A Formal Model of Policy Implementation in Multi-level Systems of Governance

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Abstract

In multi-level systems of governance, like the European Union, governments at the lower level can significantly influence the implementation of policies adopted at the higher level. This paper presents a formal model of the timing and policy shift of implementation outcomes. Using a 'decision making under institutional constraints' framework, the model provides a number of novel hypotheses about the impact of preferences, discretion, administrative capacity and policy-making constraints. The model accommodates two-dimensional preferences with varying salience. Furthermore, the paper highlights that these factors do not work in isolation and that the same implementation patterns can be achieved under very different combinations of casual factors. The insights offered by the theoretical model are relevant for the analysis of policy implementation in the EU and federal systems, and for the study of compliance with international regimes.

1. Introduction

In multi-level systems of governance (Hooghe and Marks, 2003) the implementation of public policies is often de-centralized: policies adopted at the highest level are adapted, implemented, and enforced by actors at lower levels. As a result, policy outcomes crucially depend on the willingness and capability of these actors to implement the policy in a timely and reliable manner. For example, in the European Union (EU) directives, the most important type of EU legal act, are not directly applied but have to be transposed and implemented by each member state (König and Luetgert, 2009; Steunenberg, 2006; Steunenberg and Toshkov 2009). Similarly, in federal countries, like Germany and Austria, in many policy areas regional authorities enjoy considerable autonomy in the implementation of decisions taken in the capitals (Hanf and Toonen, 1985; Mayntz, 1978). In the case of applying international agreements and conventions, the signatory states have an even greater power to influence the policy outcomes through delayed or improper compliance (Downs et al., 1996; McLaughlin and Hensel, 2007; Raustiala and Slaughter, 2002). Even in unitary states, local and regional authorities have the potential to affect the timing and content of the central government policies they implement (O'Toole and Montjoy, 1984; Rhodes, 1991).

How to account for the potential and observed differences in implementation and compliance? The existing literature has focused on the impact of the interplay between the principal and the agent in the implementation process (add references), and on the sources of the agents' unwillingness to implement properly and on time. Empirical research, however, has demonstrated the limited explanatory potential of these perspectives. For example, the findings about the impact of the preference distance between the principle and the agent, and the influence of policy-making capacity at the lower governance level are contradicting and paradoxical in light of the existing theoretical models.

This paper suggests that the exclusive theoretical focus on the strategic interactions between the principal and the agent in explaining implementation outcomes in multi-level systems might be misguided. Instead, we need to inquire more systematically into the trade-off between time and policy change that the implementing agents face when applying the policies.

This paper presents a decision-theoretical model that implies several novel hypotheses about the impact of administrative capacity, policy-making constraints, discretion, and preference salience on the timing and content of policy change. According to the model, lower-level governments can only bring closer to their preferences the policy set by the higher level actors at the expense of time. In turn, the enforcement efforts of the higher governance levels limit the tolerable amounts of delay and interpretation to the original policy. Finally, administrative and policy-making capacities determine the rate at which time is converted into policy change. Combining two analytical approaches - spatial voting analysis and constrained optimization - the paper uncovers several original implications of this simple theoretical set-up. For example, it turns out that the impact of policy-making capacity on implementation time is much more complex than previously assumed: counter-intuitively, increasing policy capacity can actually lead to more time used for implementation. Furthermore, the model clearly illustrates that preferences and capacities jointly determine policy outcomes. As a result, any analysis that pits preference vs. institution-based explanations misses their non-exclusive, complementary influences. The conclusions of the paper also shed light on the necessity and sufficiency of the explanatory factors included in the model for different observable implementation patters.

The paper proceeds as follows. First, I review the literatures on policy implementation and compliance with international regimes. Identifying several shortcomings, I proceed to introduce the basic features of a new theoretical model. Next, I analyze the structure of the

model by deriving a solution to the constrained optimization problem posed. In the following section, I investigate the comparative statics of the model and derive a set of five hypotheses. In the concluding section of the paper I summarize the results and discuss the contributions of the analysis. Finally, the mathematical proofs of the hypotheses are contained in the appendix.

2. Explaining implementation and compliance: willingness vs. ability?

Theorizing implementation in multi-level systems of government is related to two social science literatures: studying compliance with international norms (International Relations) and studying public policy implementation (Public Administration). Inherited from these intellectual predecessors is a fundamental distinction between theories that emphasize the *will* and theories that highlight the *abilities* of states to comply/implement. The distinction emerges times and again as the dividing line between the 'enforcement' and 'management' schools in international relations[1], between 'top-down' and 'bottom-up' implementation theories[2], and between rational-choice and sociological institutionalisms[3]. Under the 'enforcement' view, non-compliance stems from an 'incentive structure in which the benefits of shirking exceed the costs of detection' (Tallberg, 2002, 611). A coercive strategy of monitoring and sanctions is needed to remedy the problem of insufficient compliance,

[1] For the management approach see Chayes and Chayes (1993). For related constructivist approaches see Franck (1998), Raustiala and Slaughter (2002). For the enforcement approach see Downs and Rocke (1996), Simmons (1998), Downs et al. (1996), Dai (2005). For a recent overview see McLaughlin and Hensel (2007).

[2] For public policy implementation theories see Sabatier and Jenkins –Smith (1999), Mayntz (1997). For applications in the field of the EU see Pappas (1995), Siedentopf and Ziller (1998), and Dimitrakopoulos (2001a).

[3] For sociological institutionalism and its application in studies of Europeanization see Checkel (2001), Risse (2002), Dimitrova and Rhinard (2005), Berglund et al. (2006). For rational choice applications see (Dimitrova and Steunenberg, 2000; Steunenberg, 2006, 2007).

according to enforcement theorists. In contrast, under the managerial view compliance is the normal behavioural reflex of the administrative system as 'efficiency dictates considerable policy continuity'(Chayes and Chayes, 1993, 178). Non-compliance, when it occurs, is a result of misinterpretation of the norms, or insufficient resources to implement them.

Usually, these theories are pitted against each other (Börzel et al., 2007; Bursens, 2002; Haas, 1998; Jonsson and Tallberg, 1998). My argument is that this need not be the case[4]. A theoretical model that carefully integrates both preferences and capability arguments is more realistic, more comprehensive, and, as I hope to illustrate in this paper, more useful for explaining compliance in multi-level systems of governance. Preferences and capacities for change do not operate in isolation. They are intricately and complexly connected. My proposal is to integrate the impact of preferences and capacities with the help of a decision-making model under institutional constraints. The model makes use of the tools of spatial analysis. In the following section I focus on the structure of the model, and on its causal logic and empirical implications while the mathematical formalization is presented in the appendix.

3. Decision-making model under institutional constraints

A fundamental trade-off between the time used for implementation and the amount of policy interpretation and calibration possible to apply to policies[5] is at the core of this theoretical

[4] Attempts to provide an integrative account have been made before (Beach, 2005; Knill and Lenschow, 2005; Tallberg, 2002; Zurn and Joerges, 2005) . The challenge is, however, to develop a theory that intricately and organically links preferences, capacity and power-based arguments instead of simply admitting that all these forces work simultaneously.

[5] Policies can be embodied in the form of directives, as in the EU, or international conventions, like the Kyoto protocol, or federal laws as in federal countries.

model of implementation. The further away actors want to move from a literal interpretation of the policy, the more time it takes to analyze, prepare, adopt and justify the changes.

The actors considered in the model can be national, regional, or local governments depending on the context of the model. In the case of the EU and in the case of international regimes, the relevant actors are the national governments in power. In the case of federal countries, the relevant actors are regional or state governments. In unitary states, the actors can be local, regional or even independent regulatory authorities[6]. The governments are treated as unitary actors. We can compare the policy positions of different governments synchronically and diachronically.

This basic set-up of the model is illustrated in Figure 1. The horizontal axis represents policy space (for example, socio-economic left/right, more or less regulation, the strictness of some environmental standard, etc.). The most preferred position of a government (ideal point) and the policy to be downloaded (the EU directive, for example) can be attributed values on this line. Let $P_j\ (x_1)$ represent the location of the **p**olicy j to be transposed, and $G_i\ (x_0,y_0)$ represent the ideal point of the **g**overnment i. The closer the positions are on the line, the less

[6] The model focuses on the decision calculus of a single actor, instead of taking into account strategic interactions between different actors in the making of implementation decisions. At first this might seem as a limitation of the model. As we shall later see, however, the influence of other actors (at different governance levels) is incorporated into the model through the discussion of enforcement and policy-making capacity. In choosing to posit a more comprehensive utility function of one actor at the expense of modeling directly strategic interactions, the theory also stays closer to the reality of policy implementation in multi-level systems of governance. Especially in the cases of EU law and international agreements, the executive (the governments in power) and their supporting majorities in the legislature are by far the most important actors in taking decisions how and when to implement the policies. Of course, in weighting different options the likely reactions of other actors, like opposition political parties, interest groups or enforcement authorities, are important considerations, and the current model takes that into account.

preference distance between the government position and the policy to be implemented. The vertical axis represents time. Hence, each dot in the plane stands for a particular combination of content and timing of implementation measures. The further the outcome is from a literal interpretation of the policy, the further it is from point P_j. The further the outcome is from the X-axis, the more time will be used for implementation. In effect, the choice of actors is not a binary decision to implement or not, but a choice over a continuum of combinations of points in time at which to implement and the exact policy content. The choice of content and timing of implementation is limited by three features: the discretion set, the policy-making and the administrative constraints.

First of all, only a certain range of interpretations of the policy are possible. Every federal law, or EU directive, or international agreement allows for a specific amount of discretion (leeway). The policy might be left deliberately vague in order to be compatible with a wide range of possible interpretations (Epstein and O'Halloran, 1999). It might specify only goals, or targets, to be achieved but leave the choice of means, or instruments, to the implementation actors. Alternatively, the possibility for different exceptions, derogations, and transitional periods might be explicitly acknowledged in the text of the legal act to be 'downloaded'. Even the use of words like "appropriate", "suitable", "proportionate", etc. in the legal texts open the door for interpretation by the implementation actors.

The discretion is not, however, unlimited. We can denote the discretion set by $x_1 \pm d$. An interpretation that goes too far is not sustainable since it is going to be challenged by the higher governance level. The discretion set contains all possible interpretations of the policy. The range is different for every policy: some are very strict in their provisions, while others allow for a great degree of flexibility (Dimitrova and Steunenberg, 2000; Franchino, 2004; Steunenberg, 2007). The discretion sets need not be symmetric around the literal

interpretation (Steunenberg, 2006). An assumption of symmetric discretion, however, simplifies the presentation of the model.

[Figure 1 here about here]

The second limitation on the choice is represented by the policy-making constraint. Moving away from the literal interpretation of the policy comes at a cost. And the cost is reflected as additional time needed for implementation. There is a trade-off between drawing the original policy closer to your preferred point (within the acceptable limits set by the discretion set) and the time it takes to implement it. This additional amount of time is accumulated because governments need to discover what is possible to change in the policy and how much deviation is admissible; to assess the impact of the amendments on the local situation; to co-ordinate the changes with the different parts of the public administration and the legislature; to perform hearings; to engage in reasoning, to request and assess scientific evidence, etc. The constraint is linear and symmetrical – a move to the right requires as much time as a move to the left. On Figure 1 the policy-making constraint is represented by a line with a certain **s**lope[7] *s*. The capacity for policy making determines the exact slope. Less efficient policy making will be reflected as a steeper line since less policy interpretation will be possible to accomplish for the same amount of time.

The third limitation is the administrative capacity constraint (Dimitrakopoulos, 2001b; for an application of the concept in a different context see Huber and McCarty, 2005). Even if actors (governments) are willing to go with a literal interpretation of a policy they still need to spend time working on implementation. Purely technical, or administrative, phases of the

[7] The parameter *s* is restricted to be strictly positive meaning that the time used for transposition can never decrease with increasing policy shift.

process are still required such as translating and editing the legal text of the policy, identifying the local legislation it is relevant to, drafting the implementation measures and processing them through the rule-making machinery. It is important to note that this type of capacity is different than the policy-making capacity discussed above. The administrative capability refers only to the 'technological' time needed to complete a certain implementation cycle. The policy-making capacity refers to the potential of the political system to steer and co-ordinate policy change and to accommodate policy preferences in a legal text. The administrative constraint is comparable to 'fixed' costs and the policy-making constraints are comparable to the 'variable' costs common in economics. As the implementation of each policy necessarily goes through the administrative part of the process but not all policies go through the policy-making part, the additional time needed for amending the original text comes on top of the time spent for the technical preparation of the implementing measures. On Figure 1 the administrative constraint is represented by a horizontal line of a certain height *a*. The higher the line, the greater the administrative constraint, the lower the administrative capacity, and the more time needed to implement a certain policy.

4. Solving the model

In this part of the paper, the theoretical model described above will be analyzed in order to derive an explicit solution to the optimization problem faced by the actors in the model. All possible outcomes (combination of timing and content of implementation measures) that an actor can attain are contained in the region defined by the three constraints. The set of sustainable outcomes is represented by the shaded area. Which outcome from all the possible combinations of timing and content will be selected?

Before I present the solution to the model it is necessary to formalize the discussion in order to shed light on the underlying assumptions. Actors are assumed to have two-

dimensional weighted Euclidean preferences over policy and time. The preferences satisfy the usual requirements of transitivity and completeness[8]. The preferences are symmetric, separable and the two dimensions may have different weight (salience)[9], determined by the parameter *w*. The utility function *u* (*x,y)* is:

$$u(x,y) = -\sqrt{(x - x_0)^2 + w(y - y_0)^2}$$

That is, utility strictly decreases with time and policy distance. Hence, the utility function is maximized by minimizing the distance:

$$\sqrt{(x - x_0)^2 + w(y - y_0)^2}$$

between the ideal point $G_i(x_0, y_0)$ and the outcome $O_{ij}(x, y)$, subject to the constraints:

$$(1) y = a + s|x_1\text{-}x|$$

[8] Completeness means that the actor either prefers A to B, or prefers B to A, or is indifferent between them (Shepsle and Bonchek, 1997) (the actors can compare and evaluate the utility of each of the possible alternatives). Transitivity means that if actors prefer A to B and B to C they also prefer A to C (Shepsle and Bonchek, 1997).

[9] Symmetric preferences imply that a move in one direction from the ideal point decreases utility by the same amount as the same move in the opposite direction((Hinnich and Munger, 1997). 'Separable preferences' mean that the actors' preferences on the x-dimension do not depend on the level of the values of y-dimension (Hinnich and Munger, 1997). Equal weight of the dimensions implies that actors value the same amount of change on the different dimensions (Hinnich and Munger, 1997) , while different weight (salience) implies that actors value differently the two dimensions. For the utility function described above, if *w* is greater than 1 the *y* dimension is more important than the *x* dimension. Correspondingly, if *w* is less than 1 the *x* dimension is more salient.

$$(2) \qquad (x_1 - d) \leq x \leq (x_1 + d)$$

where x_1 is the location of the policy P_j. Equation (1) represents the policy-making and the administrative constraints and equation (2) represents the discretion set. In addition, d, s, and a are strictly positive. From this moment onwards and without loss of generality I will consider only the case when the government's ideal point is to the left of the policy to be downloaded. Let's also set x_0 and y_0 equal to zero (again without any loss of generality) in order to ease the exposition.

How do we solve the model? Mathematically, we are faced with a constrained optimization problem which can be solved using the Lagrange multiplier method[10]. Applying the appropriate technique we can find that the two variables of interests x and y (the coordinates of the outcome) can be expressed as:

$$x = \frac{s\,(a + sx_1)}{s^2 + 1}$$

and

$$y = \frac{a + sx_1}{s^2 + 1}$$

For the moment, w is set to one (both dimensions have the same salience). The formulas present the policy position and the time used for implementation (compliance) as a function of the distance of the policy x_1 from the ideal point x_0 and the two parameters a and s which

[10] Constrained optimization is an analytical method that is widely applied in operations research but, despite that its use can be traced back to Herbert Simon, it is less familiar to international relations, public administration and political science scholars. For an early application see (Shepsle, 1975).

define the administrative and policy-making constraints[11]. The proofs for the solution are found in the appendix. Expressing the outcome as a function of preference distance and the constraint parameters allows us to examine how a change of the parameters affects the outcome in terms of time and policy position (comparative statics) and to derive explicit hypotheses from the model.

5. Comparative statics analysis

The impact of preferences

Preferences and the preference distance between the governments' ideal points and the policy to be downloaded play important role for the level and timing of compliance. In general, and all other factors being equal, decreasing preference distance leads to less time used for implementation and results in less policy shift from the original text of policy. This result can be easily demonstrated[12] in Figure 2 if we move point $\boldsymbol{G_1}$ to the right to $\boldsymbol{G_2}$ (so that the ideal point of Actor 2 $\boldsymbol{G_2}$ is closer to the policy to be implemented P_j. The outcomes change correspondingly from O_{1j} to O_{2j}, with Actor 1 using more time for more interpretation (policy shift). Hence, the first two hypotheses state:

H1a: The greater the substantive preference distance, the more time used for implementation.

[11] Strictly speaking, these results are only valid for values of $x_1 \geq sa$ and $x_1 \leq s(a+sd) + d$, because of the discretion set constraints. See the discussion below and the appendix.

[12] Formally, the impact of policy distance is examined through taking the first derivate of x and y with respect to x_1 (giving s^2 and s respectively). Since the first derivatives are positive, we can conclude that the effects of policy distance on transposition time and policy shift are positive and linear (they do not depend on the level of change in x_1).

H1b: The greater the substantive preference distance, the greater the policy shift.

[Figure 2 about here]

These general hypotheses have to be qualified, however. First of all, for governments sufficiently distant from the policy to be downloaded, any further increase in preference distance has no effect on the time used: these governments would have taken all the time they need to explore to the fullest the interpretation possibilities offered by the policies anyways.

The relationship between preference distance and outcomes can be traced on Figures 3 and 4 which examine how a change in the substantive policy distance changes the outcome in terms of speed and policy shift. At first, as long as the government's ideal point is sufficiently close to the policy P_j, the outcome is simply the literal interpretation P_j . The size of this region depends on the height of the administrative constraint and on the slope of the policy-making constraint. Next, increasing the policy distance moves the outcome closer and closer to the ideal point until it reaches the limit of the discretion set $P_j - d$. At this point the policy distance is defined by $s(a+sd)+d$. The outcome remains $P_j - d$ even if we continue to increase the policy distance.

[Figures 3 and 4 about here]

Figure 4 focuses on the influence of policy distance on the time used for implementation. Again, for very small policy divergence the outcome is simply a (the least amount of time possible to complete the implementation/compliance as defined by the administrative constraint). Once the policy divergence grows greater than sa, the time used increases linearly

with increasing policy distance. Lastly, when we reach the discretion limit and we have exhausted all the potential to move the policy closer to our ideal point, increasing further the policy distance does not have an additional effect on the time used for implementation which remains $a + sd$. This discussion and Figures 3 and 4 show that time and policy shift increase only weakly with policy distance. In other words, increasing divergence between the ideal point of the implementation actor and the text of the policy to be downloaded does not *necessarily* lead to longer implementation delays and greater policy drift. So far, I analyzed the impact of policy distance and derived a hypothesis about its impact on time and policy shift (policy interpretation). Next, I will turn to the effect of changing the administrative constraint.

Administrative constraint

How does increasing administrative capacity influence the timing and content of implementation according to our theoretical model? Graphically, this would correspond to a drop of the horizontal constraint line[13].

More points in the plane (combinations of content and timing) will become attainable to the governments. The implementing actors will be able to achieve more (in policy change) in less time. Looking at Figure 5, the outcome has been moved from $O_{1,j}$ to $O_{2,j}$. Interestingly, the decrease in time used is not as large as the increase in capacity since some the time has been used to draw the policy closer to the ideal point of the government.

H2a: The greater the administrative capacity, the less time used for implementation.

H2b: The greater the administrative capacity, the greater the policy shift.

[13] Formally, the derivatives of x and y with respect to a are s and 1 respectively. As they are both positive, we can conclude that the effect of a on x and y is linear and positive in both cases.

[Figure 5 about here]

These hypotheses capture the partial effect of releasing/tightening the administrative constraint. The effects are rather straightforward to describe. Next, I turn to an exploration of the impact of changing the policy-making constraint which proves to be much more complex.

Policy-making constraint

How does the policy-making capacity influence the speed and content of implementation according to our theoretical model? Figure 6 illustrates the effect of a decrease in the policy-making capacity. The slope of the constraint line is changing, reflecting the fact that less policy interpretation is possible for the same amount of time. Indeed, comparing outcome O_{1j} with the new outcome O_{2j}, we notice that the adopted implementation measure in the second case has been pushed further from the ideal point of the government. The time used for implementation has also increased, however. But this example and its graphical representation in Figure 6 do not represent the whole picture about the link between changing the policy-making capacity and the resulting changes in implementation time and policy shift. In order to analyze more systematically the impact we have to go back to the algebraical representation of the problem. Taking the partial derivatives of x and y with respect to s produces the following expressions[14]:

$$\frac{\Delta y}{\Delta s} = \frac{2s(a + sx_1) - (s^2 + 1)x_1}{(s^2 + 1)^2} = \frac{x_1 s^2 + 2as - x_1}{(s^2 + 1)^2}$$

[14] See the appendix for proofs and derivations.

and,

$$\frac{\Delta x}{\Delta s} = \frac{2s(sa + s^2x_1) - (s^2 + 1)(a + 2sx_1)}{(s^2 + 1)^2} = \frac{as^2 - 2x_1s - a}{(s^2 + 1)^2}$$

[Figure 6 about here]

The relationship between the parameter *s* (which controls the slope of the policy-making constraint) and time and policy shift is complex. The best way to explore the relationship is to plot the effect of changing *s* on *x* and *y*. The slope parameter is allowed to vary from 0.1 to 4.0 on Figure 7. On the y-axis the corresponding change in *y* (implementation time) is represented. The different lines represent different combinations of values of *a* and x_1 (the administrative constraint and the policy distance).

We can see that in the beginning *y* (the time used for implementation) increases until a local maximum is reached (see the appendix for the precise location of the maximum). After this critical point, time decreases with higher values of the slope parameter. The most important feature of the graph is the shape of the function. The differences in the height of the local maximum and the value of *s* at which it occurs are due to the different combinations of parameters.

[Figures 7 and 8 about here]

The next Figure 8 present the effect of the policy-making constraint on the policy shift (the amount of interpretation used). The slope parameter varies from 0.1 to 10 and the corresponding change of the policy shift is represented on the y-axis for different combinations of *a* and x_1. The functions again grow until they reach a local maximum (for the

precise locations see the appendix) and then decrease. Hence, in the beginning the policy shift increases while later it decreases with increasing policy-making constraint.

H3a: Decreasing policy-making capacity at first increases the time used for implementation but for sufficiently low values of policy-making capacity, decreasing further the capacity decreases the implementation time.

H3b: Decreasing policy-making capacity at first increases policy shift but for sufficiently low values of policy-making capacity, decreasing further the capacity decreases slightly the policy shift.

If the administrative constraint is severe, or the preference distance is negligible, the effect of changing the policy-making constraint will be less pronounced or non-existent at all. Simply, some governments can hardly manage with the administrative phase of implementation on time, so they are not sensitive to the policy-making constraint.

Preference salience

The discussion so far assumed that the two dimensions on which preferences and utility functions are defined have equal weight (salience). That is, we assumed that actors care as much about time as about policy content. This assumption is rather restrictive. For different governments, and for the same governments in regard to different policies, time might not be an issue of the same importance as policy distance. In some cases, EU or international norms are simply not worth the trouble to spend much time on. In other cases, the potential benefits from interpreting the supranational (or, international, or supra-regional) policy are not significant enough to justify the additional time needed, and the opportunity costs. Yet in

other situations implementation delays are justified if a government can pull the policy closer to its preferences. In the context of EU decision-making and implementation the timing of adaptation might receive a higher intrinsic value in itself: candidates and member states might derive utility from implementing EU legislation within the deadlines, and this utility might outweigh the potential (substantive policy) gains from interpreting and calibrating the text of the directive.

The utility function defined in this chapter can accommodate different salience of the two dimensions. By varying the parameter *w* (short for 'weight)' we can manipulate the relative importance of the time dimension vis-à-vis the policy dimension. For values of *w* less than 1 the time dimensions has lower salience and as a result actors will be less sensitive to changes in the timing of implementation measures then to the substantive policy content. In the limit, time does not matter at all: all the actors care about is substance. On the other hand of *w* is greater than 1, the time dimension weights more heavily in the utility calculation: in the limit, actors case only about the timing of implementation and not about the content.

$$u(\mathrm{x},\mathrm{y}) = -\sqrt{(\mathrm{x}-\mathrm{x}_0)^2 + w(\mathrm{y}-\mathrm{y}_0)^2}$$

Re-calculating for y and x we get:

$$y = \frac{a + sx_1}{w(s^2+1)}.$$

and

$$x = \frac{s\,(a + sx_1)}{s^2+1} * \sqrt{1 + w - \frac{1}{w^2}}.$$

The first derivative of *y* with respect to *w* is negative (see the appendix) which implies that the function is decreasing. Hence, for higher values of *w* (higher salience of the time

dimension), the values of y (time) decrease. Substantively this makes sense since the more you care about the timing, the faster you are going to complete the implementation. Turning to the effect on policy shift, the derivative of x with respect to w is positive. Hence, the function is increasing. The more salient the time dimension, the more policy distance between the ideal point of the government and the outcome, all other factors being equal. Figure 9 illustrates the effects. In the first case, Actor 1 attaches equal weight to both the time and the policy dimension. The resulting outcome is 0_{1j}. Actor 2 has the same ideal point. The administrative and policy-making constraints remain fixed. However, for Actor 2 the salience of the substantive policy dimension is greater ($w<1$). The dotted lines represent the indifference curves in both cases. For Actor 1 the indifference curve is a circle, while for Actor 2 the indifferent curve is an ellipse. As a result, the outcome shifts to 0_{2j} with more time used for implementation and less distance between the ideal point and the outcome on the x-dimension. The above discussion leads to the following hypotheses:

H4a: The greater the salience of the substantive policy dimension, the more time used for implementation.

H4b: The greater the salience of the substantive policy dimension, the greater the policy shift.

[Figure 9 about here]

The impact of discretion

Does manipulating the amount of discretion influence the speed of implementation and the policy shift? The analysis of the model shows that discretion has an impact only for a very specific configuration of factors. Looking at Figure 10 we can easily visualize the nature of

the influence and the position of actors for which changing the width of the discretion set matters. In the example shown in the figure, the initial discretion limit is moved to the left, thus enlarging the discretion set and making new interpretations of the policy sustainable. As a result, although the ideal point of the government remains the same, the outcome is transferred from $O_{1,j}$ to $O_{2,j}$. The new outcome implies more time used for implementation, and more policy shift as the actor has been allowed to bring the policy even closer to its preferences. Had the actor been sufficiently close to the location of the policy to be downloaded[15], however, the additional increase in the width of the discretion set would have made no difference at all. Thus, we can conclude that increasing discretion only weakly increases implementation time and policy shift.

H5a: The greater the discretion set, the more time used for implementation.

H5b: The greater the discretion set, the greater the policy shift.

[Figure 10 about here]

6. Conclusion

Concluding the paper, it is worth emphasizing what is new about the theoretical model presented in the previous sections. First, the model combines spatial representation of preferences with a constrained optimization framework in order to account for the decision-making process of actors having to implement policies agreed at a higher governance level. Defining the problem as one of constrained optimization, the paper was able to explore in a transparent and rigorous manner the empirical implications of the theoretical argument.

[15] More precisely if the distance between the policy and the actor's ideal point is less than $a+sd$ where d is the the initial amount of discretion allowed.

Second, I posit two-dimensional preferences for the actors: scholars have focused only on the policy dimension so far and have excluded from consideration the additional independent utility derived from the timing of implementation measures. Introducing two-dimensional preferences with varying salience allows for a more realistic model closer to the complexity of real-life decision-making. It also makes explicit the trade-off between time and substantial policy shift.

Third, the model introduces a distinction between administrative and policy-making capacities. This distinction has been so far ignored in the literatures on implementation and compliance. But as hypotheses 2 and 3 demonstrate the effects of these two constraints on implementation time and policy shift differ in important ways.

Although it is not the purpose of this paper to test empirically the model, it is worth discussing how it fits with existing empirical knowledge about implementation and compliance in multi-level systems of governance. In fact, even a short overview can demonstrate that the model can accommodate much of the findings of the empirical studies while providing a novel insight into some the remaining puzzles. Research on compliance with EU law has found ample evidence for a positive impact of administrative capacity on compliance (Berglund et al., 2006; Börzel et al., 2007; Haverland and Romeijn, 2007; Linos, 2007; Perkins and Neumayer, 2007). In line with the current model, higher administrative capacity is related with less delay in the implementation of EU directives, and with less infringement procedures against the member states.

The effect of preference distance is more difficult to establish, according to empirical research. When more direct measures of preferences are available, smaller preference distance appears to decrease implementation delays (Perkins and Neumayer, 2007; Thomson et al., 2007; Toshkov, 2008). On the other hand, indirect measure of preferences, like societal EU attitudes are never found to be related to the level of compliance in the ‘old’ member states

from Western Europe (Börzel et al., 2007; Kaeding, 2006; König and Luetgert, 2009; Lampinen and Uusikyla, 1998). Nevertheless, for the ten new member states that joined in 2004 societal and party support for European integration *are* related with better application of EU law during the time of enlargement (Toshkov, 2008). By treating separately substantive and time related preferences and their salience, the current model can accommodate these contradictory findings in a more general argument that during times of accession negotiations, the importance (salience) of the formal requirement for timely adaptation to EU law overrides the substantive policy disagreements governments might have with the European rules.

Empirical research reports contradictory findings about the impact of policy-making capacity and related variables[16]. The theoretical model presented in this paper resolves the puzzle by highlighting that in some situations higher policy-making capacity can indeed be expected to slow down compliance while in others in can speed up the implementation of the rules.

A further contribution of the model is to provide a theoretical expectation about the effect of discretion on compliance. So far in the literature contradictory views have been expressed. Some scholars argue that more discretion should lead to fewer troubles with implementation since the lower level actors' preferences can be better reflected in the policy to be downloaded (Thomson, 2007). Others expect that higher levels of discretion should be related to longer

[16] Looking into the veto players concept, the link between constraints on the decision-making and compliance appears even quite precarious. Toshkov (2007) finds no effect of the number of veto players using data on EU-15 for the period 1998-2005. Similarly, Jensen (2007) and Mbaye (2001) conclude that there is no effect. On the other hand Giulliani (2003) finds a negative relationship between the number of veto players and national adaptation to EU law. Kaeding (2006) finds no effect of veto players using an index of political structures but a negative effect using a measurement of veto points. Perkins and Neumayer (2007) find a negative relationship employing (an index of) political constraints. Börzel et al. (2007) find no effect.

delays. This paper provides a rationale for an impact of discretion, and argues that the amount of leeway is negatively related to implementation time and positively related to policy shift *but only* for certain configurations of the additional explanatory factors.

Throughout the paper I have argued that the theoretical model outlined here can be applied for the analysis of policy implementation in any multi-level system of governance. The problems of policy implementation in the EU or in federal states, and of compliance with international agreements are intrinsically related. The structure of the problems is essentially the same, and transgresses the disciplinary boundaries of International Relations, Comparative Politics and Public Administration. Compliance of international agreements is, of course, different from transposition of EU directives and implementation of federal laws. The main difference lies, however, in the possibility and mechanisms for enforcement. By incorporating enforcement in the theory, the paper has enables a systematic comparisons of implementation in different systems of multi-level governance.

Appendix A

Deriving the solution of the constrained optimization problem

The objective is to minimize:

$$f(x,y) = \sqrt{(x - x_0)^2 + (y - y_0)^2},$$

given the constraint:

$$y = (a + sx_1) - sx.$$

Define the function:

$$g(x,y) = y - (a + sx_1) + sx.$$

Let

$$\Lambda(x,y,\lambda) = f(x,y) + \lambda g(x,y) = \sqrt{(x - x_0)^2 + (y - y_0)^2} + \lambda(y - (a + sx_1) + sx).$$

The critical values of Λ occur when its gradient is zero. The partial derivatives are:

$$\frac{\partial \Lambda}{\partial x} = \frac{x}{\sqrt{x^2 + y^2}} + \lambda s = 0,$$

$$\frac{\partial \Lambda}{\partial y} = \frac{y}{\sqrt{x^2 + y^2}} + \lambda = 0,$$

$$\frac{\partial \Lambda}{\partial \lambda} = y - (a + sx_1) + sx = 0.$$

The first equation implies that:

$$\lambda = -\frac{x}{s\sqrt{x^2 + y^2}}.$$

Substituting this in the second equation implies:

$$\frac{y}{\sqrt{x^2 + y^2}} - \frac{x}{s\sqrt{x^2 + y^2}} = 0,$$

which simplifies to:

$$ys = x.$$

Substituting in the third equation:

$$y - (a + sx_1) + ys^2 = 0.$$

Solving for y:

$$y = \frac{a + sx_1}{s^2 + 1},$$

and then:

$$x = \frac{s(a + sx_1)}{s^2 + 1}.$$

Since the policy-making constraint changes direction at x_1, if

$$x \leq sa,$$

then

$$y = a$$

The second constraint demands that

$$(x_1 - d) \leq x \leq x_1$$

The value of y at $(x_1 - d)$ is $(a + sd)$. Substituting, we get:

$$x_1 > \frac{(a + sd)(s^2 + 1) - a}{s},$$

which simplifies to:

$$x_1 > s(a + sd) + d.$$

Thus, for values of x_1 greater than

$$x_1 > s(a + sd) + d,$$

the solution for x is

$$x = x_1 - d.$$

Proof of Hypotheses 3a and 3b

Taking the derivative of y with respect to s:

$$\frac{\Delta y}{\Delta s} = \frac{2s(a + \mathrm{sx}_1) - (\mathrm{s}^2 + 1)\mathrm{x}_1}{(\mathrm{s}^2 + 1)^2} = \frac{\mathrm{x}_1\mathrm{s}^2 + 2\mathrm{as} - \mathrm{x}_1}{(\mathrm{s}^2 + 1)^2}.$$

Taking the derivative of x with respect to s:

$$\frac{\Delta x}{\Delta s} = \frac{2s(sa + \mathrm{s}^2\mathrm{x}_1) - (\mathrm{s}^2 + 1)(\mathrm{a} + 2\mathrm{sx}_1)}{(\mathrm{s}^2 + 1)^2} = \frac{\mathrm{as}^2 - 2\mathrm{x}_1\mathrm{s} - \mathrm{a}}{(\mathrm{s}^2 + 1)^2}.$$

In order to find the local maximum we set the first derivative of y with respect to s to 0:

$$\frac{\mathrm{x}_1\mathrm{s}^2 + 2\mathrm{as} - \mathrm{x}_1}{(\mathrm{s}^2 + 1)^2} = 0.$$

Then:

$$s = \frac{-2a \pm \sqrt{(2a)^2 + 4\mathrm{x}_1{}^2}}{2\mathrm{x}_1} = \frac{-a \pm \sqrt{a^2 + \mathrm{x}_1{}^2}}{\mathrm{x}_1}.$$

Since we are interested only in the cases in which $s > 0$, the only solution is:

$$s = \frac{-a + \sqrt{a^2 + \mathrm{x}_1{}^2}}{\mathrm{x}_1}$$

At this value of *s, y* has a local maximum.

Similarly for x, we set the first derivative of x with respect to s to 0:

$$\frac{\mathrm{as}^2 - 2\mathrm{x}_1\mathrm{s} - \mathrm{a}}{(\mathrm{s}^2 + 1)^2} = 0.$$

Then:

$$s = \frac{2\mathrm{x}_1 \pm \sqrt{(-2\mathrm{x}_1)^2 + 4\mathrm{a}^2}}{2\mathrm{a}} = \frac{\mathrm{x}_1 \pm \sqrt{\mathrm{x}_1{}^2 + \mathrm{a}^2}}{\mathrm{a}}.$$

Again, since we are interested only in the cases $s > 0$, the only solution is:

$$s = \frac{x_1 + \sqrt{{x_1}^2 + a^2}}{a}.$$

At this value of *s, x* has a local maximum.

Proof of Hypotheses 4a and 4b

Lets redefine the utility function:

$$u(x,y) = -\sqrt{(x - x_0)^2 + w(y - y_0)^2},$$

and the function to be minimized:

$$f(x,y) = \sqrt{(x - x_0)^2 + w(y - y_0)^2}.$$

It follows that:

$$y = \frac{a + sx_1}{w(s^2 + 1)}.$$

Solving for x:

$$x = \frac{s\,(a + sx_1)}{s^2 + 1} * \sqrt{1 + w - \frac{1}{w^2}}.$$

The first derivative of y with respect to w is:

$$\frac{\Delta y}{\Delta w} = -\frac{(s^2 + 1)sx + as^2 + a}{w^2},$$

which is negative, hence the function is decreasing.

The first derivative of x with respect to w is:

$$\frac{\Delta x}{\Delta w} = \frac{(w^3 + 2)|w| \quad \frac{s\,(a + sx_1)}{s^2 + 1}}{2w^3\sqrt{(w^3 + w^2 - 1)}},$$

which is positive, hence the function is increasing.

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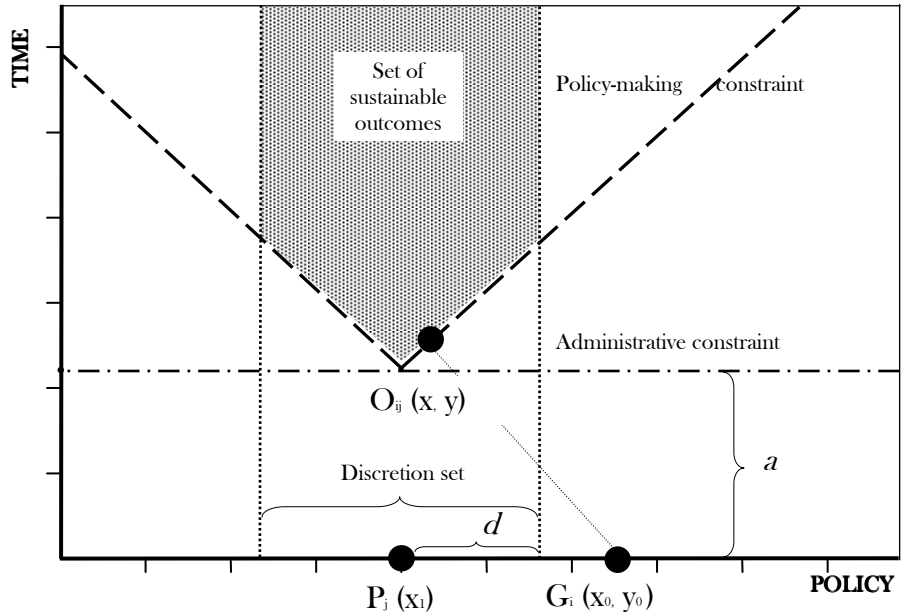

Figure 1 Decision-making under constraints and the set of sustainable proposals

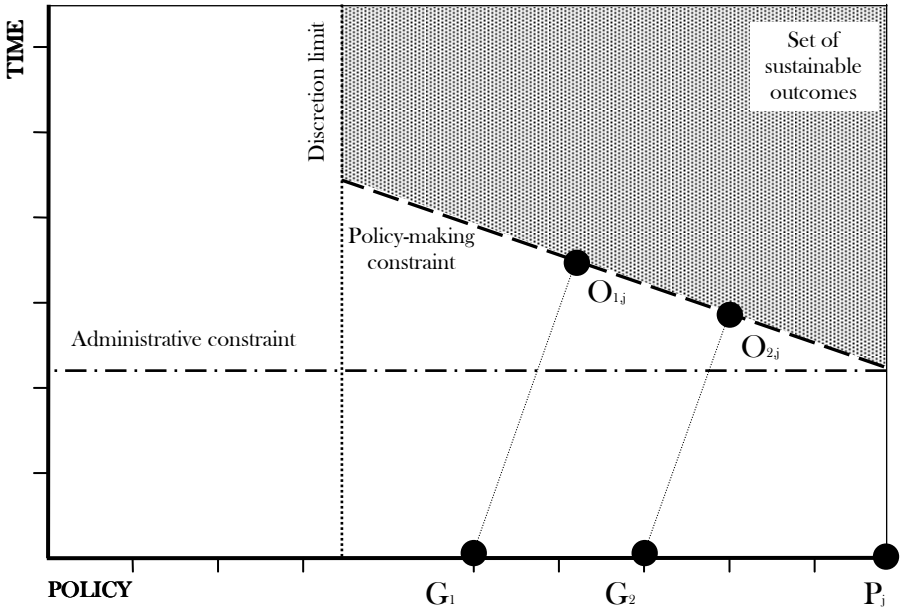

Figure 2 The impact of changing preferences

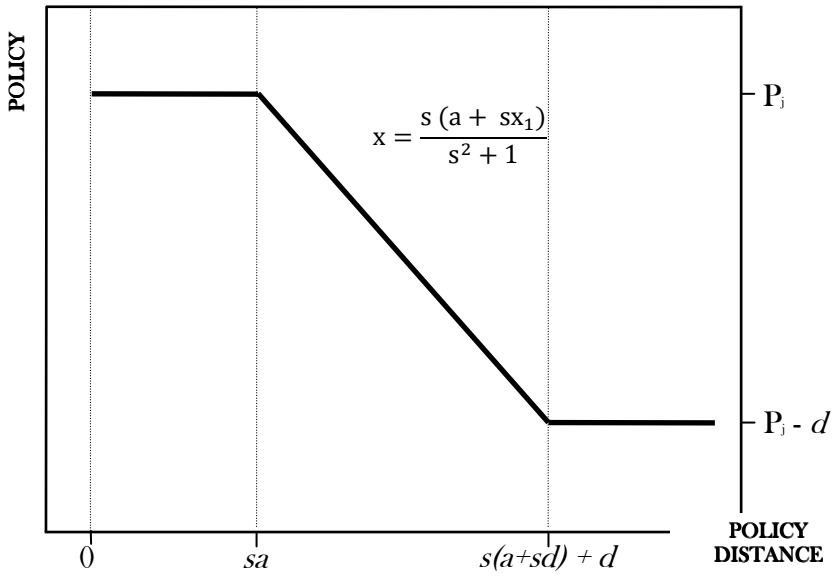

Figure 3 Policy distance and the corresponding policy outcome

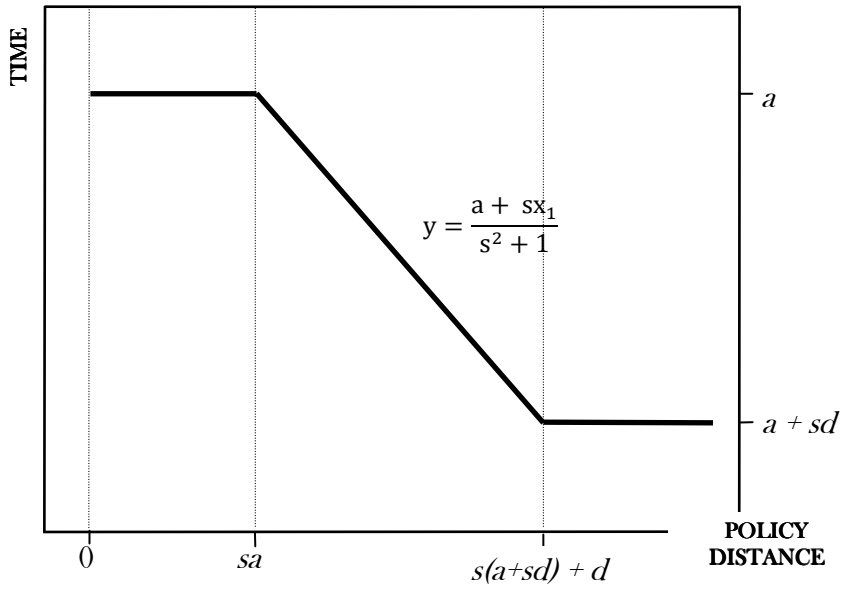

Figure 4 Policy distance and the corresponding time outcome

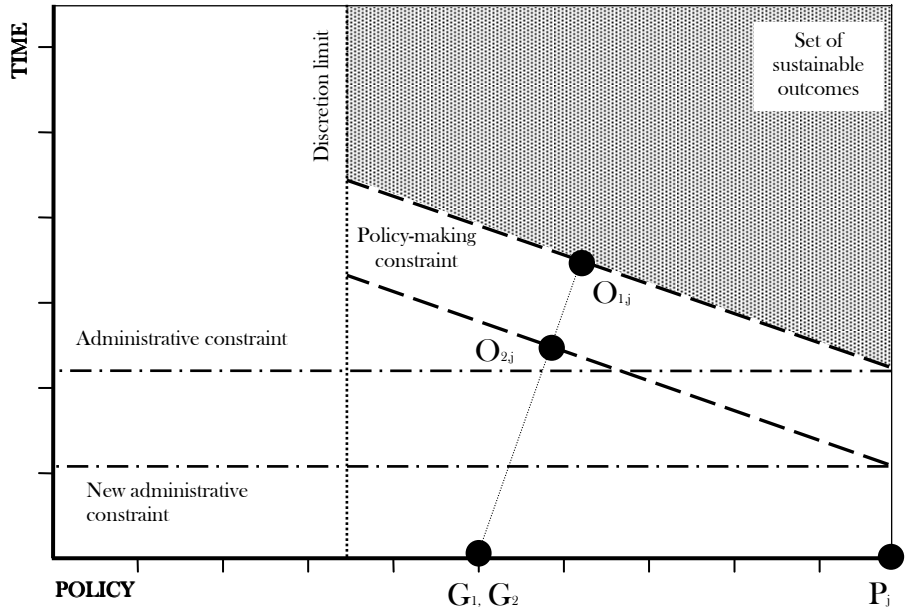

Figure 5 Impact of changing the administrative capacity

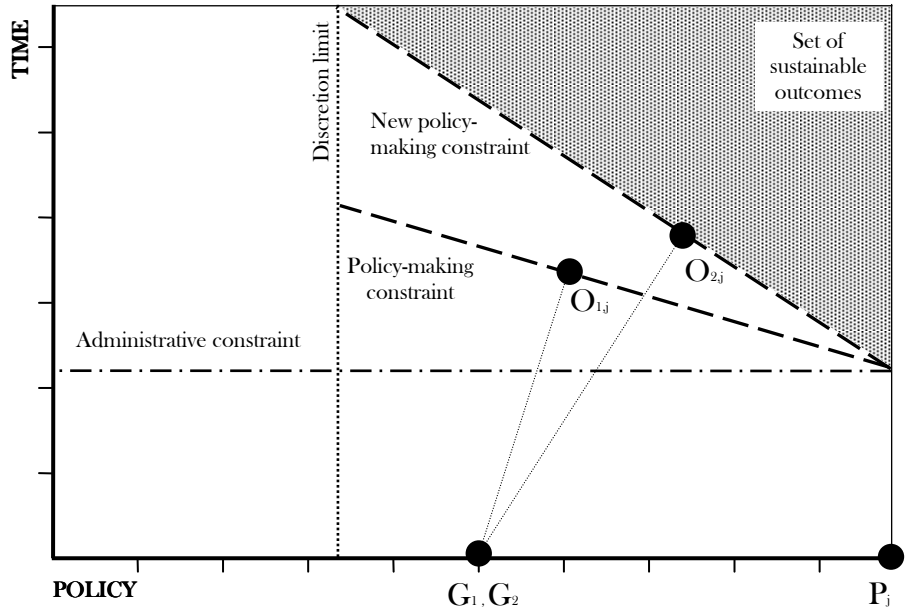

Figure 6 Impact of changing the policy-making capacity

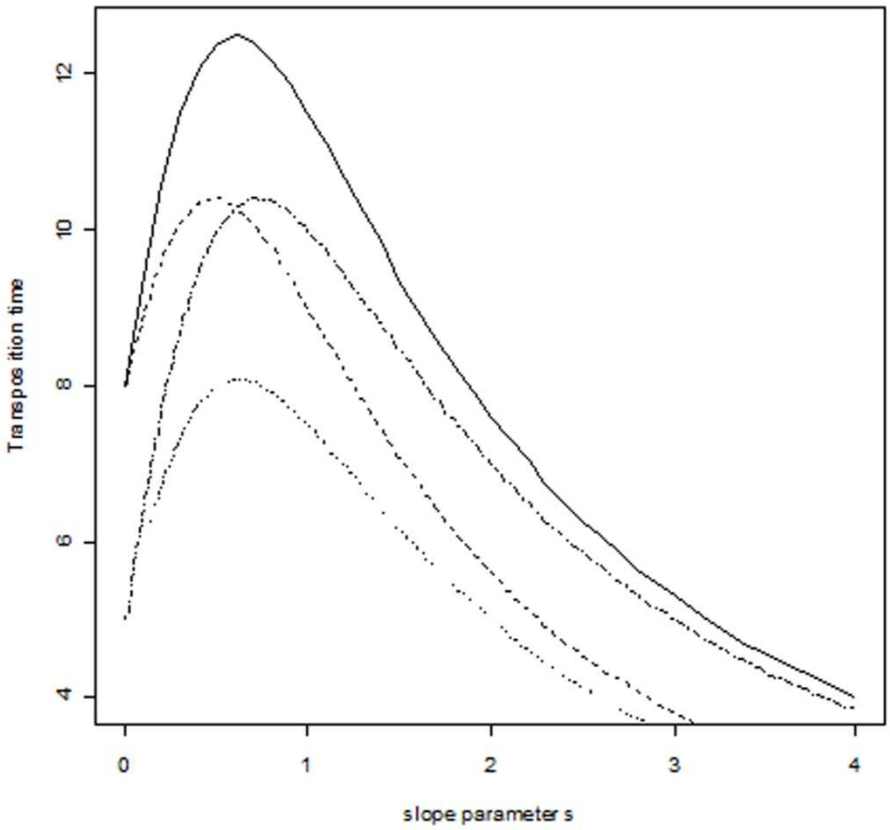

Figure 7 Policy-making capacity and transposition time

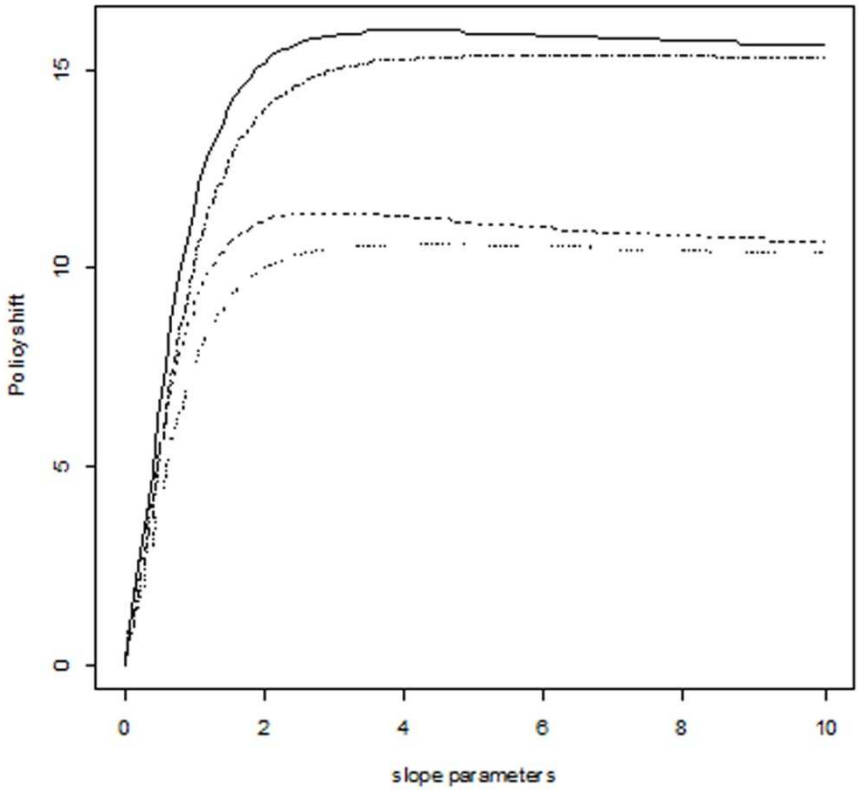

Figure 8 Policy-making capacity and policy shift

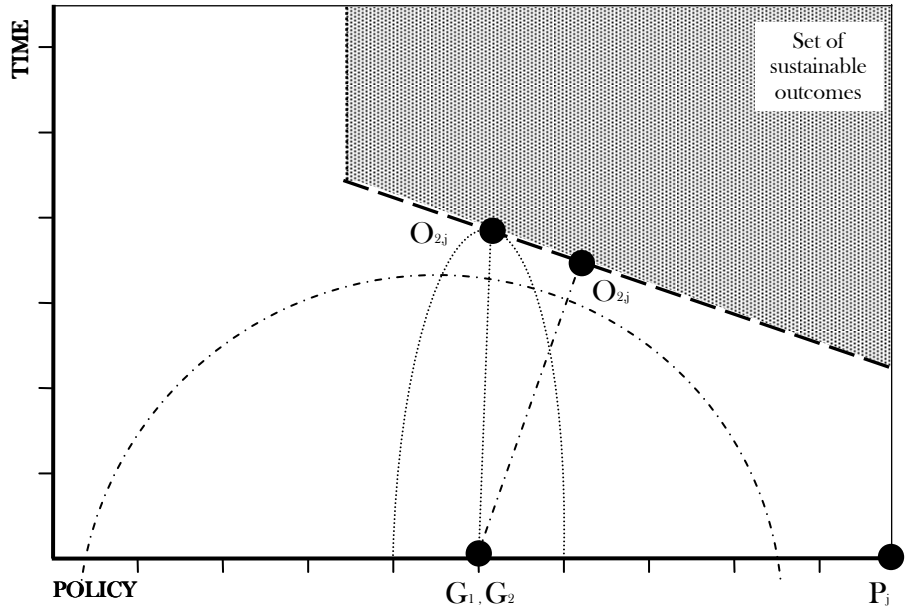

Figure 9 Changing the salience: an illustration

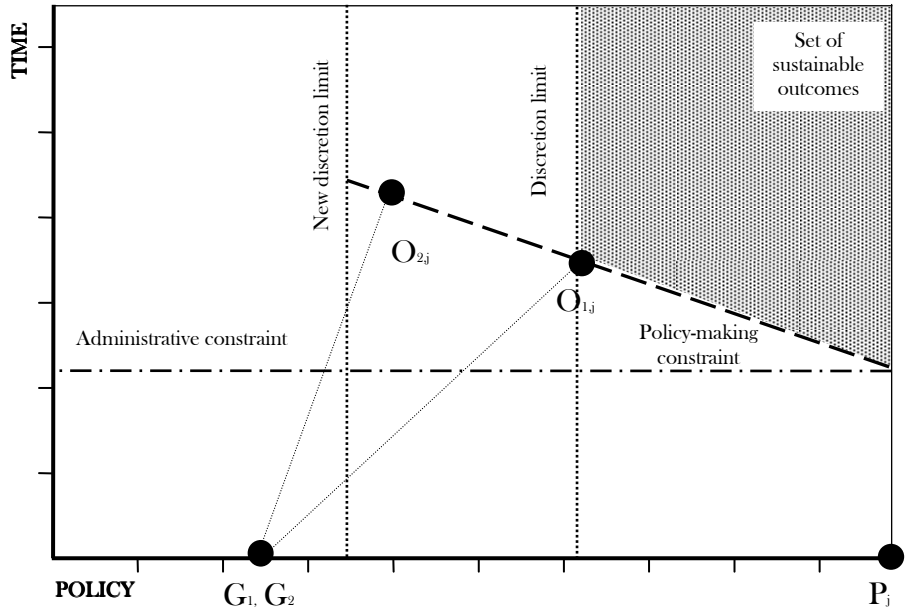

Figure 10 Impact of change in the discretion set