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Procedural Policy Tools and the Temporal Dimensions of Policy Design : Resilience, Robustness and the Sequencing of Policy Mixes

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Abstract

In recent years work on policy design and instrument choice has advanced towards a better understanding of the nature of policy mixes, their dimensions, and the trade-offs between choices of tools, as well as the identification of basic design criteria such as coherence, consistency and congruence among policy elements. However, most of this work has ignored the temporal dimension of mixes or has studied this only as an important contextual variable affecting instrument choices, for example, highlighting the manner in which tools and mixes often evolve in unexpected or unintended ways as they age. This ignores the important issue of the intentional sequencing of tools as part of a mix design, either in terms of controlling spillovers which emerge as implementation proceeds, ratcheting up (or down) specific tool effects like stringency of implementation and public consultation as time passes. This article reviews existing work on the unintentional sequencing of policy activity as well as the lessons which can be derived from the few works existing on the subject of intentional sequencing. In so doing, it helps define a research agenda on the subject with the expectation that this research can improve the resilience and robustness of policies over time.

Keywords

policy tools, robustness, resilience, policy sequencing, procedural instruments

Introduction : Intentional and Unintentional Aspects of Temporality and Sequencing in Policy-Making

Policy-making is all about creating and implementing mixes of policy instruments expected to attain policy goals, no matter how loosely defined or publicly beneficial those goals might be. Given their nature, the policy tools or instruments, or the techniques used by government to implement policy goals (Howlett 2005), thus have a special place in considerations and studies of policy design (Howlett 2018 and 2019).

Each tool has its own particular ‘*character*’ and exists as a bundle of attributes utilizing one or more governing resources (Hood 1986; Salamon 2002; Howlett 2019b). Understanding this character is an important aspect of designing programmes and packages likely to attain government goals and, not surprisingly, many past studies have focused on identifying the nature, advantages and strengths and weaknesses of the varied techniques used by government to implement their wishes (Salamon 2002). But choosing policy tools and designing a policy becomes more complex when, as is very common in most policy-making situations, multiple goals and multiple sectors are involved in a program (Doremus 2003; Jordan et al 2012; Howlett et al 2009). In such situations, instrument choices are not restricted to single tool, but rather to a mix or portfolio of policy instruments. And in constructing such bundles, balancing the character of different types of tools within a mix is a challenge.

How to achieve ‘complementarity’ among mix elements, arrive at the redundancy required to ensure mixes are robust across space and resilient across time, while at the same time avoiding excessive duplication and counter-productive relationships among tools are key questions which must be considered in this process (Grabosky 1995; Hou and Brewer 2010; Justen et al 2013a). Some combinations of tools may be purely redundant while others, even if repetitive or duplicative, may be beneficial for promoting resiliency and adaptiveness (Braathen and Croci 2005; Braathen 2007; Swanson et al 2010; Walker et al 2010) and erstwhile policy designers need to be able to tell the difference and choose accordingly.

Studies of policy uncertainty and policy failure, for example, have emphasized the need to design *robustness* into policies in order for them to be able to adapt to a variety of foreseeable futures (Moynihan 2009) and also *resilience*, or the ability to deal with opposition and conflict that may result post-enactment over the medium-to-long term (Walker et al 2010; Kwakkel et al 2010; Capano and Woo 2017). The first aspect means to design policies capable of maintaining the same performance in the face of any different operational context, while the second aspect refers to the ability of the policy to adapt in the face of any type of internal/external perturbation (Capano and Woo 2017). Both are necessary in order to deal with surprises and avoid possible policy failure caused by unexpected or unknown occurrences and changing contexts which upset initial design specifications and assumptions (Howlett et al 2015b), and both highlight the need to investigate seriously the manner in which mixes evolve over time and how their various parts are and can be *sequenced*.

Achieving resilience and robustness typically means duplicating some resources and adding procedural policy tools in order to deal with the possibility of unforeseen events (Howlett 2000). Studies of policy dynamics and reform (Patashnik 2008; Jordan and Matt 2014), for example, have urged the creation of ‘sticky’ or resilient designs in long-term policy areas such as climate change or pensions capable of withstanding major political challenges and performing well under changing circumstances (Jacobs 2008; 2011). This often means including in a policy some mechanism or procedure for monitoring and revising policies in a planned fashion

in order to deal with future issues and spillovers from existing policy efforts (Lang 2019).

Importantly, many elements of a policy need not be adopted all at once but can be sequenced, or adopted piecemeal as a policy evolves over time. Although in recent years work on policy design and instrument choice has advanced towards a better understanding of the nature of policy mixes, their dimensions, and the trade-offs between choices of tools, as well as the identification of basic design criteria such as coherence, consistency and congruence among policy elements, most of this work has ignored the temporal dimension of mixes. Most existing work, for example, has studied temporality only as an important contextual variable affecting instrument choices, for example, highlighting the manner in which tools and mixes often evolve in unexpected or unintended ways as they age (Howlett and Goetz 2014).

This ignores the important issue of the intentional sequencing of tools as part of a mix design, either in terms of controlling spillovers which are predicted or expected to emerge as implementation proceeds, ratcheting up (or down) specific tool effects like stringency of implementation and public consultation as time passes (Taeihagh et al 2013), or establishing procedures through which a policy can be adapted to changing contexts (Bellehumeur 1997).

To fill this gap, this paper reviews existing work on the unintentional sequencing of policy activity as well as the lessons concerning robust and resilient designs which can be derived from the few studies existing on the subject of intentional sequencing. In so doing, it helps move forward our understanding of long-term policy design and the means and mechanisms through which policy resilience and robustness can be achieved.

Policy Design Issues Related to Resilience and Robustness

Of course, how and why a policy should be designed to be robust and resilient over time is not a simple question and it is well known that ensuring policy processes, tools, and outputs line up properly over both the short- and long-term is not an easy task (Jacobs and Weaver 2015). Attaining continued policy success over the long term is a difficult task for a number of reasons.

As is well known, even at the best of times there is commonly a high level of uncertainty in policy-making (Manski 2013), which makes anticipation of future timescapes fraught with challenges and uncertainties. As a result, even many otherwise well-thought out, well-intentioned or otherwise well-designed policies fail. Governments must grapple with complex problems involving situations in which they must deal with shifting coalitions of multiple actors, ideas and interests in complex problem environments which typically evolve and change over time. This so-called 'VUCA' (volatility, uncertainty, complexity, and ambiguity) world (Bennett and Lemoine 2014) complicates policy-making in many ways and establishes a base case for thinking about how such problems can be overcome.

That is, beyond the complaints of knowledge limitations and uncertainty, governments can and do adopt policies with a high expectation of success, from developing road and air traffic systems to the creation of food and drug safety regulations, all of which deal with highly uncertain futures and constant changes in industry actors and behaviour, public attitudes and technological changes, among others. Searching for the cause of failures and the means of dealing with them thus transcends epistemological despair as governments around the world put procedures and practices into place to deal with whatever levels of uncertainty exist in particular sectors and issue areas.

Thus, for example, failures are known to occur due to issues relating to implementation and formulation practices which go beyond knowledge limits, such as a lack of resources or prob-

lems of vague goal definition and poor implementation, evaluation and other policy practices (Wu et al 2018), not to mention the existence of corrupt or inefficient bureaucracies or other policy actors who are either incompetent or motivated by other values than the public good (Goodin 1980). The presence of powerful veto players among both state and societal actors who try to block even the best conceived plans, such as Obamacare in the US, for example, makes the process of designing effective policies over both the short- and long-term difficult and complex (Beland et al 2016; Peters et al 2018).

These are also serious impediments to the very idea of ‘design’ (Turnbull 2018). But, nevertheless, the modern policy sciences were founded on the idea that accumulating and utilizing knowledge of the effects and impacts of a relatively well-known set of policy means or tools developed over many years of state-building experience can help marshal and utilize the resources and knowledge required to overcome these obstacles and lead outcomes and processes towards both short- and long-term policy success (Lasswell & Lerner 1951; Howlett and Mukherjee 2014).

That is, individual policies can be thought of as both more or less robust – that is, capable of attaining their intended effects in a variety of circumstances – and more or less resilient – or capable of remaining robust over time. The former concern is often centered on overcoming limitations in the initial conditions when a policy is adopted, while the latter addresses the issue that policy failures also commonly occur as the policy environment changes and evolves, often undermining the assumptions and expectations that went into their initial formulation (Jacobs and Weaver 2015; Nair and Howlett 2017; Howlett et al 2015). Thus, even when policies are designed with a clear evidentiary basis in a model formulation process so that they are robust and well suited to the issues and concerns of the contemporary era, they may still fail over time if they do not adapt to changing circumstances and concerns as policy implementation proceeds and the policy is put into action (Nair and Howlett 2017; Bennett and Lemoine 2014). Such problems affect many sectors, from healthcare policies affected by long-term demographic patterns to communications and industrial policies which are highly susceptible to technological change (Coleman and Basten 2015; Bastian and Börjesson 2015).

Redundancy, Prudence and the Precautionary Principle in Policy Design

Achieving both robustness and resilience suggests a need to be able to design and adopt policies featuring agility and flexibility in their components and processes. However, the degree to which such changes can be identified and correctly anticipated at the outset of policy adoption varies directly with the level of ‘turbulence’ in the policy environment (Metcalf et al 1978; Salmador and Florin 2013), meaning it is not always clear *a priori* precisely how much agility or redundancy is required.

Even in environments in which policy actors, targets and goals change only slowly and are relatively stable, there is always a degree of uncertainty about how long this situation will last, and a prudent policy, much like a bridge or a building, should always be designed within a relatively expansive set of risk parameters and with some degree of flexibility in the face of the unexpected (Capano and Woo 2017). In more turbulent circumstances, where policy ideas and actors change frequently (Howlett and Ramesh 2002), this problem is magnified. In such conditions, policies must be designed to be flexible. In practice, this means policies and policy-making require not only additional and redundant resources but also the capability to change course as conditions change, such as built in feedback mechanisms and procedures for automatic or semi-automatic adjustment (Soss and Moynihan 2014).

Recognition of the need for redundancy stands in strong opposition to many ideas about policy-making which equate better designs with efficiency, implying only the minimum possible amount of resources should be allocated to a policy, and which also often emphasize routinization and the replication of standard operating procedures and program elements in order to ensure consistency in program delivery (Moxey et al 1999; Cole and Grossman 1999). It also requires clearer thinking about what exactly the sequencing of policy elements means, how it occurs in policy-making and how it can best be managed to ensure resilient and robust policies are created and remain effective.

Unintentional Sequencing : Historical Legacies, Layering and the Trajectories of Public Policies

One critical issue around the temporality of public policy-making which policy scholars have begun to study concerns the trajectories of policies and their impact on the timing of the replacement or elimination of components and elements of policy mixes (Justen et al 2013; Jordan et al 2013; Howlett 2009).

That is, policy-making can be viewed not as a one-off but rather as an inherently temporal process in which policy content and outcomes shift over time, leading to patterns of the sequencing of different policy elements in a trajectory of events and activities in any specific policy area (Mahoney 2000; Daugbjerg 2009). This statement is as true of designs intended to be robust and resilient as of those in which temporal considerations may have been absent in their initial formulation.

The practical significance of this perspective on policy-making activities and precepts is clear, as many older studies suggested that design and adoption occurred as processes in which policy packages were designed 'de novo' and implemented 'en bloc', with less attention paid to their evolution once in place. More recent studies, however, acknowledge that most design circumstances involve building on the foundations created in another era and working within existing arrangements of instruments and tools put in place over an extended period of time (Howlett and Rayner 2013).

Work in this area typically follows the lead of neo-institutionalists such as Thelen and Mahoney, specifying several processes such as layering, drift, replacement and conversion, through which policies have been observed to evolve (Thelen 2004; van der Heijden 2011; Beland 2007). However, it also includes some sequential policy-making activities such as stretching and tense layering (Feindt and Flynn 2009; Kay 2007) in which subsequent events and actions on the part of policy-makers result in a less than favourable pattern of policy changes as adaptations take place in a reactive way or fail to take place at all, introducing tensions into existing policy mixes which may not have been there when those policies were first adopted. This has happened in many sectors, such as land management, where subsequent incursions of new industries into formerly agricultural or forestry domains can result in the stretching of existing land use policies to try to cover-off the activities of the new industries, often with very poor results (Rayner et al 2017).

While focusing on the limitations of policy-making, these works have advanced our knowledge of temporal policy-making processes and the opportunities available to design policies capable of reacting to significant alterations in existing trajectories of policies and outcomes (Howlett & Mukherjee 2014). Their lessons and findings help us better understand policy-making processes and tool mix evolution and how policy portfolios can be designed to be flexible and achieve a higher level of resilience and robustness. How policy formulators, like software de-

signers, can issue ‘patches’ in order to correct flaws in existing mixes or allow them to adapt to changing circumstances, for example, has been a subject of study in this vein (Rayner and Howlett 2013; Howlett and Rayner 2007), which helps identify a mechanism through which adaptations can be made to policies in changing circumstances in a self-reflexive way (Grin et al 2010; Voss et al 2006).

Intentional Policy Sequencing : The Role of Path Dependency and Lock-In Effects in the Creation of Robust and Resilient Designs

Beyond these advances, recent policy design studies have also established insights into the question of what makes a policy ‘sticky’, or more likely to remain in place over the long term (Bobrow 2006; Howlett 2011; Flanagan et al 2011; Peters et al 2018) and how such attributes can be designed into a policy at its outset.

Path dependency, for example, is a well-known phenomenon in social processes (Arthur 1988; 1989; David 1985; 1986; Liebowitz and Margolis 1995; 1990), and one which has been applied with effect in the policy sciences in order to understand the construction and maintenance of policy trajectories – that is, how initial policy actions remain more or less in effect over a long period of time, often being reinforced and made more difficult to change (‘locked in’) by the passage of time (Greener 2005). This is a common occurrence in such areas as urban housing, for example, where initial land distributions or zoning regulations can result in patterns of buildings and building uses which are very difficult to change once in place.

Mahoney has outlined three principal elements of the general path dependent model of historical evolution which characterize these circumstances. These are: (1) only early events in sequence matter or at least matter more than ones that occur later in a temporal sequence; (2) these early events are said to be contingent in the sense that they could have occurred otherwise or not at all; and (3) later events are inertial in the sense that they follow the lead of earlier events and choices (Mahoney, 2000).

This view on path dependency is useful for policy design studies in two ways. First, it suggests that initial decisions made early in a trajectory are critical while, secondly, it also highlights that identifying the reasons for ‘turning points’ or ‘conjunctures’ when trajectories change is critical to anticipating, or guarding against, their appearance. Thus, in a policy context, for example, a problem in an area such as forestry around uncertain property rights which leads to over-cutting and trespass often leads to the creation of a rights regime such as the sale of public lands or long-term area-based tenures which, once in place, are very difficult to change, except around the edges (Moore 1957; List 2004). This lock-in, or path dependency, has important consequences for policy mix dynamics and the prospects for policy reform and change (Cox 2004; Dobrowolsky and Saint-Martin 2005; Deeg 2001; Kay 2005) and how they can be manipulated by policy-makers and policy designs.

In economics, the reasons cited for lock-in include ‘network effects’, or the ability of inferior technologies to spread and block the adoption of more efficient ones; ‘increasing returns’, or the historical accident of the timing of the entry of new technologies into the market place; and (premature) ‘standardization’, which can also block the spread of superior technologies (Liebowitz and Margolis 1995). These are generally negative applications of the concept. In the social and political realm, however, the use of the concept of path dependency is less specific and has been applied simply as a description of historical policy-making processes in which initial conditions matter. Hence, although often thought to be a sub-optimal affair, the fact that lock-in *prevents* changes from occurring also applies to situations in which initial policy

elements can be put in place which lock-in robust relationships and practices, thereby enhancing resilience.

Positive Lock-In : Designing for Robustness and Resilience over Time

Much work on policy design and policy mixes has focused on the manner in which various parts of a mix or portfolio may be more or less *integrated* or co-ordinated (Briassoulis 2005a; 2005b). That is, policies are said to be composed of several elements and some correspondence across these elements is required if policies are to be robust (Cashore and Howlett 2007).

The components of a mix include policy goals and policy means at various levels of generality (Howlett 2009; Kern and Howlett 2009; Cashore and Howlett 2007), and design and instrument selection in these contexts “are all about constrained efforts to match goals and expectations both within and across categories of policy elements” (Howlett 2009, 74). These include efforts to attain ‘*consistency*’, or the ability of multiple policy tools to reinforce rather than undermine each other in the pursuit of policy goals; ‘*coherence*’, or the ability of multiple policy goals to co-exist with each other and with instrument norms in a logical fashion; and ‘*congruence*’, or the ability of goals and instruments to work together in a uni-directional or mutually supportive fashion (Lanzalaco 2011; Howlett and Rayner 2007; Kern and Howlett 2009).

A major issue for considerations of robustness, for example, is the fact that not all of the tools involved and invoked in a mix may be inherently complementary (Tinbergen 1958; Grabosky 1995; Gunningham et al 1998; Gunningham and Sinclair 1999; del Rio et al 2011; Boonekamp 2006) in the sense that they evoke contradictory responses from policy targets, however those targets are defined (Schneider and Ingram 1990a, 1990b; 1993; 1994; 1997; 2005). Such problems emerge, for example, in policies which simultaneously increase gasoline prices in order to discourage consumption or reduce carbon emissions and at the same time provide subsidies to automobile or truck manufacturers or buyers in order to increase sales and employment. Consumers are thus pushed and pulled in opposite directions by elements in the same policy portfolio (Myers 1998). A key principle of current policy design thinking around robustness, therefore, is to try to better integrate policy elements, maximizing complementary or supplementary effects while minimizing counterproductive ones.

Smart’ design thus implies creating policy packages which take these precepts into account in their formulation (Gunningham, Grabosky and Sinclair 1998; Gunningham and Sinclair 1999; Eliadis et al 2005). But whether or not a mix can attain, and retain, a high degree of integration or not is not just a matter of the character of individual tools and mixes at a single point in time, but also of the context in which the policy evolves, which affects how these elements continue to interact and whether or not they continue to achieve their goals (May et al 2005; Gilabert and Lawford-Smith 2012; Majone 1975).

This attention to the ability of a policy mix to deal with changes in context is apparent in contemporary work aimed at better understanding and avoiding both ‘over’ and ‘under’ reactions, or how best to balance policy ‘effort’ with the severity of a problem (Haynes and Li 1993; Maor 2012). In most cases, with the exception of those symbolic instances where ‘over-design’ is welcomed, such as in areas such as national security or crime prevention (Maor 2013; 2014; 2017), efficient policy designs are said to be those that affect only those targets whose behaviour it is necessary to change and with only the minimum necessary levels of coercion and display. But this issue in itself varies over time as the size and type of target can change, not least due to the impact of the policy itself, such as when policies devoted to building more public housing succeed in changing the degree of homelessness and the nature of the concerns the recently-

housed homeless may have about their new accommodations.

Consequently, how to enhance or alter mixes over time through the sequencing of policy tools so that policies are able to continue to meet old goals and take on new ones is a key question. Mixes that emerge over long stretches of time as a result of earlier policy decisions and layering, for example, often face the situation in which even when the initial logic of a mix may have been clear at the outset, it can gradually transform into a degenerative or incoherent mix over time (van der Heijden 2011; Bode 2006; Howlett and Rayner 1995; Orren and Skowronek 1998; Torenvlied and Akkerman 2004; Hacker 2005).

These kinds of ‘unintentional’ mixes can be contrasted with designs which deploy sets of procedural tools specifically intended to overcome or avoid the problems associated with layering. These include tools such as periodic reviews and sunset provisions, which can enhance resilience and robustness by building in opportunities to ‘patch’ policies and place their elements back in synch with each other (Gunningham et al 1998; Kiss et al 2013).

The idea, of course, is to ‘lock-in’ resilience within an initial design. That is, adopting measures to ensure not only that the component parts of a policy mix relate well to each other when a mix is adopted, but also in the future (Howlett and Rayner 2007, Grabosky 1994, Gunningham, Grabosky and Sinclair 1998, del Rio 2010).

Intentionally Designing Instrument Sequences to Ensure Resilience and Robustness : Controlling Spillovers and Learning from Experience

While work on the intentional sequencing of policy elements to ensure resilience is rare, some work on this subject does exist and serves as a starting point for this analysis. In the mid-1970s and early 1980s, for example, Bruce Doern, Richard Phidd, Seymour Wilson and others argued that a critical aspect of instrument choice centered on compliance and that the best way to deal with uncertainties around compliance involved the temporal sequencing of tools in reaction to compliance gains and losses. They argued that different policy instruments varied primarily in terms of the ‘degree of government coercion’ each instrument choice entailed (Doern 1981; Doern and Phidd 1983; Doern and Wilson 1974; Tupper and Doern 1981), and that tool choices should ‘move up the spectrum’ of coercion from minimum towards maximum only if compliance issues persisted and government goals failed to be met by lower-level tools.

Preferring ‘self-regulation’ as a basic default, for example, they argued that in a good design governments should first attempt to influence overall target group performance through exhortation and then add or replace instruments as and if required in order to compel recalcitrant societal actors to abide by their wishes, eventually culminating, if necessary, in the public provision of goods and services. They illustrated this argument with examples of such developments in many countries in the air transport area, for example, where national carriers were ultimately created only after earlier efforts at government encouragement and subsidies failed to attract private sector investment in air travel (Tupper and Doern 1981). Such a vision, of course, expects governments to be able to avoid lock-in at sub-optimal compliance levels and to design a policy to be reactive to subsequent target behaviour.

Similarly, as noted above, more contemporary design studies have engaged in a lengthy discussion as to how to better integrate policy mixes so that multiple instruments are arranged together in sometimes very complex portfolios of policy goals and means (Gunningham et al 1998; Doremus 2003; Briassoulis 2005a; Howlett 2011; Yi and Feiock 2012; Peters et al. 2005; Jordan et al. 2011; 2012). Work on smart regulation’ by Gunningham, Grabosky and Sinclair

(1998) in the 1990s, for example, led scholars and practitioners to focus on how instruments within a policy mix, or ‘portfolio’, could be made to complement each other (Buckman and Diesendorf 2010; Roch, Pitts and Navarro 2010; Barnett and Shore 2009; Blonz, Vajjhala and Safirova 2008; del Rio et al 2010). But attaining such relationships requires certain tools to be deployed in a preparatory fashion and others to be deployed only after others have been put into place, as is the case, for example, with the initial establishment of regulations and subsidies in areas such as telecommunications and their subsequent revision by regulatory commissions dedicated to monitoring the environment and altering policy measures as conditions changed (McGraw 1975).

Taeihagh et al (2009 and 2013) have usefully described the relationships between tools that need to be taken into account in initial designs (see Table 1). As this table shows, at least two of the relationships are temporal (‘precondition’ and ‘potential contradiction’) and require procedural tools if their deployment is to be made in such a way as to anticipate change and plan for policy robustness (Schrader et al 1993; Leung et al 2015; Bond et al 2015).

Table 1. Five types of relations among policy measures.

Relation	Description
Precondition (P)	Defined as a relation that is strictly required for the successful implementation of another policy measure. For instance, if policy measure B is a precondition to policy measure A, the successful implementation of policy measure A can only be achieved if policy measure B is successfully implemented beforehand. The precondition relation is a direct relation.
Facilitation (F)	In a case where a policy measure ‘will work better’ if the outcome of another policy measure has been achieved, the relation is considered as a facilitation relation. For instance, policy measure B facilitates policy measure A when policy measure A works better after policy measure B has been implemented; however, policy measure A could still be implemented independently of policy measure B. The facilitation relation is also a direct relation.
Synergy (S)	A special case of facilitation relation in which the ‘will work better’ relation is bidirectional (undirected relation). It can be argued that such a relation can be treated as a two-way facilitation; however, we believe that treating this relation as a separate type is advantageous, as it suggests a higher effectiveness of both of the policy measures having the synergetic relation vis-a-vis the overall policy.
Potential contradiction (PC)	A potential contradiction exists between policy measures if the policy measures produce conflicting outcomes or incentives with respect to the policy target under certain circumstances, hence the contradiction is ‘potential’. This relation is undirected.
Contradiction (C)	In contrast to the conditional nature of potential contradiction, the contradiction relation is defined when there are ‘strictly’ conflicting outcomes of incentives between policy measures. Similar to the potential contradiction relation, this relation is undirected.

Source Taeihagh et al 2013 and 2009

On a substantive level, ‘robust’ policies are those which incorporate some slack, allowing room for adjustments as conditions change. This is well illustrated in the case of crisis and disaster management where, in order to be able to survive crises, systems and organizations require redundancy, back-up systems, and a greater use of materials than would normally be necessary for efficiency in a technical sense (Lai 2018; Cyert and March 1963). Organizations which are too lean (Radnor and Boaden 2004) may eliminate elements that could be useful when circumstances change, thus restricting the ability of an organization to respond to surprises (Lai 2012).

Resilience, on the other hand, requires the ability to alter and adapt policies spontaneously – to improvise effectively. This can involve, for example, building into a policy a range of ‘automatic stabilizers’ such as welfare payments or unemployment insurance payments which increase in the event of an economic downturn, maintaining some level of spending and saving despite a general economic contraction or removing some funds from investment availability during boom times (Salamon 2002; Sterner 2003). But it often requires explicitly process-related tools to be adopted in designs, such as advisory councils in the event of regulations, whose purpose is to ensure future adjustments to the policy to ensure its continuing relevance.

That is, policy robustness and resilience in such circumstances requires the inclusion of policy-making procedures which allow responses to surprises to be improvised and implemented in an effective way *as they occur* (Room 2013a; 2013b). This means adding procedural measures to existing policy portfolios that provide strategic sensitivity or the early awareness of incipient trends as they develop and evolve. This can include, for example, the adoption of procedural policy tools such as built-in policy reviews and mechanisms for outside evaluation and control, including provisions for future public hearings and information access, disclosure and dissemination, which allow significant adjustments to changing circumstances to occur (Lang 2019). This requires strategic resources or funds, people and competencies to be put into place that can be mobilized and (re)deployed quickly to sustain a policy in the face of change or, more to the point, to design policies in such a way that challenges might be defused before they begin (Doz and Kosonen 2014; Luthar and Cicchetti 2000).

Conclusion : Designing for Resilience and Robustness

In recent years, work in the policy sciences has advanced towards a better understanding of the nature of policy mixes and the dimensions and trade-offs that can be made between tools in a superior design. A set of basic design principles has been articulated, such as the need to promote coherence, consistency and congruence between policy elements (Howlett and Rayner 2007; Rogge and Reichardt 2016; Rogge et al. 2017; Howlett 2018). Until recently, most of this work has ignored the *temporal* dimension of mix design, or the manner in which policies evolve over time, or has studied it only in terms of the *unintentional* sequencing of tools which has occurred through processes such as layering and drift (Capano 2018). However, scholars have now begun to turn their attention to the empirics of how policy mixes actually evolve post-enactment and the means by which procedural tools can aid the sequencing of policy elements and promote robustness, resilience and the continuing effectiveness of a policy (Howlett 2009; Jordan et al. 2012; Justen et al 2014).

This work acknowledges that policymaking is an inherently temporal process, and that while lock-in and path dependency exist, policy content and outcomes do shift over time through processes such as policy patching (Kern et al 2017). These studies seek to better understand the pressures and dynamics of policy components and how policies, like other artifacts, can be de-

signed to control for as many events—both unforeseen and predictable—as possible; including potentially highly disruptive ones such as elections that bring new actors to power who may potentially undermine existing policy regimes and paradigms in an intentional way (Jordan and Matt 2014).

These studies, along with those on policy uncertainty, crisis management, policy learning and policy capacity, have all emphasized the need to design some modicum of resilience into most policies, which means planning to revise them in time to deal with both expected and unpredictable but foreseeable future issues and spillovers from existing policy efforts (Dunlop 2010; Howlett and Ramesh 2014; Moynihan 2009). This need for designs embodying resilience is clear. Policies that were originally thought to be ‘robust’ can become less so over time due to, for example, demographic changes that increase the number of elderly pension earners beyond original targets, or due to circumstances such as climate-change inspired insect infestations undermining projections of agricultural and forest yields. Declines in robustness also can occur due to policy drift or as a result of the actions of beleaguered policymakers trying to improve efficiencies in times of austerity, when it is hard to secure planned resource disbursements (van de Walle 2014).

This means, it is essential that policy-makers not only be able to design policies capable of maintaining the same performance in a number of circumstances but also in the face of internal and external perturbations over time (Capano and Woo 2017; Howlett et al. 2015). Policy designs that contain both a substantive component—a set of alternative arrangements thought to be potentially capable of resolving or addressing some aspect of a policy problem—as well as a procedural component—a set of activities related to maintaining some level of agreement among those charged with formulating, deciding, and administering a policy—are needed to enhance resilience and robustness in the long term (Capano and Woo 2017; Kwakkel et al. 2010; Nair and Howlett 2016; OECD 2011; Walker et al. 2010; 2013).

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