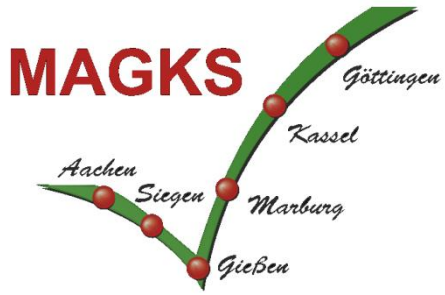

Joint Discussion Paper Series in Economics

by the Universities of

Aachen · Gießen · Göttingen
Kassel · Marburg · Siegen

ISSN 1867-3678

No. 18-2022

Carsten Hefeker

Policy Competition, Imitation and Coordination Under Uncertainty

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Carsten Hefeker*

revised, April 2022

Abstract

The paper analyzes under what circumstances policymakers experiment with policies with uncertain outcomes, when they prefer to imitate policies initiated in other countries, and when they prefer to coordinate policies internationally. Policymakers have private costs of active policies and compete internationally in a yardstick competition which gives rise to a potential distortion between what citizens want and what policymakers do. I find that policymakers' policies as well as regime choice deviate from what citizens want but that an increase in uncertainty about policy outcomes decreases this distortion.

Keywords: Uncertainty, policy competition and coordination, yardstick competition.

JEL Codes: D 78, F 42, F 59.

*Department of Economics, University of Siegen, 57068 Siegen, Germany; and CESifo, München, Germany; carsten.hefeker@uni-siegen.de

1 Introduction

Whether international economic cooperation of countries is a good thing or a bad is highly contested (Barrett 2007, Feldstein 1988). Apart from being able to realize economies of scale, the main argument for cooperation is that it allows to take spillovers and externalities into account. But cooperation can also be seen as collusion to avoid competition among countries (Keen and Konrad 2013). Restricting competition may lead to lower quality of policies at higher costs and especially under uncertainty competition can serve as a discovery procedure to identify better policies (Vaubel 2008). What is often overlooked by this argument is that policymakers not only have an incentive to collude and thus avoid competition. As long as policies are costly and uncertain, they also have an incentive to let others go ahead with policy changes and free-ride on their policy efforts (Mukand and Rodrik 2005). If all countries decide to wait, however, no policy measures at all will be taken. In that sense, cooperation and coordinated active policy can also avoid that there is too little policy experimentation. Therefore, uncertainty is not only a factor that supports policy competition, it might also be a factor in support of policy coordination. In addition, coordination may lower the costs of policy experimentation as costs could be shared among participants because of economies of scale or risk sharing arrangements (Hefeker and Neugart 2018).

Consider, for instance, fiscal, monetary, labor market or regulation policies. In times of high economic uncertainty or crisis, the exact impact of changes of taxation or quantitative easing on the national economy may not always be clear. Likewise, an increase in the minimum wage may have positive or negative negative effects on employment, and introducing new financial regulation may have an unforeseen impact on the stability of the financial system. Moreover, countries often compete for investment or increasing their exports with other countries so that implementing the right policy may also increase their competitive edge, and policymakers will be held responsible by their populations for how they master the economic, environmental or health crisis. Thus, policymakers have to decide about policies which are uncertain in their impact, facing at the same time economic and political competition from other policymakers.

In this situation, different strategies are available to policymakers. They can compete, hoping to perform better than policymakers in other jurisdictions. Not only would the economy benefit but they would also personally benefit by showing that they are more competent than others. This incentive may actually imply that too much policy experimentation takes place and that policymakers take excessive risk from the point of view of citizens. The alternative is to wait and observe policy outcomes abroad. Simply copying saves experimentation costs and also personal efforts. Of course, if all policymakers pursue this strategy, no one does anything and the voters in both countries are worse off as necessary policies are not undertaken. Lastly, policymakers could instead cooperate and coordinate their policies. But imitation and cooperation also carry the risk that policies may not be fully adequate for the national economic structure and thus fail to set the "right" policies (Berkowitz, Pistor, and Richard 2003).

I develop a model that brings these different aspects together to understand better the trade-offs involved and whether, and under what circumstances, policymakers' decisions are politically distorted in the sense that they do not match the preferred choice of their citizens. I consider two countries which are economically integrated and where national policies generate spillovers. Because national policies have uncertain outcomes, both have an incentive to wait and learn from observing how effective policies are abroad. Imitating policies reduces uncertainty and the costs of experimentation and implementation. To this setup, I introduce two types of political distortions to

see how policymakers' decision to compete, imitate or cooperate reflect preferred policies of their populations. Policymakers have individual costs of policy setting if they decide not to imitate but set their own policies. In addition they have to bear a political cost if they perform worse in terms of meeting national policy needs than the policymaker abroad which reflects yardstick competition. Thus, they may do too little because of personal risk and costs or they may do too much because they wish to impress voters with being more active than others. Moreover, they may cooperate when their nationals would actually prefer competition, or vice versa. I show that in certain cases there is too little experimentation and that cooperation can indeed be seen as collusion, but it is also possible that there is too much experimentation if yardstick competition becomes more important. In general, I find that cooperation is preferred over competition if policy needs or targets are relatively close together but that policymakers at the same time would prefer to imitate the policy of others rather than setting active policy themselves in such a situation. Cooperation can thus also be seen as a commitment mechanism to overcome the incentive to do nothing. Not surprisingly, the model suggests that policymaker will tend to become more active as policy needs start to diverge but at the time cooperation becomes more difficult.

A possible application of the model can be the situation where countries have reform needs, such as in the transition from socialism to market or in response to an economic crisis. Given structural or preference differences between countries, however, the "right" policy or policy targets may differ between countries. Alternatively, federal states and regions in a country may have authority to experiment with education, tax or regulations policies. They can decide to use their right to experiment with policies but they may also decide to copy others or coordinate policies with them. Another application would be the European Union where countries could set their monetary policies independently, copy that of other countries (such as pegging to the German mark before monetary union), or decide to form a monetary union. In that perspective, my model helps explaining why certain policies are more coordinated than others in the European Union.

The next section connects the analysis to earlier literature, section 3 develops the basic model, and sections 4 and 5 look at the decision to imitate or cooperate and how policymakers' choices differ from what citizens would prefer. Section 6 concludes.

2 Literature

The paper is related to several threads in the literature. The first is the literature that addresses the economic benefits and costs from coordination if economic spillovers exists, such as in environmental policy (Barrett 1999), macroeconomic and fiscal policies (Cooper 1985, Keen and Konrad 2013, Ostry and Ghosh 2016), or health policies (Beck and Wagner 2020, Bown and Bollky 2020). Whenever countries are affected by actions taken by others which are not internalized via the market they should have an interest in internalizing those effects politically. Increasing international integration and an increase in the impact of spillovers in this perspective requires more and intensive cooperation among countries, as could be observed in the wake of the Global Financial Crisis and the increased importance of the G-20. As some authors point out, however, coordination can also serve to erode competition. Abolishing tax competition gives more room to the Leviathan to enrich itself through too high taxation (Brülhart and Jametti 2019, Edwards and Keen 1996), or to erode the quality of monetary services and increase inflation (Rogoff 1985, Vaubel 1990). Competition can thus be a check on non-benevolent and exploitative governments (Feldstein 1988, Sinn 1992).

Depending on perspective, uncertainty about policy effects can magnify positive and negative effects of cooperation. If cooperation can serve to internalize positive or negative effects of policy, depending on the type of uncertainty the impact of spillovers is increased or mitigated, thus increasing or decreasing the incentives for cooperation (Ghosh and Masson 1994, Hefeker and Neugart 2018). On the other hand, one can argue that if policy effects are uncertain, experimentation with policies can help to find the right and adequate policies (Dewatripont and Roland 1995), and competition can be seen as a discovery procedure (Hayek 1968, Klodt and Lorz 2008, Vaubel 1985). In this view, policy coordination can block better and more adequate policies.

If policies are costly to set or to reverse, however, uncertainty about policy effects also creates an incentive to free ride by observing and copying policy measures that have been implemented in neighboring economies (Fidrmuc and Karaja 2013, Pitlik 2007, Venkatesh and Goyal 1998). Thus, successful policies may be copied when informational spillovers occur as the outcome of policy measures can be observed in neighboring regions. Waiting for others, of course, can also lead to too little policy experimentation (Rose-Ackerman 1980, Strumpf 2002), and some authors analyze what can be done to correct those incentives (Callander and Harstad 2015, Casella 2001). The price of these policy imitations, of course, can be that policies that have proved successful in one circumstance need not be adequate in others as well (Cheng and Li 2019, Mukand and Rodrik 2005). Thus, imitation lowers the costs of experimentation but may result in less than optimal outcomes.

Lastly, political distortions may arise because of asymmetric information or costs. Policymakers may set policies that are to their own benefit but not to that of their voters and distort policies to signal competence and improve their (re)election chances (Maskin and Tirole 2004, Rogoff 1990, Rogoff and Sibert 1988), or they may stick with inefficient and inadequate policies for the same reason (Majumdar and Mukand 2004). A potential correction for this can be if voters are able to judge policymakers for their performances by comparing them to other politicians in similar situations. So-called yardstick competition works as a constraint for policymakers (Besley and Case 1995, Bodenstein and Ursprung 2005, Salmon 2019, Wrede 2001).

This paper brings together these aspects from the literature that have not been combined before to my knowledge. The basic structure is as in Mukand and Rodrik (2005) where policymakers face an exogenous need for policy reform to address the state of the world. They can decide to copy another region's policy, and thus saving personal policy costs, but at the risk that the policy is not fully adequate to their own region. This hence captures the impact of informational spillovers and the incentive to free-ride on the implementation of uncertain policy measures. I add to the model a second policymaker and policy spillovers among countries which creates the incentive for cooperation and internalization of those spillovers. To capture the trade-off between internalization and policy competition, I introduce the policymaker's incentive for collusion and show that cooperation can also have negative effects. Here these negative effects are two-fold: cooperation can imply that policy is not fully adequate if countries have asymmetric policy needs, and it can mean that policymakers do not provide their best efforts if there are personal costs of policy setting. Yardstick competition is often seen as a solution to this second problem but I find that yardstick competition can also be an incentive for too much policy activities. While policymakers have an incentive for collusion to avoid economic competition, cooperation also implies that they then cannot gain politically by doing better that other policymakers which undermines the incentive to collude.

3 The Model

3.1 Economic Structure and Preferences

I consider two countries, $i = 1, 2, i \neq j$, where i is also referred to as the home country. Each country is populated by a private sector and a policymaker. I abstract from conflicts among non-politicians (indexed V) which can be interpreted as a representative citizen or voter or society in general. Moreover, there is only one policymaker (indexed P) and no domestic political competition, so that all possible national conflicts concerning policy making arise between society and the policymaker. In each country there is an exogenously given desirable policy or policy target $\theta_i \geq 0$; a policy instrument x_i, that is under the exclusive control of the policymaker; and a policy outcome y_i. The desirable policy θ_i can be interpreted as an objectively given policy need that captures the "state of the world" in economy i as in Mukand and Rodrik (2005) or it can be a national policy preference (Persson and Tabellini 2000). To keep the model tractable and focus on the main influences, θ_i captures all differences between the countries concerning economic and political structures or preferences so that all other technical or preference parameters are identical across countries and assumed to be positive.

The policy output is given as

$$y_i = x_i(1 + \varepsilon) + b(x_i - x_j) \tag{1}$$

where the impact of domestic policy making on the policy outcome is uncertain and reflects the experimental character of policy with $\varepsilon \gtreqless 0$ with $E(\varepsilon) = 0$ and $E(\varepsilon^2) = \sigma^2$ where E denotes the expectations operator. Thus, x_i can be thought of as monetary or fiscal policy whose impact on employment or investment cannot precisely be predicted. It might be that expansive monetary policy has a positive demand effect but it can also be that it results in a wage-price spiral that discourages investment and reduces employment. This uncertainty about the precise impact is captured by ε. (The expected impact of domestic policy is normalized to unity.) If y_i is increasing in the difference between $x_i$and x_j, this can be interpreted as competitive policy setting between countries i and j. Thus output and employment may be increasing if country i has a higher monetary expansion than country j because of exchange rate effects, . The degree of competition is measured with b and I assume $1 > b \geqslant 0$ throughout so that the expected impact of domestic policy on the policy outcome is stronger than the effect of policy competition.[1]

In each country, deviations of policy outcome y_i from the adequate policy θ_i lead to losses and society's expected losses are given as

$$EL_i^V = E[(y_i - \theta_i)^2] \tag{2}$$

The difference between society and the policymaker is that there is a private cost of setting policy x_i for the policymaker. This can be thought of as requiring from the policymaker to set a policy that is not to his personal liking, or it could mean that setting policy involves effort such as acquiring information or preparing legislation. These private costs enter the policymaker's losses with weight $\alpha \geq 0$. Moreover, there may also be political competition in the form of yardstick competition: the politician has a benefit by "doing better" than a comparison. This can be thought

[1] For simplicity I assume that b is not uncertain. Making b stochastic as well would not change the main results; it would however increase the incentive for cooperation among countries to internalize spillover uncertainty (Hefeker and Neugart 2018).

of how able the politician is to reduce unemployment, increase exports, or secure a high level of social security. One interpretation of this is that voters will compare the domestic policymaker's performance with that of a foreign policymaker and not re-elect him him if he performs worse (Bodenstein and Ursprung 2005, Wrede 2001). Another interpretation would be that the policymaker has a personal pay-off (ego rent) from doing better or being more successful than others may ensure a lucrative career after leaving politics (Rogoff 1990). This political competition effect does not enter the objective function of society or citizens who may judge national policymakers by their relative performance but they are not materially affected if policymakers abroad perform better or worse. The policymaker thus has additional political and personal costs if his policy is less adequate to the situation than that of his opponent which enter his objective function with weight $2\hat{\mu} \geq 0$. To measure how far the policy outcome is from the desirable and adequate policy, I define a "policy gap", $z_i = |\theta_i - y_i| \geq 0$ that measures the difference between implemented policy and the adequate or desired policy. Since I assume $\theta_i \geq 0$, the policy gap is non-negative if $x_i, x_j = 0$ so that the policymaker must set $x_i \geq 0$ to close it.

With this, the policymaker's expected losses can be expressed as

$$EL_i^P = E[(y_i - \theta_i)^2 + \alpha x_i^2 + 2\hat{\mu}(z_i - z_j)] \tag{3}$$

3.2 Conflict between Society and Policymaker

The policymaker's choice is distorted from that what the private sector would want because of the private costs of setting policy (α), which distorts his policy downwards, and the influence of yardstick competition ($\hat{\mu}$), which is an upward distortion. This section explores this distortion by comparing the policies set by policymakers and those preferred by society for a given foreign policy.

Using (1) in (3) and taking the policymaker's first order condition, his reaction function follows as

$$x_i^P = \frac{\theta_i + bx_j + \mu}{1 + b + \lambda} \tag{4}$$

with $\mu = \hat{\mu}(1 + 2b)/(1 + b)$ and $\lambda = \lambda^P + \lambda^U$ which can be interpreted as the cost-effectiveness ratio of setting policy x_i. It comprises the policymaker's private costs of policy $\lambda^P = \alpha/(1 + b)$ and the cost of uncertainty $\lambda^U = \sigma^2/(1 + b)$ that equally arises to society and the policymaker.

Without the influence of $\lambda^P$and μ, the private sector's preferred policy response to any given foreign policy is

$$x_i^V = \frac{\theta_i + bx_j}{1 + b + \lambda^U} \tag{5}$$

Comparing (4) and (5), the policy set by the policymaker is too excessive from society's point of view if $x_i^P > x_i^V$ or

$$\frac{\mu}{\lambda^P} > \frac{\theta_i + bx_j}{1 + b + \lambda^U} \tag{6}$$

Yardstick competition does indeed induce the policymaker to provide more effort, or set a more expansive policy, but this is not necessarily in society's interest. Political competition does not only imply that policymakers do "more", it can also imply that they do "too much". Unless μ dominates the policy target and the spillover from foreign policy, however, (6) is unlikely to be fulfilled which means that voters would actually prefer a more expansive policy than that set by

the policymaker. This, not surprisingly, holds in particular if λ^P is large. Moreover, the critical relation between μ and λ^P is positive in θ_i and in x_j because an ambitious policy target and the influence of economic competition with the other country require a more active policy. The critical relation is negative in λ^U, however, reflecting the congruence between policymaker and society that a higher uncertainty about policy outcomes should lead to a less active policy (Ghosh and Masson 1994). As both agree that less should be done if the outcome is uncertain, the distortion between preferred policies diminishes.

4 Active Policy and Imitation

I assume that policymakers can independently decide whether they pursue their own policies and experiment with setting policy x_i in a non-cooperative fashion. They may also decide to simply imitate the policy of the other country, setting $x_i^P = x_j^P$. By assumption, observing the outcome of a policy measure abroad reduces uncertainty (normalized to $\varepsilon = 0$) as the consequences of the policy on policy outcomes can be observed. Following a monetary, fiscal, privatization or public health policy implemented abroad thus allows to "learn" about its outcome on domestic variables (Fidrmuc and Karaja 2013, Pitlik 2007, Venkatesh and Goyal 1998). Moreover, imitating the foreign policy also reduces private costs of policy making ($\alpha = 0$) because no effort has to be provided as policy can simply be copied. Thus, imitation reduces policy costs but it also implies that policy may not fully conform to the domestic policy need θ_i (Mukand and Rodrik 2005). By following foreign policy, moreover, the effect of competition on policy output disappears.

Thus, each policymaker i has three strategies available and can set active policy (denoted A_i), aim to imitate the policy of the other policymaker (I_i) or cooperate (C_i). Strategies $A_i$and I_i are set non-cooperatively whereas cooperation requires agreement of both policymakers. Under non-cooperation, each policymaker independently decides to experiment and implement an active policy which, if the other policymakers decides to imitate, makes the active player a policy leader. The assumption is that the leader does not know if he will become the leader when he makes his decision, thus deciding under imperfect information. Assuming otherwise would imply that the follower informs the leader about his intention to follow. This exchange of information can also be considered a form of cooperation which is excluded here. If both aim to be imitate, both wait for the other to go ahead and do nothing.

The sequence of events as is follows: In stage 1, policymakers decide to cooperate or not. At stage 2, they set policy jointly if they cooperate, otherwise each policymaker has to decide independently on a policy strategy. In this case, they do not coordinate their actions so that each policymaker is not aware of the opponent's decision. After their decisions have been made, policies can be observed but active policy cannot be reversed. Thus, a policymaker can (costlessly) decide to wait in order to observe policy setting abroad behavior and copy it. At stage 3, outcomes are realized. The game is solved by backward induction (perfect Bayesian equilibrium).

In what follows, I compare and discuss these different alternatives and evaluate them from the policymaker's and society's perspective. This section first considers the expected losses that policymakers incur under the non-cooperative strategies and discusses their strategies, given they are uncertain about their opponents behavior. The decision to coordinate is analyzed in section 5.

4.1 Policy Choices

If both policymakers i and j decide on an active and competitive policy setting (indexed A_i, A_j, where the first index refers to the policy of the respective player and the second to that of his opponent), the equilibrium policy follows from (4) as

$$x_i^P(A_i, A_j) = \frac{(\theta_i + \mu)}{(1+\lambda)} + \frac{b(\theta_j - \theta_i)}{(1+\lambda)(1+\lambda+2b)} \tag{7}$$

which is falling in λ but increasing in μ. Higher costs of using the instrument in terms of efforts and uncertainty will lead to a less active policy but yardstick competition will lead to more efforts. Also, economic competition, captured by b, has a positive effect on policies if the policy target abroad is more ambitious than at home.

The resulting policy gap in this case is

$$z_i(A_i, A_j) = \theta_i - \frac{\theta_i - \mu}{(1+\lambda)} + \frac{\lambda b(\theta_j - \theta_i)}{(1+\lambda)(1+\lambda+2b)} \tag{8}$$

and thus increasing in the policy target of the other country because with $\theta_j > \theta_i$ competition between the countries has a negative effect on policy outcome in country i and thus widens the policy gap.[2]

Using these expressions in (3), expected losses for the policymaker under competitive policy setting are

$$EL_i^P(A_i, A_j) = (z_i(A_i, A_j))^2 + \lambda(1+b)(x_i^P(A_i, A_j))^2 + 2\hat{\mu}(z_i(A_i, A_i) - z_j(A_j, A_i)) \tag{9}$$

In contrast to policy competition, policymakers may also decide to imitate policies observed abroad. As argued above, the assumption is that when imitating there are no personal costs or effort for the policymaker, and there is no uncertainty about the outcome of policy. This is the reason why also voters may prefer imitation over setting active policy.[3] In addition, imitation implies that economic competition disappears. The cost for this strategy is, of course, that policy need not be fully adequate for country i because of potentially different policy needs or targets. Moreover, yardstick competition does not fully disappear because policymakers still have an incentive to do better than the policymaker abroad.

The first possibility is that country i decides for active policy (A_i) whereas country j decides to imitate (I_j).[4] The follower will simply set $x_j^P(I_j, A_i) = x_i^P(A_i, I_j)$ and from (4) their policies are

$$x_i^P(A_i, I_j) = x_j^P(I_j, A_i) = \frac{\theta_i + \mu}{1+\lambda} \tag{10}$$

The resulting policy gap for the leader is

[2]Note that $z_i(\cdot)$ has no superscript P because the policy gap is the same for voters and policymakers whereas their preferred policies $x_i(\cdot)$ are not.

[3]Evaluating the policies set by the policymakers from society's perspective follows straightforwardly by setting $\lambda^P = 0$ and $\hat{\mu} = 0$. Thus (9) would become $EL_i^V(A_i, A_j) = (z_i(A_i, A_j))^2 + \lambda^U(1+b)(x_i^P(A_i, A_j))^2$ with similar simplifications for (12), (15) and (16) below.

[4]In case policymaker i knows his policy will be copied, he becomes Stackelberg leader and policy collapses to $x_i(A_i, I_j) = x_j(I_j, A_i) = \frac{\theta_i}{1+\lambda}$. Thus, the influence of yardstick competition is neutralized.

$$z_i(A_i, I_j) = \theta_i - \frac{\theta_i + \mu}{1 + \lambda} \tag{11}$$

It is still positive for $\mu < \lambda\theta_i$ which holds as long as the political yardstick motive does not dominate the economic need for active policy.

The leader's expected losses are given as

$$EL_i^P(A_i, I_j) = (z_i(A_i, I_j))^2 + \lambda(1 + b)(x_i^P(A_i, I_j))^2 + 2\hat{\mu}(z_i(A_i, I_j) - z_j(I_j, A_i)) \tag{12}$$

If policymaker i instead imitates the policy of country j, his policy becomes

$$x_i^P(I_i, A_j) = x_j^P(A_j, I_i) = \frac{\theta_j + \mu}{1 + \lambda} \tag{13}$$

leading to policy gap

$$z_i(I_i, A_j) = \theta_i - \frac{\theta_j + \mu}{1 + \lambda} \tag{14}$$

and expected losses of

$$EL_i^P(I_i, A_j) = (z_i(I_i, A_j))^2 + 2\hat{\mu}(z_i(I_i, A_j) - z_j(A_j, I_i)) \tag{15}$$

Since policies are uncoordinated it can of course also be the case that both aim to imitate. In this case, both will do nothing and thus $x_i(I_i, I_j) = 0$ with the corresponding policy gap of $z_i(I_i, I_j) = \theta_i$. If both policymakers do nothing, the expected payoff is

$$EL_i^P(I_i, I_j) = (\theta_i)^2 + 2\hat{\mu}(\theta_i - \theta_j) \tag{16}$$

Notice with respect to yardstick competition that only the case of competitive policy setting makes a difference for expected losses. Imitating and being imitated yields the same result as $(z_i(A_i, A_j) - z_j(A_j, A_i))$ and $(z_i(I_i, A_j) - z_j(A_j, I_i))$ both simplify to $(\theta_i - \theta_j)$ which is also the case if both countries remain passive.

4.2 Choice of Non-Cooperative Strategy

The choices that are available to policymakers i and j when not cooperating are active policy and imitation, leading to four possible outcomes. Both can choose active strategies, one can choose active policy while the other imitates, or both can try to imitate. For policymaker i, the active strategy dominates imitation if simultaneously $EL_i^P(A_i, A_j) < EL_i^P(I_i, A_j)$ and $EL_i^P(A_i, I_j) < EL_i^P(I_i, I_j)$.

I first look at the optimal strategy for policymaker i if faced by active policy setting in country j. Comparing (9) and (15), the expression cannot be unambiguously signed for all parameter constellations as it depends on the difference between θ_i and θ_j in a non-linear way. Setting $\theta_i = \theta_j$ the condition becomes $\lambda(1 + b)(\frac{\theta_i + \mu}{1+\lambda})^2 < 0$ and is thus never fulfilled. However, because $EL_i^P(A_i, A_j)$ declines as $\theta_i - \theta_j$ increases, the condition is more likely to be fulfilled if the policy target of country i is more ambitious than that of country j. Hence, whenever policymaker i knows that his opponent will set active policy he has an incentive to remain passive and imitate policy. This is certainly his best behavior if both have identical or close policy needs. Only if the domestic policy target is much larger than the one that the foreign policymaker addresses does it become

more attractive to set active policy. For policy targets close together both prefer to copy, but with strong asymmetry the one with a more ambitious target will go ahead.

What, however, if the foreign policymaker imitates with certainty? Comparing (12) and (16), the condition for policymaker i playing active in this case is

$$\frac{\theta_i}{\mu} > \frac{(1+\lambda+\lambda b)}{(1+\lambda-\lambda b)} \tag{17}$$

which implies that policymaker i prefers to play active if he knows that policymaker j will imitate his policy unless yardstick competition dominates his desire to reach the policy target.

The policymakers are thus in a dilemma. In case their policy targets are close together, they would prefer to follow their opponent and imitate policy. If one can commit to doing nothing, his opponent's best response is to go ahead. If this is not possible, both have an incentive to remain inactive in the hope that the other policymaker goes ahead. If waiting is costly, eventually one of them can be expected to go ahead and become a policy leader. If waiting is costless, however, it can indeed be the case that both remain passive in the hope that the other will eventually go ahead.

Since the comparison of pay-offs in pure strategies shows that none of the non-cooperative strategies is dominant, policymakers condition their strategy on the expected behavior of their opponent. In what follows, I assume that policymaker i assigns a probability of q that policymaker j will choose an active strategy and probability $1-q$ that policymaker j will choose to imitate policy.

If policymaker i decides for active policy, his expected payoff thus is

$$EL_i^P(A) = qEL_i^P(A_i, A_j) + (1-q)EL_i^P(A_i, I_j) \tag{18}$$

whereas the expected payout from trying to imitate is

$$EL_i^P(I) = qEL_i^P(I_i, A_j) + (1-q)EL_i^P(I_i, I_j) \tag{19}$$

Comparing (18) and (19) yields a critical value of $\bar{q}_i$ above which policymaker i will choose to remain passive. This expression is quite complicated but evaluating the difference when both policy targets are identical yields

$$\bar{q_i}^P\big|_{\theta_i=\theta_j} = \frac{(\theta_i-\mu)(1+\lambda) - \lambda b(\theta_i+\mu)}{\theta_i(1+2\lambda)-\mu} \tag{20}$$

This critical value is increasing in θ_i and decreasing in μ and λ (as long as $\theta_i > \mu$). The larger is the policy target, the more pressing it is to pursue active policy. The policymaker will thus only postpone setting active policy if he is relatively certain that his opponent goes ahead with active policy that he can copy. Obviously, the higher the costs of active policy, the more inclined he is to wait when he can expect to be able to observe policy outcomes abroad. Since the influence of yardstick competition will level up the leader's policy (see eq. 10), it has a similar influence as the costs of active policy setting and lowers the critical $\bar{q}$.

Given that the costs for active policy are larger for the policymaker than society, there will be an incentive for him to run a less active policy than what society wants. Setting $\mu = 0$ and using $\lambda = \lambda^U$ in (20) for the private sector yields a critical $\bar{q_i}^V\big|_{\theta_i=\theta_j}$ higher than $\bar{q_i}^P\big|_{\theta_i=\theta_j}$, meaning the policymaker is more likely to imitate than society would do.

5 Cooperation

The previous sections showed that, depending on parameter values, all combinations of strategies are potential equilibria. One alternative solution would be that policymakers agree on and are able to commit to a common policy. Such an agreement would not only internalize spillovers from competitive policy setting but it could also dissolve a possible situation where policymakers do nothing.[5]

Cooperative policy could follow from a binding agreement like membership in the European Union or by delegating policy to a joint agency like the European Commission or the European Central Bank. This eliminates political and economic competition, but it also allows to share the costs of policy making in terms of efforts and uncertainty. The common administration of policy, for instance, may give rise to economies of scale which lowers individual costs, and the costs of uncertainty may be going down if participating countries create an implicit or explicit insurance mechanism which also lowers individual costs. As many observers argue, however, such an agreement can also be interpreted as collusion because competition between policies is eliminated (Vaubel 1990).

5.1 Joint Policy

In case of joint policy making, I assume a joint utility function of policymakers where policymakers have equal weight

$$EL^P = \frac{1}{2}E(L_i^P + L_j^P) \tag{21}$$

Since cooperating parties know they cooperate, they also know that $x_i^P = x_j^P$ so that economic competition disappears. Moreover, the influence of political yardstick competition μ on the joint policy vanishes because an outcome difference is a gain for one and a loss for the other and thus cancels in joint policy setting. Note, however, that differences in policy targets will still matter for individual policymakers as yardstick competition does not disappear through cooperation.

Joint policy (indexed C) follows as

$$x_i^P(C_i, C_j) = x_j^P(C_j, C_i) = \frac{\theta_i + \theta_j}{2(1 + \alpha + \sigma^2)} \tag{22}$$

where cooperative policy is an average of both countries' policy targets but also shows that the costs of policy setting for each country are reduced.

A comparison between (7) and (22) shows that competitive active policies will be more expansive than cooperative policy if

$$\frac{\mu}{(1+\lambda)} + \frac{\theta_i}{(1+\lambda+2b)} - \frac{(\theta_i+\theta_j)[(1+\lambda)^2 - 2\lambda b^2]}{2(1+\lambda+\lambda b)(1+\lambda)(1+\lambda+2b)} > 0 \tag{23}$$

which is the case if θ_j is not much larger than θ_i and μ. (The expression is obviously increasing in θ_i and μ but the third term will be negative since $b < 1$ so that a very large θ_j could turn the expression negative. It is always positive if $\theta_i = \theta_j$) Thus, cooperation does indeed mean that less is done under cooperation than under competitive policy setting. Therefore, cooperation implies

[5] Policymakers could also agree on cooperative policy setting but nationally differentiated policies. Spillovers would be internalized but there would be no costs of cooperative policy setting. I consider this case as relatively uninteresting and focus on setting a common policy.

lower policies and also lower losses stemming from policy setting and uncertainty.

By the same logic, the competitive policy preferred by society would also be more active than the cooperative policy if

$$\theta_i + \frac{(\theta_i + \theta_j)[2b(\lambda^P + \lambda b) - (1 + \lambda^U)^2]}{2(1 + \lambda^U)(1 + \lambda + \lambda b)} > 0 \tag{24}$$

Given that this term is larger than (23) above for small μ, it also implies that cooperative policy deviates more from society's preferred policy than from the policymaker's non-cooperative policy. Thus, if the private costs of policy making dominate the policymaker's action, "collusion" distorts policies downwards whereas society would prefer a more active policy. For large μ and a strong influence of yardstick competition, this result can turn around. Political competition can distort the incentive for policymakers so strongly that they end up doing "too much".

5.2 The Incentive to Cooperate

It remains to be seen when a policymaker prefers cooperation over policy competition or remaining passive in the attempt to imitate his opponent. Given that under non-cooperation policymakers are not aware what their opponent will do, the expected return to setting active policy is (18) and for imitating policy it is (19). The expected loss from cooperation is

$$EL_i^P(C_i, C_j) = (z_i(C_i, C_j))^2 + \lambda(1 + b)(x_i^P(C_i, C_j))^2 + 2\hat{\mu}(\theta_i - \theta_j) \tag{25}$$

Therefore, cooperation is preferred to an active policy if $EL_i^P(A) > EL_i^P(C_i, C_j)$ or

$$\begin{aligned} q[(z_i(A_i, A_j))^2 + \lambda(1 + b)(x_i^P(A_i, A_j))^2 + 2\hat{\mu}(\theta_i - \theta_j) - 2\mu(x_i^P(A_i, A_j) - x_j^P(A_j, A_i))] + \\ (1 - q)[(z_i(A_i, I_j))^2 + \lambda(1 + b)(x_i^P(A_i, I_j))^2 + 2\hat{\mu}(\theta_i - \theta_j)] \\ > (z_i(C_i, C_j))^2 + \lambda(1 + b)(x_i^P(C_i, C_j))^2 + 2\hat{\mu}(\theta_i - \theta_j) \end{aligned} \tag{26}$$

which is a complicated expression that is clearly fulfilled for the special case $\theta_i = \theta_j$. Thus, cooperation will generally be preferred to competitive policy setting if the policy targets are relatively close together which reflects the benefits of internalized spillovers and cost sharing. If, however, the policymaker's policy target becomes larger than that of his opponent, the condition could turn to become negative, implying that coordinating policy with someone whose policy target is "too low" is not preferred over competitive policy setting.

Moreover, $EL_i^P(I) > EL_i^P(C_i, C_j)$ collapses to

$$q(\theta_i - \frac{\theta_j + \mu}{1 + \lambda})^2 + (1 - q)(\theta_i)^2 > (\theta_i - \frac{\theta_i + \theta_j}{2(1 + \lambda(1 + b))})^2 + \lambda(1 + b)(\frac{\theta_i + \theta_j}{2(1 + \lambda(1 + b))})^2 \tag{27}$$

which cannot be unambiguously signed. For the special case of $\theta_i = \theta_j$, the condition becomes $\frac{\theta_i^2}{(1+\lambda(1+b))} - \frac{q(\theta_i+\mu)}{(1+\lambda)^2}(\theta_i - \mu + 2\lambda\theta_i) > 0$ which may be fulfilled at low q , implying that policymaker i prefers cooperation over imitation. A low q implies that he expects the foreign policymaker to play imitation as well, and in this case it is clearly better to cooperate than ending up both doing nothing. In all other cases instead, policymaker i will prefer imitation over joint active policy, in particular if he expects the foreign policymaker to set active policy. Thus, cooperation is difficult to achieve if policymakers believe they can free-ride on the efforts of other countries.

Moreover, cooperation is more likely to be beneficial and supported by both policymakers if their policy targets are relatively close together. The more they grow apart, the less attractive it becomes to coordinate policies. In case that one policymaker has a more ambitious target than the other, he will prefer setting policy independently over coordination, whereas the other would prefer cooperation imitating following a policy target that is too ambitious. Strong asymmetries thus make cooperation less likely as both policymakers need to agree to it.

5.3 Too Much Cooperation?

Given that the optimal policy that society would set differs from that implemented by policymakers, the question is if the decision of policymakers to cooperate reflects what society would choose as well. To see this, define the policymaker's incentive for cooperation by using (9) and (25) as

$$G_i^P = EL_i^P(A_i, A_j) - EL_i^P(C_i, C_j) \tag{28}$$

which will be positive if expected losses for the policymaker are larger under competitive policy setting than with cooperation so that joint policy making is chosen.

A similar expression can be derived for the private sector by setting $\lambda^P = \hat{\mu} = 0$ in the respective expressions in (28). If now $G_i^P > G_i^V$ it is clear that there is a distortion on the side of the policymaker to enter into "too much" cooperation from the voter's perspective because his gains from cooperation are larger than they are for society. However,

$$\begin{aligned} G_i^P - G_i^V = \alpha[&\frac{(\theta_i + \mu)}{(1+\lambda)})^2 + q(\frac{b(\theta_i - \theta_j)}{(1+\lambda)(1+\lambda+2b)})^2 - (\frac{\theta_i + \theta_j}{2(1+\lambda(1+b))})^2] \\ &- 2q(\theta_i - \theta_j)(1+b)\frac{(1+\lambda)^2\mu + \lambda^P b(\theta_i + \mu)}{(1+\lambda)^2(1+\lambda+2b)} \end{aligned} \tag{29}$$

cannot be unambiguously signed. It is clear, though, that for $\theta_i = \theta_j$ it boils down to $G_i^P - G_i^V = \alpha[(\frac{(\theta+\mu)}{(1+\lambda)})^2 - (\frac{\theta}{(1+\lambda+\lambda b)})^2] > 0$. Thus, for all cases in which the policy targets are close together, cooperation will indeed distort policymakers' decision so that he coordinates policy too soon and too often from the perspective of voters. First, there is the influence of yardstick competition (μ) which gives the domestic policymaker an advantage if $\theta_j > \theta_i$ because he fares relatively better than the foreign policymaker who is likely to be further away from the foreign policy target if both implement the same policy. Thus, cooperation indeed reduces political competition because it avoids that the other policymaker can implement a more ambitious policy than the domestic policymaker. Secondly, the first term multiplied by α reflects that fact that private policy costs should be avoided and cooperation becomes thus more attractive if non-cooperative policy requires more personal effort of the policymaker. Hence, there is a tendency of too much cooperation where voters would have preferred competition. This stems from the private costs of setting policy which is lower in case of cooperation.

To see how this distortion is affected by policy uncertainty, one can derive

$$\left.\frac{\partial(G_i^P - G_i^V)}{\partial\lambda^U}\right|_{\theta_i=\theta_j} < 0 \tag{30}$$

Thus, the political distortion is decreasing in λ^U which means that uncertainty reduces distortions.

The reason is that uncertainty reduces society's and policymakers' preferred policies and thus shrinks their difference. In other words, the problem from society's point of view of too much cooperation is mitigated in a world of high policy uncertainty.

The implication of the policymakers' self-interests is, of course, that they may impose losses on society voters by entering into cooperation agreements which would not be entered by society itself. Indeed, the suspicion that international agreements are not always in the best interests of the population at large cannot be dismissed in general. The incentive to perform better than others and the incentive to lower personal costs of policy making can thus impose collateral losses on society.

6 Conclusion

The literature on the desirability of international cooperation is inconclusive (Barrett 2007, Feldstein 1988, Rogoff 1985, Vaubel 1985). Economic spillovers and competition among countries often give rise to inefficient levels of policy setting. If polices are costly and their effects are uncertain, however, there is also an incentive to exploit informational spillovers. Letting other countries experiment with policies and observing the outcome can lower costs and thus are an incentive for too little policy activity. Cooperation and coordination among national policymakers allows to internalize such spillovers and increase efficiency. The negative side of cooperation is that it can give rise to collusion among policymakers and lead to policies which are not in the interest of society. Policymakers have an incentive to cooperate too much if this lowers the costs of policy setting. As competition between policymakers is reduced, this also reduces the corrective mechanism of yardstick competition. National policies deviate from what society would prefer because policymakers tend to do "too much" because of political yardstick competition or "too little" because of private costs of policy making.

As this paper shows, yardstick competition is indeed an incentive for policymakers to do more (and maybe even "too much"), but only if other countries have more ambitious policy targets, implying that there is a tendency of policy convergence under competition. This, by definition, is also the case under policy coordination. Thus, policy coordination may lead to sub-optimally low levels of policies from the perspective of society, supporting the collusion argument. But while coordination takes away the risk of doing worse than other policymakers, it also excludes the incentive to demonstrate one's own better performance. Therefore, general statements that cooperation is always or mostly unlikely to be not in the interests of society and voters cannot be maintained. Indeed the model, despite being quite simple, shows that the different factors interact in a complicated way, making it difficult to derive general results.

Interestingly, the possible political distortion between policymakers' choices and society's preferences, is decreasing in policy uncertainty. For highly uncertain policies or policy environments the preferred policies of society and policymakers hence tend to be more aligned. Uncertainty thus corrects to some extent the principal-agent problem between voters and policymakers. Higher uncertainty is an incentive to cooperate for policymakers, but it also implies that citizens tend to support cooperation more when policies are uncertain. In that sense, uncertainty reduces the distortions that come from policymakers' self interests.

The model also helps to explain why international cooperation is often difficult to achieve. Given the private costs of policy making, there is a tendency to free-ride on the policy efforts of other countries and to imitate rather can actively experiment with policies with uncertain

outcomes. While cooperation is preferred over competitive policy setting, imitation is preferred over cooperation in many cases. Similar policy targets or needs make cooperation more easy to agree on but it also increases the incentive to try to exploit informational spillovers and remain passive. Policy coordination is therefore a double-edged sword: It can lead to collusion among policymakers but it can also serve to coordinate on active policies and avoid an equilibrium where all wish to imitate and nothing is done at all. That ad-hoc cooperation is therefore less frequent and stable (Ostry and Ghosh 2016) than continuous and binding cooperation such as in the European Union is also well explained in view of these results. The incentive to wait and let others go ahead with costly and uncertain policies is hard to overcome and may need binding agreements. If policy needs or targets deviate by too much, of course, cooperation becomes more difficult but also imitation becomes less likely.

Because the model is very general it does not directly allow to draw conclusions for particular cases of cooperation or policy areas. Further research should therefore be directed at applying the model's predictions to concrete cases where international policy cooperation is possible or fails to see how far the model is able to explain outcomes. A second line of extending the research would be to focus more one the distortions that may arise between policymakers' choice and society's interests. As the analysis cautions against general statements concerning the presence of such distortions, it would be potentially fruitful to identify in more detail cases where these are present or not.

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