



# Creative destruction or mere niche support? Innovation policy mixes for sustainability transitions



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## ABSTRACT

Recently, there has been an increasing interest in policy mixes in innovation studies. While it has long been acknowledged that the stimulation of innovation and technological change involves different types of policy instruments, how such instruments form policy mixes has only recently become of interest. We argue that an area in which policy mixes are particularly important is the field of sustainability transitions. Transitions imply not only the development of disruptive innovations but also of policies aiming for wider change in socio-technical systems. We propose that ideally policy mixes for transitions include elements of 'creative destruction', involving both policies aiming for the 'creation' of new and for 'destabilising' the old. We develop a novel analytical framework including the two policy mix dimensions ('creation' and 'destruction') by broadening the technological innovation system functions approach, and specifically by expanding the concept of 'motors of innovation' to 'motors of creative destruction'. We test this framework by analysing 'low energy' policy mixes in Finland and the UK. We find that both countries have diverse policy mixes to support energy efficiency and reduce energy demand with instruments to cover all functions on the creation side. Despite the demonstrated need for such policies, unsurprisingly, destabilising functions are addressed by fewer policies, but there are empirical examples of such policies in both countries. The concept of 'motors of creative destruction' is introduced to expand innovation and technology policy debates to go beyond policy mixes consisting of technology push and demand pull instruments, and to consider a wider range of policy instruments combined in a suitable mix which may contribute to sustainability transitions.

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## 1. Introduction

Recently, there has been increasing interest in the innovation studies literature in questions surrounding policy mixes. While it has long been acknowledged that the stimulation of innovation and technological change can include a number of different types of policy instruments and that the most appropriate type of instrument might depend on the stage of the innovation process or the respective sector (Pavitt, 1984), the issue of how such instruments form policy mixes has only recently been highlighted as being of interest to this community (Flanagan et al., 2011; Borrás and Edquist, 2013;

Magro and Wilson, 2013; Quitzow, 2015) as well as policy makers from the European Commission (Nauwelaers et al., 2009).

We argue that policy mixes are particularly important in the field of sustainability transitions. This literature has received increasing interest in the context of technology and innovation studies and goes beyond single innovations, examining change at the level of socio-technical systems (cf. Markard et al., 2012). Transitions in the form of systemic changes in current structures for consumption and production are viewed as being of paramount importance to reduce the overall environmental impacts of human activities. Much of the literature focusses either on protective niche spaces for innovations which might overturn incumbent regimes (Smith and Raven, 2012) or on facilitating the emergence of technological innovation systems (e.g. Bergek et al., 2008). Recently, attention has also been paid to the processes of destabilising incumbent regimes through "weakening reproduction of core regime elements" that are seen as necessary to create "windows of opportunity" for the upscaling of niche innovations (Turnheim and

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Geels, 2012, 2013). In this context, major policy change has been argued to be important, because “it shapes both the direct support for industries. . . and economic frame conditions” (Turnheim and Geels, 2012, p. 46). Thus, transitions may not only require the development of disruptive innovations but also of disruptive policy mixes aiming for systemic change (e.g. Kivimaa and Virkamäki, 2014; Weber and Rohracher, 2012). This type of policy change is often, however, constrained by the political challenges of introducing more coherent policy mixes (Howlett and Rayner, 2007; Kern and Howlett, 2009).

Building on the seminal concept of creative destruction, proposed by Joseph Schumpeter, and the recent concept of regime destabilisation (Turnheim and Geels, 2012), we propose that policy mixes favourable to sustainability transitions need to involve both policies aiming for the ‘creation’ of new and for ‘destroying’ (or withdrawing support for) the old. By making this distinction we want to ease the identification of elements potentially lacking in existing policy mixes from the perspective of transitions. Moreover, the urgency of sustainability transitions requires explicit analyses of active destabilisation, because solely relying on the emergence and growth of a variety of alternatives to replace incumbent systems will be too slow. We conceive of these kinds of policy mixes as not only comprising typical innovation and technology policies but all policies that potentially work in favour of transitions.

This paper extends the work on the functions of Technological Innovation Systems (TIS) by proposing a novel conceptual framework for policy mixes for sustainability transitions, and introducing it as “motors of creative destruction” building on and extending Suurs and Hekkert’s (2009) concept of “motors of innovation”. The extension addresses a previous critique of the TIS approach (e.g. Smith and Raven, 2012; Kern, 2015) that it does not pay enough attention to the regime level for analysing transitions. While the idea of destabilising regimes may be implicit in TIS through its intended key contribution to function as a tool for identifying system weaknesses preventing a specific TIS from developing (e.g. Jacobsson and Bergek, 2011), the development of a new TIS does not automatically lead to ‘destruction’ in the dominant regime. Moreover, destabilisation can serve the upscaling of several TISs in different subsystems, not just a specific one. Therefore, we combine attention to supporting the development of specific niche innovations and new technological innovation systems with attention to regime destabilisation, and argue that policy mixes need to attend to both processes in a mutually re-enforcing way. Empirical testing of the framework is provided by examining policy mixes influencing low energy transitions in Finland and the UK. Both countries have made significant efforts to promote energy efficiency but provide interesting contrasts in several ways (discussed later).

The next section reviews the literature before Section 3 turns to the proposed analytical framework and the methodology. Section 4 presents the empirical analysis followed by a discussion of the key insights in Section 5 and conclusions in Section 6.

## 2. Innovation policy mixes and sustainability transitions

### 2.1. Policy mixes

Recent interest in innovation policy mixes has been justified on the grounds that real world policy contexts involve several policy instruments in different policy domains and with different rationales, dispersed governance structures and many levels of administration (Flanagan et al., 2011; Borrás and Edquist, 2013; Magro and Wilson, 2013; Quitzow, 2015). Many scholars use the concept of ‘policy mix’ similarly to Borrás and Edquist (2013, p. 1514) who refer to ‘a set of different and complementary policy instruments to address the problems identified’ in a national

or regional innovation system. However, broader interpretations have been suggested by Magro and Wilson (2013) and Rogge and Reichardt (2013), adding to the mix also policy goals and rationales as well as processes of policy making and implementation. While we see merit in the broader concept of the policy mix, for purposes of empirical illustration in this paper, we focus on what Rogge and Reichardt (2013) would define as instrument mixes. We do, however, extend from Borrás and Edquist in that we examine policy mixes for transitions over several policy domains, not merely ‘classic’ innovation policy instruments. Analyses across domains are important from the perspective of policy coherence and consistency, as sub-optimal or even perverse outcomes of policies can frequently be explained by clashing policies designed for different purposes across different policy domains (e.g. Huttunen et al., 2014; Nilsson et al., 2012).

Howlett and Rayner (2007) have explained the complexity of policy mixes developing over time in non-innovation policy contexts. They define three kinds of policy mix evolution: *layering* that indicates new goals and instruments added on top of existing ones, often leading to incoherent and inconsistent mixes; *drift* to imply changed policy goals without altering the instruments, creating inconsistency between them, and; *conversion* denoting change in instruments without altering goals. A fourth type is introduced by Kern and Howlett (2009) as *replacement* that fundamentally restructures both goals and instruments in a conscious, coherent and consistent manner. However, Howlett and Rayner (2013, p. 177) note that most existing policy mixes have developed through “layering, or repeated bouts of policy conversion or policy drift”, often resulting in inconsistent policy mixes, and that situations where new consistent policy mixes are developed are rather rare. Similarly, in the context of innovation studies, Flanagan et al. (2011) have argued that policy mixes can at best be coordinated by a process of mutual adjustment between a variety of actors and systems. This means that there are no ‘optimal’ (Nauwelaers et al., 2009; Borrás and Edquist, 2013; Quitzow, 2015) or even ‘good’ (Flanagan et al., 2011) innovation policy mixes in a general sense.

Our contribution complements many recent studies on innovation policy mixes (e.g. Flanagan et al., 2011; Borrás and Edquist, 2013; Rogge and Reichardt, 2013) that are predominantly conceptual (the exception being Quitzow, 2015), by applying the concept of an innovation policy mix to an empirical context. We also address other shortcomings in this literature: the consideration of innovation fairly narrowly in the context of R&D support, firms and individual technologies (e.g. Nauwelaers et al., 2009; Rogge and Reichardt, 2013; Quitzow, 2015) and the lack of attention to policy mixes fostering ‘directed’ transitions towards more sustainable socio-technical systems. The need for such transitions is a crucial policy challenge and an increasing focus of academic research, reviewed below.

### 2.2. Sustainability transitions and innovation policy

Considerable recent literature on sustainability transitions has emerged to study the transformation of socio-technical systems (incl. technologies, infrastructures, institutions, industrial sectors, user behaviours) towards environmental sustainability. The multi-level perspective (MLP) has developed as a key meso-theory to explain such processes (Markard et al., 2012). The principal idea of the MLP is that transitions come about through interactions between three different levels: landscape (macro-economic and macro-political trends, significant environmental changes, demographic trends, etc.), regime (the deep structure of the socio-technical system involving alignment between technologies, infrastructure, institutions, practices, behavioural patterns, markets, industry structures, etc.), and niches (spaces where various technical, social and organisational innovations are created and

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