure of some country's ambition in deploying RES). This directly leads us to a **second conceptual specification**, which concerns the **benchmark of policy convergence** (cf. Baumol 1986, Holzinger et al. 2008b):

- *absolute convergence:* implicitly assumes that all countries attain the same outcomes, e.g. in terms of the steady-state level of RES generation shares.
- *conditional convergence:* acknowledges differences among countries, for instance regarding economic wealth and geographical potential implying that countries may converge towards different steady-state levels.

The notion of conditional convergence may be particularly helpful to improve the concept of outcome convergence. As noted above, a focus on pure outcomes may not relate much to policy convergence. But correcting for Member States' GDP could, for instance, take exogenous economic factors sufficiently into account. Furthermore, correcting for Member States' RES potential would enable relating conditional outcome convergence to the normative rationale of efficiency in terms of RES generation costs. Thus, introducing

conditional convergence measures might, in principle, solve some of the problems related to outcome convergence. At the same time, the choice between policy instruments is a discrete choice, which implies that instrument convergence may not be representable in terms of absolute and conditional convergence (although it may be relevant in the case of specific policy design issues, such as tax levels, public expenses etc.).

The crucial difference, then, lies in *when* we can argue to have convergence. We might say that conditional convergence is some weak version of policy convergence. For instance, in the case of RES instrument convergence in terms of support levels, absolute convergence is only achieved when support levels are equalized. In contrast, conditional convergence may describe a situation where countries are moving in the same direction (i.e., where not some countries are decreasing the support while others are increasing it), and there exist systematic and legitimate reasons for why we may never see completely equalized support levels. Table 1 provides an overview of the conceptual specifications introduced so far.

Convergence benchmark **Stage of political process**	**absolute**	**conditional**
policy targets	identical RES targets	identical target ratios, w.r.t. correction factors, e.g: - RES target/GDP/capita - PV target/solar radiation - Wind target/wind speed
instruments/ **support level**	identical instruments	identical policy ratios, w.r.t. correction factors, e.g.: feed-in-tariff/per capita GDP
outcomes	identical RES shares; identical RES mixes; identical deployment rates (convergence of target fulfillment speed)	identical RES ratios/mixes/deployment rates, w.r.t. correction factors, e.g: - RES share/per capita GDP - PV share/solar radiation - Wind share/wind speed

Table 1: Specifying "convergence" for the case of RES policies in Europe

2.3. The drivers of policy convergence

A **third conceptual issue** relates to the **drivers of policy convergence**: a narrow definition of convergence may refer to bottom-up drivers only, but a wider definition would also include top-down drivers. We will review the specific mechanisms leading to convergence in more detail below (see Section 3) but since the bottom-up/top-down issue is crucial for attaining a clear concept of convergence, we need to introduce it right away. Figure 2 shows how the general concept of convergence as "increase of policy similarity over time" may be specified with respect to different causal mechanisms. If we focus on bottom-up processes of policy alignment, we may further differentiate between policy diffusion (in the narrower sense[4]), relying on interaction between countries, and independent policy formulation without interaction.

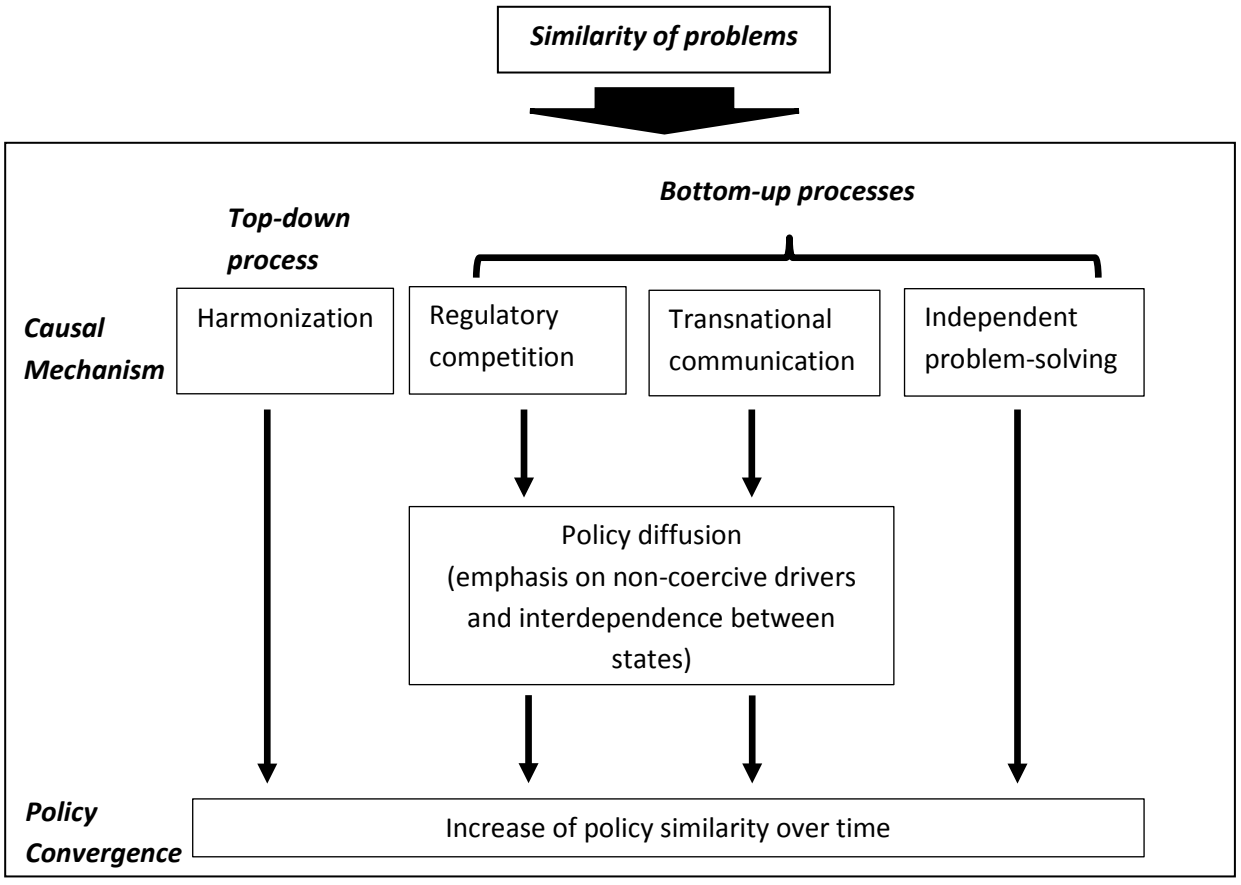

Figure 2: Causal mechanisms of convergence.

Based on and adapted from Holzinger et al. (2008b: 24)

[4] There are also wider notions of diffusion to be found in the literature that allow for top-down mechanisms, but we focus on a narrower concept of diffusion as bottom-up process to make the matter not overly complex.

In the case of European RES policies, bottom-up processes may be especially relevant. The main reason here is the relative weakness of supranational EU institutions with regards to energy policy. While the Lisbon treaty for the first time stipulates an active role for the EU in conducting energy policy, Member States have retained their sovereignty over the general course of their energy policies (Article 194(2) TFEU). The EU commission, on the other hand, tries to shape Member States' policies even if its *direct* regulatory power is limited. The common EU climate and energy target architecture for 2020 and 2030 constitutes an *indirect* way of top-down influence – a common framework that creates a similar problem context (i.e., "how to increase the share of RES?") for all Member States. Also, the Commission is increasingly active in using the internal market directives (2003/54/EC, 2009/72/EC) to steer Member States energy policies in the preferred direction (e.g., in the form of tender schemes that use competitive bidding procedures to determine the level of RES support, or fixed premium schemes that offer RES-producers a mark-up on top of the spot-market price). The Commission's (2014/C 200/01) "Guidelines on State aid for environmental protection and energy 2014-2020" constitute another lever. Eventually, the "EU impact on the national energy mix is predominantly indirect, yet powerful" (Callies and Hey 2013: 88). Furthermore, the absence of formal coercion does not rule out other, less explicit forms of pressure. For instance, there may be market-induced pressures that lead countries to adopt similar financial and social policies (cf. Ther 2014). In sum, it should be noted that even if we conceptually restrict convergence to bottom-up processes, top-down influences should not be neglected.

2.4. The directed process of policy convergence

Finally, a **fourth conceptual aspect** of convergence results from its conceptual conjunction of both ***process*** and ***final state.*** Specific definitions may accentuate these characteristics to different degrees. Consider, for instance, the following hypothetical situation: some EU Member States move from wide diversity towards more similarity, albeit still far from homogeneity. If we emphasize proximity to *final states*, we would rather not refer to this situation as convergence. However, if we focus on the *process* of increasing similarity, we would speak of a case of convergence – even if the process is far from finished. In a similar vein, Plümper and Schneider (2009) distinguish between complete and incomplete convergence.

Against this background, the process-dimension is a crucial conceptual element of convergence, not least because it directly opens the analytical framework for investigating the

mechanisms that may lead to convergence (see Section 3). Furthermore, as Bennet (1991: 230) remarked: "Policy convergence should also be conceptualized in dynamic terms. The relevant theoretical dimension is time rather than space. Otherwise the concept becomes a synonym for similarity". At the same time, final states are important as a benchmark against which to measure the progress of increasing similarity. In the particular context of RES policies, the final states are moving targets (e.g., support level or RES share/per capita GDP) that evolve with technological and political development: unless we refer to the EU's long-term aim of full decarbonisation, essentially implying 100% RES, it does not seem sensible to consider specific support levels or RES shares as "final" in a literal way.

Formally, the process-dimension of convergence might be illustrated as follows. Given D_{AB}^{x} = difference between two countries A and B concerning attribute *x*, then the countries are converging if

$$\frac{dD_{AB}^{x}}{dt} < 0.$$

This rather broad definition would have to be operationalized for given contexts, yet it is beyond the scope of this paper to outline specific evaluation methods in detail (cf. Heichel et al. 2005). Two issues are noteworthy, though. First, while the literature predominantly measured the variance of a given sample, this approach is problematic (e.g., it fails to detect conditional convergence, Plümper and Schneider 2009). Second, although the above definition is fairly general, it does not account for the ordinal ranking of countries (e.g., do laggards overtake frontrunners?, cf. Heichel et al. 2005: 833ff.).

2.5. Specifying policy convergence – Implications for the case of RES policies

In sum, the above suggests that a comprehensive analytical concept of policy convergence relies on several specifications:

(1) Object
- convergence in terms of targets
- convergence in terms of instruments
- convergence in terms of outcomes

(2) Benchmark
- absolute convergence
- conditional convergence

(3) Drivers
    - bottom-up
    - top-down
(4) Directed process
    - process – movement towards homogeneity
    - final state – homogeneity

Applying this framework to the case of RES policies in the EU, the above discussion emphasized (1) convergence in terms of instruments, (2) conditional on economic and natural conditions, and (3,4) unfolding via bottom-up processes. In terms of Figure 2, that would imply a focus on the policy diffusion cluster – interdependent co-evolution of Member States' policies within the common institutional framework of the EU. The latter may, even in absence of explicit pressure, affect national policy making through agenda setting and other indirect forms of influence. Moreover, be reminded that specifications (1) and (2) directly relate to normative considerations: the more we emphasize cost-effectiveness in terms of electricity generation costs, the more convergence would need to refer to the specific design of RES instruments, such as support levels – in *absolute* terms. The broader our perspective, so as to acknowledge heterogeneity in preferences or economic context, the more RES targets, outcomes and their distributions – *conditional* on some to-be-defined criteria – are to be considered.

3. What drives policy convergence? Linking economic and political approaches

The introductory quote of Bennet (1991) points at an important precondition for policy convergence – namely that *states are facing similar problems*. In principle, such an alignment of issues-to-be-addressed by policy intervention can come about through different channels, such as economic context, natural conditions, common institutional framework and ideological background. Nevertheless, the sobering experience of Europe's "monetary disunion" (Streeck and Elsässer 2015) hints to a particularly strong link between economic and policy convergence. While a common monetary policy binds the Euro group together, the lack of i) a sufficiently homogeneous area in terms of economic fundamentals and of ii) a fiscal stabilization mechanism have almost teared the Euro apart (thereby also supporting the theory of optimum currency areas, see Mundell 1961, Fingleton et al. 2015). In other words, policy harmonization without economic convergence may not be sustainable. Therefore, we now first review the theory of and the empirical evidence for economic convergence. Yet,

although economic convergence may yield similarity of problems, these might be addressed by wholly distinct policies. Hence, we subsequently review the political drivers of policy convergence.

3.1. Economic convergence: theory and evidence

The standard model of economic growth dates back to Solow (1956). It conceptualizes growth as extension of capital stocks (where capital includes all forms of productive assets, from machinery to know-how). If countries exhibit similar characteristics, such as the level of technological progress, the Solow-model predicts convergence of capital stocks (per capita) among these countries. In case the fundamental economic characteristics differ, convergence is not absolute but conditional, reflecting these differences. Yet, declining marginal productivity of capital may erode differences over time: poor economies should grow faster than rich economies because investments in the former yield higher *marginal* returns. Eventually, all countries would converge to the same steady-state level of capital (Baumol 1986). This is the so-called "catching-up" hypothesis. Within an interdepended world of trade, economic theory traditionally sees the case for gradual convergence fostered (Ohlin 1933, Samuelson 1948). Yet there is also a longstanding controversy over the "catching-up" hypothesis, in particular as regards the influence of trade: for instance, it has been shown that opening up poorer countries to trade may stop growth convergence processes and even cause divergence (Bajona and Kehoe 2010).

The economic literature on growth and convergence has been connected to environmental policies via the concept of the so-called Environmental Kuznets Curve (EKC, cf. Grossmann and Krueger 1995). The EKC suggests an inverted-U-shape relationship between GDP and environmental pollution: with raising wealth, pollution at first increases but then decreases. Brock and Taylor (2010) argue that the EKC is a necessary byproduct of economic convergence within the Solow model. Yet as to the specific mechanisms that might give rise to such patterns, a wide range of candidates has been discussed. One prominent mechanism relates to the increasing demand for high environmental quality with rising income levels. Thus, economic convergence would directly translate into convergence of demand for generally stricter environmental policies. For instance, demand for clean energy provision increases as poorer countries catch up; due to higher marginal productivity of capital, poorer countries can raise their RES-shares (e.g., in terms of solar PV, wind power) faster than early adopters, with all countries eventually converging. Conversely, without economic

convergence, there could be little reason to expect countries to align their energy and environmental policies and to attain similar outcomes in terms of, for instance, RES shares.

The hypothesis that in an interdependent world, characterized by trade and mobile investment capital, economies will convergence to similar levels of wealth, however, is empirically disputed (see Rodriguez and Rodrik 2001 as well as Islam 2003 for extensive overviews). And even staunch supporters of globalization concede that "catch-up will be a long, difficult grind" (The Economist 2014). So if even mainstream economics contains doubts as to the extent with which the theoretical mechanism of convergence-by-catching-up actually materializes, what about the European experience?

In Europe, the post-Cold-War era revealed the strong impact of institutions, and, more generally, of the socio-political context, on national economic trajectories. During the 1990s, formerly communist countries in Central Eastern and South Eastern Europe lived through rather diverging economic developments, due to both different starting positions (e.g., in terms of available human capital and geographical location) and different policy choices (Ther 2014).

Within the EU, there is meagre evidence for overall economic convergence (measured in real per capita income) but there is evidence of convergence within several subgroups – that is, clusters of Member States growing at the same rate (Borsi and Metiu 2015). Importantly, a clear separation between old EU-Member States and new Member States in Eastern Europe appears: although the latter have exhibited higher growth rates, catching-up has not yet been sufficient in order to smooth out differences across Member States (Borsi and Metiu 2015). This can also be seen from recent GDP per capita statistics of the EU-28: at the upper end (omitting Luxembourg), the Netherlands stay at 31% above the EU-28 average (year 2013, Eurostat[5]). On the lower end, Bulgaria is listed with a GDP per capita of 55% below the average. In sum, one might speak of clustered, slow and non-monotonic processes of economic convergence in the EU.

This leads us to the apolitical character of the original Solow-model of economic growth upon which the catching-up hypothesis is built. In order to explain processes of economic divergence or convergence, political variables are crucial. Emphasizing institutions as "historical choices", Hall and Soskice (2001) pointed to persistent "Varieties of Capitalism" – liberal market economies on the one hand, coordinated market economies on the other hand.

[5] http://ec.europa.eu/eurostat/statistics-explained/index.php/GDP_per_capita,_consumption_per_capita_and_price_level_indices

The latter, however, in recent years have implemented more extensive deregulation than the former (Pierre 2015), possibly suggesting a convergence of the coordinated approach to the liberal one. Nevertheless, the institutional perspective reminds us that similarity of economic context (globalization and the resulting competitive pressure on national economies) not inevitably translates into a convergence of policies.

3.2. Policy convergence: the role of political processes

Theories of economic convergence are apolitical in the sense that they build on economic variables (e.g., technological progress, capital accumulation) that may explain demand for specific polices; yet they are silent on the workings of the "political market" where policy supply needs to meet this demand (cf. Keohane et al. 1998). Policy convergence implies that demand is met in similar ways. In other words, problem convergence is a necessary but not sufficient condition for policy convergence: in principle, states might find rather different solutions to essentially identical problems. Thus, a comprehensive framework of convergence needs to identify the specific mechanisms that lead states to adopt similar policy solutions.

As Figure 2 demonstrates, the literature on policy convergence mostly highlights different forms of interdependence between states, possibly combined with elements of top-down steering. Bennet (1991) proposed four different drivers of convergence: emulation, elite networking, penetration by external actors and harmonization. Subsequently, the literature focused on specific variations of Bennet's first two mechanisms under the label "policy diffusion" (Bush and Jörgens 2005, Tews 2005). In particular, the non-hierarchical character of diffusion has been emphasized: "Diffusion is the spreading of innovations due to communication instead of hierarchy or collective decision making within international institutions," (Tews 2005: 65). Thus, diffusion is to be differentiated from coercive imposition and harmonization as other possible mechanisms that may establish homogeneous policies. Diffusion proceeds horizontally rather than vertically and is "driven by information flows" (Busch and Jörgens 2005: 865) within processes of emulation and learning. Coming back to Figure 2, policy diffusion marks the result of interdependent problem-solving: neither are policies implemented due to pressure from above, nor are they conceived by solitary policy-makers. Empirically, diffusion has been identified as a crucial driver of economic policy reform in general (Pitlik 2007) and, more particularly, the spread of RES policies: "The

international spread of feed-in tariffs[6] and quotas was driven neither by mechanisms of harmonization nor imposition. Rather, the analysis […] points to an important role of diffusion mechanisms during the instruments' spread" (Busch and Jörgens 2005: 876).

The bottom-up drivers of policy convergence were further investigated by Holzinger and Knill (2005), and Holzinger et al. (2008b) who focus on three bottom-up mechanisms of convergence – transnational communication, regulatory competition and independent problem-solving. Jacobs (2012) builds on this framework to evaluate convergence of RES policies in Spain, France and Germany. First, transnational communication contributed to RES policy convergence between these EU Member States; in particular, it was "decisive for the spread of certain feed-in tariff design options" (Jacobs 2012: 134). Second, regulatory competition arises from Member States' objective to stay competitive in terms of attracting investment. Note that the idea of regulatory competition also aligns very well with the "laboratory federalism" argument from the theory of fiscal federalism (Oates 1972, 1999). While one of the main results of Holzinger et al.'s (2008a) empirical analysis is that regulatory competition has only negligible explanatory power for environmental policy convergence in the EU, Jacobs finds at least some evidence for convergence of photovoltaic feed-in tariffs due to competition between EU Member States. Third, common problem solving pressure may lead states to independently adapt very similar solutions: For instance, rapidly cumulating remunerations for photovoltaic installations were a problem both in Germany and Spain during the late 2000s. As a solution, "flexible tariff degression was developed independently in Germany and Spain" (Jacobs 2012: 227).

Of course, the conceptualization of Figure 2 is rather abstract and coarse in that processes are split into bottom-up or top down, as well as interdependent or independent. In reality convergence processes may result from a combination of these ingredients. In particular, the EU's multi-level system with its complex architecture of partly differentiated, partly overlapping and often contested allocation of responsibilities allows for hybrid processes. From a formal perspective, decisions may be taken voluntary, yet at the same time they may respond to pressures arising from EU-guidelines and intergovernmental discussions. The example of RES targets and RES instruments perfectly illustrates these linkages. The RES targets for 2020 were allocated via collective decision-making – from the EU Member States' point of view, RES targets, therefore, frame national decisions on RES instruments. When

[6] Feed-in tariffs remunerate RES-producers with a certain amount for each kWh of electricity.

designing specific policy instruments, Member States may cooperate, compete, communicate, emulate one another or combine all of these activities.

Against this background, the Open Method of Coordination (OMC), whereby the EU Commission influences national policies by agenda setting and framing inter-Member State discussions (cf. Ania and Wagener 2014, Borrás and Jacobsson 2004, Kerber and Eckardt 2007), represents one potentially important driver of convergence. For instance, Germany recently introduced a test phase for tender schemes to determine the feed-in tariffs for large photovoltaic installations – and this development might be interpreted as a case of preemptive compliance with the EU-Commission's push towards this direction, as laid down in the state aid guidelines (Tews 2015).

Thus, while the literature discusses a range of mechanisms for convergence of policies, it puts a strong emphasis on diffusion, that is, horizontal spill-over effects. In contrast, top-down imposition of policies is commonly referred to as harmonization – to be differentiated from the bottom-up processes of convergence. However, the notion of bottom-up convergence should not lead us to neglect the role of supranational institutions, in particular the EU Commission, in framing and steering policy evolution on the Member State level.

In conclusion, theories of economic and political convergence processes complement each other: studies of economic convergence are largely apolitical as they do not aim to explain why states choose or should choose the same policies to solve a given problem. At the same time, economic convergence may often represent a necessary condition for successful policy convergence.

4. Assessing the case for RES policy convergence in the EU

In the following, we take a closer look at the empirical evidence for RES policy convergence in the EU. A comprehensive statistical analysis, estimating convergence of all relevant objects, merits a separate paper, whereas we here primarily aim at conceptual consolidation. For this reason we provide a succinct overview of the available descriptive evidence on the development and the status quo of RES targets, instruments and shares.

At the level of policy targets, the EU climate and energy package, set up in 2007/08, for the first time required national governments to devise "National Renewable Energy Action Plans" and specified binding RES targets for 2020 on Member State level. However, a standard of

comparison for assessing convergence of targets is lacking because the updated 2030 framework, adopted in 2014, refrains from binding national targets.[7] Instead, it only indicates an EU-level RES target. One could, therefore, hypothesize that the 2030 framework will prospectively decelerate convergence of RES shares (or even induce divergence) since Member States cannot be hold accountable for failing their targets any more. As for the past development, given the slow and clustered process of economic convergence and the binding 2020 package, it might be reasonable to expect some evidence of conditional convergence with respect to the level of RES support instruments and RES shares.

The early history of RES support instruments, from 1970 to 2000, is summarized by Knill et al. (2008: 115ff.) as the "emergence of two dominant approaches", first "subsidies or tax reductions" and second "legal obligations for energy users to purchase a certain amount of renewable energy". Yet, in hindsight, the latter cannot be reasonably called a dominant approach. Although quota schemes, that is, tradable permits obtained from fulfilling one's obligation to purchase a certain amount of RES, have been a long-time favorite of the EU Commission, there is no long-term trend towards a widespread implementation of such schemes. In fact, in 2000, out of the 9 RES-obligation schemes cited by Knill et al. (2008: 118), only one involved tradable certificates; and while the number rose to 6 in 2005, it has been stagnating or even declining since then (cf. Table 2).

Overall, there is some tendency towards convergence in that major support instruments for RES are available in all EU Member States since 2007. In particular, feed-in tariffs have emerged as a popular support instrument, partly complemented by additional instruments (Table 2, see Kitzing et al. 2012 for more details on the period 2000-2010). However, RES support is continuously evolving: it would be a gross mistake to consider feed-in tariffs as the "final state" of RES support where Member States converge first towards the instrument and then towards aligning specific regulatory details (e.g., Kitzing et al. 2012 differentiate 5 sub-categories of feed-in tariffs). For instance, Jacobs (2012) analyses how the feed-in tariffs of France, Germany and Spain became increasingly similar over the years. But then the economic crisis squeezed federal budgets in Spain, resulting in a drastic dismantling of the RES support scheme in 2013.

[7] What is more, the 2020 targets refer to overall energy consumption. A previous directive (2001/77/EC) had set (non-binding) targets for the RES share in gross electricity consumption in 2010, so the targets for 2010 and 2020 are not comparable either.

	2000	2005	2010	2015
Feed-in tariff	7	16	23	19
Feed-in premium	-	4	7	8
Tender	2	2	6	8
Quota scheme	1	6	6	5

Table 2: Number of EU Member States that have implemented major RES support instruments, 2000-2015
Source: Kitzing et al. 2012 for years 2000-2010, database www.RES-legal.eu for 2015[8]

Furthermore, EU energy policy puts partly explicit, partly implicit pressure on Member States to move away from feed-in tariffs. The Commission's argument here reads (see Section 2.3): once common rules for the generation, transmission and distribution of electricity are implemented all over the EU, substantial cross-border interactions will be prevalent, rendering country-specific support schemes incompatible. In order to minimize market distortions and inefficiencies, country-specific RES support should oblige RES producers to directly sell electricity in the market, promoting the overall market-integration of RES and increasing cross-border electricity trading. Recent developments indicate that the Commission successfully frames national discussions on RES policies along these lines (cf. Tews 2015). Feed-in tariffs are increasingly complemented or replaced by feed-in premiums/tenders and might have passed a peak around 2010 (see Table 2).

In addition, and somewhat paradoxically, the very reason the EU Commission pushes for premiums and tenders (leaving politico-economic motivations aside), the market integration of RES, also raises doubts as to whether *any* RES instrument will serve as a convergence line. In short, no one knows what the best way to integrate RES into energy markets looks like. It remains fundamentally unclear what the final state of RES support in a world with very high

[8] From 2005 on, the number of support schemes exceeds the number of EU Member States because many of the latter are combining elements of different support schemes. Hence, one could conclude that a "meta-trend" consists in increasing complexity of individual support schemes. This trend also implies ambiguity in counting: to see this, consider the number of tenders for 2015. We arrive at 8 Member States that employ tenders but considerably lower counts might be equally justified. One crucial question is whether to include schemes, which use auctions within more complex mechanisms (such as Denmark of the Netherlands) or whether to focus on tenders as main instrument. As more and more countries are experimenting with tenders, and as the Commission's guidelines intend to foster this development, we maintain a rather inclusive perspective – for instance, we also include Germany's current test-run for PV tenders into the count.

RES shares might be (e.g., Kopp et al 2012): no more support at all? Alternatively, will "energy-only" markets transform to remunerate *production capacities*, so that RES support is fused with technology-neutral capacity payments? Eventually, different forms of market integration might be observed.

At the level of RES shares, some empirical evidence for conditional convergence exists, while absolute convergence is not to be expected any time soon. Figure 3a suggests that heterogeneity in natural conditions rather than economic heterogeneity accounts for most of the observed differences in RES shares (in 2013). Consider Austria and Sweden, which exhibit the highest shares of RES in gross electricity consumption: both rely heavily on hydropower – traditionally so, rather than triggered by recent and current RES deployment policies. By comparison, the Netherlands, with an even slightly higher level of GDP per capita, only covers a fraction of its electricity consumption with RES.

However, as Figure 3b shows, the growth rates of RES shares in gross electricity consumption are generally significantly higher for the Member States with low initial levels than for the ones with high initial levels (a very similar pattern emerges in the case of RES shares at overall energy consumption, including heat and transport). This empirical result seems to support the catching-up hypothesis. Moreover, the Member States' catching-up in terms of RES appears congruent to their economic catching-up (see Section 3.1): both catching-up processes however occur slowly and have reduced but not yet eliminated substantial differences between Member States. In other words, both processes display conditional convergence. As laid out above, economic theory could explain this congruency via a causal relation from economic growth over changes in peoples' preferences towards more environmental friendly electricity provision.

The gist of the preceding discussion: national circumstances may be so diverse that even if all Member States pursue similar paths towards RES-based energy systems and even if there is broader economic convergence, this may not bring about absolute convergence of RES shares and RES policies. At the same time, the case for conditional convergence seems rather strong.

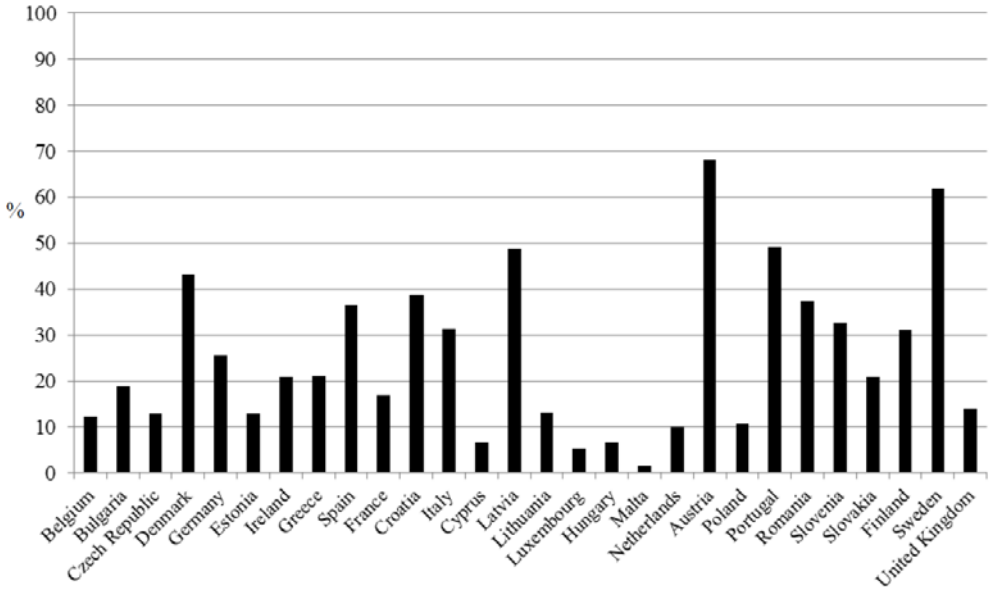

Figure 3a: Shares of Electricity Generated from RES in Gross Electricity Consumption for EU-27 Member States in 2013

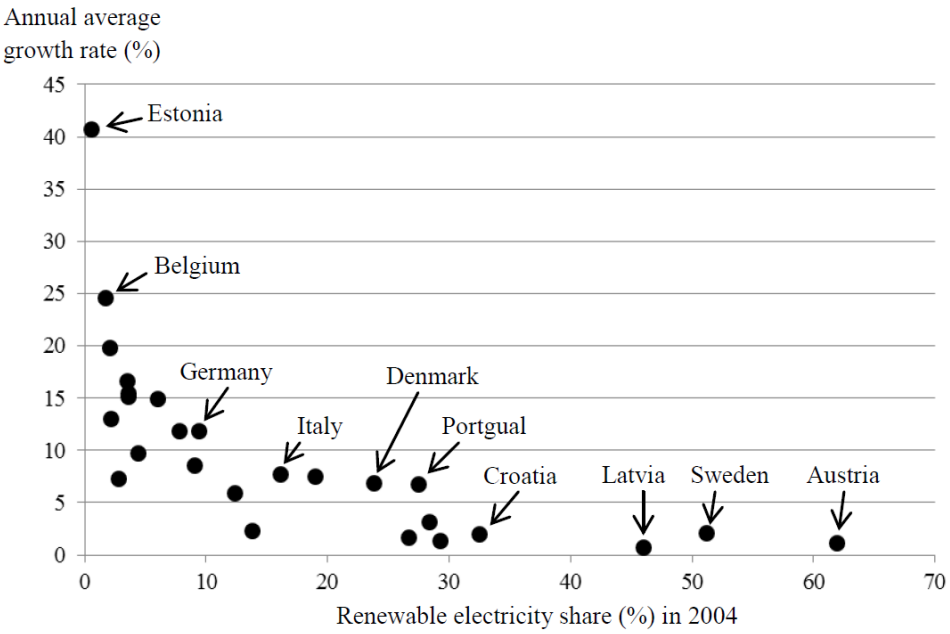

Figure 3b: Shares of Electricity Generated from RES in Gross Electricity Consumption (EU-27, excluding Cyprus) over the Time Period 2004-2013: Annual Average Growth Rates versus the Initial Level in 2004

5. Conclusion

The main conceptual contribution of this paper consists in demonstrating the complementarity of economic and political convergence theories. A comprehensive explanation of successful policy convergence needs to account for both economic and political processes. Economic convergence explains similarity of problems, but not similarity of policy solutions. Converging policies, in turn, do not solve the same problems if there is no economic convergence. Certainly, a common institutional framework such as the EU may, to some extent, also create similarity of problems: the EU climate and energy target architecture requires Member States' governments to draw up national strategies and action plans for increasing the share of RES, whether they perceive sustainable energy provision a goal worthwhile pursuing or not. Conceptually, differences in economic performance can then be framed as conditional convergence. But the European struggles to prevent the monetary union from disintegrating in the first half of the 2010s demonstrate that policy convergence without economic convergence might backfire.

Having applied a structured concept of convergence to the case of RES support policies in the EU, two interesting points stand out. First, normative views on RES support translate into specific conceptual decisions: for instance, a perspective that emphasizes the economic benefits from transnational support will focus on convergence of instruments – in fact, with the explicit objective of generating *diverging* outcomes (i.e., RES shares) so as to optimize allocation of production capacities following heterogeneous RES potential. In contrast, a perspective that centers on distributional aspects will rather focus on converging RES targets and RES shares, possibly conditional on Member States' economic performance. Second, the empirical development of RES policies indicates, again, the importance of economic indicators as explanatory variables: although support schemes already seemed to converge towards feed-in-tariffs at the end of the 2000s, the financial crisis, leading to glaring holes in Member States' budgets, lowered priority of secure RES support on the overall policy agendas – the extreme case being Spain, which completely suspended its support scheme as a result. As of now (autumn 2015), cost-effectiveness of RES support seems to be the most prominent objective of policy reform, possibly indicating a shift from feed-in-tariffs towards tender schemes, in line with the Commission's state aid guidelines. However, the heterogeneity of Member States in terms of both RES potential and preferences for sustainable energy provision may imply that, after all, there will not be only one but several final states: for example, we might see several subsets of Member States with similar policies

transforming their energy systems at similar speed, corresponding to their respective economic performance (cf. Ćetković and Buzogány 2015). In consequence, RES policies would converge towards different final states, unless economic convergence is achieved.

Acknowledging the economic conditions of policy convergence may help to further close the gap between theoretical and empirical literature on convergence (cf. Plümper and Schneider 2009). It also alerts us to the possibility of unpleasant surprises if economic fundamentals are ignored. Jonung and Drea (2010) make early critics of the EU monetary union look like fools, but they have not had the last laugh. In the context of RES, the consequences might be less dramatic but still surprising: from Jacobs's (2012) diligent analysis of convergence processes in Germany, France and Spain one might get the impression that full alignment of feed-in tariffs is imminent. Yet, just three years later, the future of feed-in tariffs seems far from certain.

Since this paper's main objective concerned conceptual clarification, the empirical analysis has provided only a quick glance on the factual development of RES policies in the EU. More detailed statistical analyses will be required to attain an in-depth understanding of the empirical processes.

Acknowledgment

This work was supported by the German Helmholtz Association under Grant HA-303.

Literature

Ania, A. and Wagener, A. (2014). Laboratory Federalism: The Open Method Of Coordination (OMC) as an evolutionary learning process. *Journal of Public Economic Theory* 16(5): 767-795

Bajona C. and Kehoe, T.J. (2010). Trade, growth and convergence in a dynamic Heckscher-Ohlin Model. *Review of Economic Dynamics* 13(3): 487-513.

Baumol, W.J. (1986). Productivity growth, convergence and welfare. *American Economic Review*, 76(5): 1072-85.

Bennett, C.J. (1991), What Is Policy Convergence and What Causes It? *British Journal of Political Science* 21(02): 215-233.

Böckers, V., Haucap, J. and Heimeshoff, U. (2013). Benefits of an Integrated European Electricity Market, *DICE Discussion Paper* No 109, September 2013.

Borrás, S. and Jacobsson, K. (2004). The Open Method of Coordination and New Governance Patterns in the EU, *Journal of European Public Policy* 11: 185-208.

Borsi, T.M. and Metiu, N. (2015). The evolution of economic convergence in the European Union. *Empirical Economics* 48(2): 657-681.

Björksten, N. and Syrjänen, M. (2000). How problematic are internal Euro area differences? European University Institute, Robert Schuman Centre for Advanced Studies 2000/14, Florence. http://cadmus.eui.eu/handle/1814/1654.

Brock, W.A. and Taylor, M.S. (2010). The Green Solow Model. *Journal of Economic Growth* 15(2): 127-153.

Busch, P.-O. and Jörgens, H. (2005). The international sources of policy convergence: explaining the spread of environmental innovations. *Journal of European Public Policy* 12(5): 860-884.

Callies, C. and Hey, C. (2013). Multilevel Energy Policy in the EU: Paving the Way for Renewables. *Journal for European Environmental and Planning Law* 10(2): 87-131.

Camarero, M., J. Castillo, A.J. Picazo-Tadeo and Tamarit, C. (2013). Eco-efficiency and convergence in OECD countries. *Environmental and Resource Economics* 55: 87-106.

Ćetković, S. and Buzogány, A. (2015). Varieties of Capitalism and renewable energy development in the European Union. Towards a common but differentiated approach. http://www.diw.de/documents/dokumentenarchiv/17/diw_01.c.508438.de/cetkovic.pdf

Drezner, D.W. (2001). Globalization and policy convergence. *International Studies Review* 3(1): 53-78.

Eichengreen, B. (1998). European Monetary Unification: A Tour D`Horizon. *Oxford Review of Economic Policy* 14(3): 24-40.

Gawel, E., Strunz, S. and Lehmann, P. (2014). To What Extent Should the German Energy Transition Policy be „Europeanized“? *Zeitschrift für Energiewirtschaft* 38: 163-182.

Grossman, G.M. and Krueger, A.B. (1995). Economic growth and the environment. *Quarterly Journal of Economics* 110: 353-377.

Fingleton, B., Garretsen, H. and Martin, R. (2015). Shocking aspects of monetary union: the vulnerability of regions in Euroland. *Journal of Economic Geography* 15(5): 843-853.

Hall, P. and Soskice, D. (eds.) (2001). *Varieties of Capitalism: The Institutional Foundation of Comparative Advantage*, Oxford: Oxford University Press.

Hayward, J. and Wurzel, R. (eds.) (2012). *European Disunion. Between Sovereignty and Solidarity*. Basingstoke: Palgrave Macmillan.

Heichel, S. Pape, J. and Sommerer, T. (2005): Is there convergence in convergence research? An overview of empirical studies on policy convergence. *Journal of European Public Policy* 12 (5): 817–840.

Holzinger, K. and Knill, C. (2005). Causes and conditions of cross-national policy convergence. *Journal of European Public Policy* 12(5): 775-796.

Holzinger, K., Knill, C. and Arts, B. (eds.) (2008a). *Environmental policy convergence in Europe*, Cambridge: Cambridge University Press.

Holzinger, K., Jörgens, H. and Knill, C. (2008b). State of the art – conceptualising environmental policy convergence. In: Holzinger, K., Knill, C. and B. Arts (eds.) *Environmental policy convergence in Europe*, Cambridge: Cambridge University Press, pp. 7-29.

Hübner, M., Schmidt, C. M. and Weigert, B. (2012). Energiepolitik: Erfolgreiche Energiewende nur im europäischen Kontext. Perspektiven der Wirtschaftspolitik, 13(4): 286-307.

Islam, N. (2003). What have we learned from the convergence debate. *Journal of Economic Surveys* 17(3): 309-362.

Jacobs, D. (2012). Renewable Energy Policy Convergence in the EU: The Evolution of Feed-in Tariffs in Germany, Spain and France. London: Ashgate.

Jonung, L. and Drea, E. (2010). It can't happen, it's a bad idea, it won't last: U.S. economicsts on the EMU and the Euro, 1989-2002. *Econ Journal Watch* 7(1): 4-52.

Keohane, N., Revesz, R. and Stavins, R. (1998). The choice of regulatory instruments in environmental policy. *Harvard Environmental Law Review* 22: 313-367.

Kerber, W. and Eckardt, M. (2007). Policy Learning in Europe: the Open Method of Co-ordination and Laboratory Federalism, *Journal of European Public Policy* 14: 227-247.

Kerr, C. (1983). *The future of industrial societies: convergence or continuing diversity?* Cambridge, Mass: Harvard University Press.

Klinge Jacobsen, H., Pade, L. L., Schröder, S. T. and Kitzing, L. (2014). Cooperation mechanisms to achieve EU renewable targets. *Renewable Energy* 63: 345–52.

Kitzing, L., Mitchell, C. and Mothorst, P. E. (2012). Renewable energy policies in Europe: converging or diverging? *Energy Policy* 51: 192-201.

Knill, C., Sommerer, T. and Holzinger, K. (2008). Degree and direction of environmental policy convergence: analysis of aggregate data. In: Holzinger, K., Knill, C. and B. Arts (eds.) *Environmental policy convergence in Europe*, Cambridge: Cambridge University Press, pp. 98-143.

Kopp, O., Eßer-Frey, A. and Engelhorn, T. (2012). Können sich erneuerbare Energien langfristig auf wettbewerblich organisierten Strommärkten finanzieren? *Zeitschrift für Energiewirtschaft*, 36(4): 1-13.

Leruth, B. and Lord, C. (2015). Differentiated integration in the European union: a concept, a system or a theory? *Journal of European Public Policy* 22(6): 754-763.

Meyer, R. and Gore, O. (2015). Cross-border effects of capacity mechanisms: Do uncoordinated market design changes contradict the goals of the European market integration? *Energy Economics* 51: 9-20.

Mundell, R.A. (1961). A theory of optimum currency areas. *American Economic Review* 51(4): 657-665.

Oates, W.E. (1972). *Fiscal Federalism*. New York: Harcourt Brace Javanovich.

Oates, W. E. (1999). An Essay on Fiscal Federalism. *Journal of Economic Literature* 37: 1120-1149.

Ohlin, B. (1933). *Interregional and International Trade*. Camebridge: Harvard University Press.

Pettersson, F., Maddison, D., Acar, S. and Söderholm, P. (2014). Convergence of Carbon Dioxide Emissions: A Review of the Literature. *International Review of Environemental and Resource Economics*, 2013(7): 141-178.

Plümper, T. and Schneider, C.J. (2009). The analysis of policy convergence, or: how to chase a black cat in a dark room. *Journal of European Public Policy* 16(7): 990-1011.

Pierre, J. (2015). Varieties of capitalism and varieties of globalization: comparing patterns of market deregulation. *Journal of European Public Policy* 22(7): 908-926.

Pitlik, H. (2007). A race to liberalization? Diffusion of economic policy reform among OECD-economies. *Public Choice* 132: 159-178.

Rodriguez, F. and Rodrik, D. (2001). Trade Policy and Economic Growth: A Skeptic's Guide to the Cross-National Evidence. In: Bernanke, B. and K. Rogoff (eds.) *NBER Macroeconomics Annual 2000* 15: 261-338.

Samuelson, P. A. (1948). International Trade and the Equalisation of Factor Prices, *Economic Journal*, 58(230): 163-184.

Söderholm, P. (2008a). Harmonization of renewable electricity feed-in laws: A comment. *Energy Policy* 36: 946-953.

Söderholm, P. (2008b). The political economy of international green certificate markets. *Energy Policy* 36: 2051-2062.

Solow, R. (1956). A contribution to the theory of economic growth. *Quarterly Journal of Economics* 70(1): 65-94.

Streeck, W. and Elsässer, L. (2015). Monetary disunion: the domestic politics of Euroland. *Journal of European Public Policy* doi: 10.1080/13501763.2015.1080287

Strunz, S., Gawel, E., and Lehmann, P. (2014). On the alleged need to strictly "Europeanize" the German Energiewende. *Intereconomics* 49 (5): 244-250.

Strunz, S., Gawel, E., and Lehmann, P. (2015). Towards a general "Europeanization" of EU Member States' energy policies? *Economics of Energy & Environmental Policy* (4)2: 143-159.

Tagliapietra, S. (2014). Building Tomorrow's Europe. The Role of an "EU Energy Union" (November 13, 2014). *Review of Environment, Energy and Economics (Re3), http://dx.doi.org/10.7711/feemre3.2014.11.002*

Tews, K. (2005). The Diffusion of Environmental Policy Innovations: Cornerstones of an Analytical Framework. *European Environment* 15: 63-79.

Tews, K. (2015). Europeanization of Energy and Climate Policy: The Struggle Between Competing Ideas of Coordinating Energy Transitions. *Journal of Environment & Development* 24(3): 267-291.

Teyssen, J. (2013). Stop unilateralism. The German Energiewende needs a European context. Energlobe, 13 May 2013. Available at: http://energlobe.eu/economy/stop-unilaterism

The Economist (2014). The headwinds return. Available at: http://www.economist.com/news/briefing/21616891-ten-years-ago-developing-economies-were-catching-up-developed-ones-remarkably-quickly-it

Ther, P. (2014). *Die neue Ordnung auf dem alten Kontinent. Eine Geschichte des neoliberalen Europa.* Berlin: Suhrkamp.

Unteutsch, M. and Lindenberger, D. (2014). Promotion of Electricity from Renewable Energy in Europe Post 2020 – The Economic Benefits of Cooperation. *Zeitschrift für Energiewirtschaft* 38(1): 47-64.