STRATEGIC SIGNALS AND MULTILATERAL FISCAL SURVEILLANCE

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Abstract

We present a game that first models the relationship among a population, a government and a watchdog. The focus is on the incentives that the government faces when making fiscal policy decisions. The population has incomplete information about the type of government that is in office, but an independent watchdog can reveal whether it is competent or affected by a deficit bias. In the second part of the paper, we elaborate on the strategic changes in fiscal policy-making induced by the introduction of fiscal surveillance at the European level. Based on recent developments, we discuss whether multilateral surveillance is effective as a safeguard against fiscal indiscipline. We find that, if the watchdog acts strategically and internalizes the impact of its signals on the intergovernmental game, it will only provide information on the economic and budgetary state of Member States in specific cases – namely when the cost of sanctions is sufficiently high compared to electoral stakes and provided that few countries are mentioned.

Keywords: Stability and Growth Pact, fiscal policy, budgetary surveillance

JEL codes: C72, D72, D80, E62, H62, H77

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NON-TECHNICAL SUMMARY

We identify two stylized facts under the Stability and Growth Pact (SGP). First, more countries over time have recorded "excessive deficits" as defined in the SGP. Second, larger countries are more likely to run excessive deficits than smaller ones. Why has the SGP not succeeded in maintaining fiscal discipline?

To answer this question, we consider the incentives that governments themselves face. We begin with a model that considers the domestic game for government. Governments may be competent or incompetent. On average, competent governments have better economic performance, but an incompetent government could experience a positive shock and have the same performance as a competent government that experiences a negative shock. Voters observe economic outcomes only, not government type or the nature of the shock. Voters support governments in good times and throw them out in bad times, but they will not know what to do during periods of intermediate economic performance. It would help voters to make decisions if some independent watchdog could reveal the nature of the shock and thereby also provide needed information about the type of their government.

We then consider the effects of Economic and Monetary Union (EMU), where governments commit to fiscal discipline under the Stability and Growth Pact (SGP). To investigate the strategy of governments, we introduce three changes to the game. First, the SGP focuses on deficit levels rather than the health of the overall economy. How do populations view deficits? We therefore consider that they may differ in their relative aversion to deficits. We add a new stage to the game that comes at the beginning where nature determines whether a population is mostly "Keynesian" or "Ricardian". Keynesian populations are comfortable with governments that implement deficit-financed expansionary fiscal policies while Ricardians are deficit-averse. The game therefore considers the decision for a government to initiate a fiscal impulse.

The second change is to evaluate what happens at the European level, and more precisely in the ECOFIN Council. Under the SGP, multilateral fiscal surveillance implies that governments can choose to punish other countries that are found to have excessive deficits. We model the circumstances under which a country can expect to be subject to sanctions under an excessive deficit procedure. As the implementation of the SGP depends upon the Member States sanctioning each other, there is the possibility of a blocking minority preventing sanctions.

This, in turn, leads to a third change, namely the addition of a sub-game at the EU level. We discuss how it affects the government's behaviour with regard to the budget deficit and the odds of its re-election. The overall message from a set of two- and three-player games is intuitive. If voters in a given country want a balanced budget badly enough, they simply get it. If populations want fiscal impulses, the outcome depends upon several factors – the underlying distribution of Keynesian and Ricardian populations, the behaviour of other governments and whether governments care more about voters support or the overall cost of sanctions. Because of the political game in the ECOFIN Council, governments look for signals about whether other governments will comply with the Pact or defect. If they know that enough of them will not comply and can constitute a blocking minority, they will not comply either. These outcomes capture well the two fore mentioned stylized facts: if a large share of countries run high deficits simultaneously, it also weakens the incentives for other countries to comply with the SGP. This explains the increasing number of "sinners".

The question then becomes, under what circumstances would a watchdog want to send a signal about whether a given country is running a high deficit? The answer depends on the relative importance of the electoral stakes and the cost of sanctions at the international level. We find that the one case when a signal may prevent defection in the three player game is when the cost of international sanctions is sufficiently high compared to electoral stakes and so long as only one country is mentioned. In all the other cases, signals are either useless or counterproductive. A signal on one country would not prevent defection, and it could even lead other countries to defect too. The implication is clear – if it wants to maximize the chances of compliance with the Pact, paradoxically a strategic watchdog will provide little information. It will send signals only when it expects them to be effective. There is a dilemma inherent in multilateral surveillance: signalling bad pupils can have counterproductive implications on the behaviour of other countries.

I   INTRODUCTION

The Maastricht Treaty set a series of goals that Member States have to meet to join the euro area. The Treaty is not specific, however, about how to prevent free-riding fiscal behaviour of its members once Economic and Monetary Union (EMU) is in place.[3] In response to domestic pressure both from the public and from the Bundesbank, the German Finance Minister, Theo Waigel, proposed a 'Stability Pact' in autumn 1995 to address the absence of European level fiscal rules. While it was renamed as 'the Stability and Growth Pact' (SGP) and some parts of the proposal were weakened, the core parts of the proposal became EU law after the Member States agreed to it at the Dublin European Council Summit in December 1996 (Heipertz and Verdun 2004).

The Pact's design includes preventive and corrective mechanisms. The emphasis for the preventive arm rests on the monitoring of Member State behaviour. Member States were expected to submit economic plans in the form of 'convergence programmes' already in 1994, but the content of those plans as well as their timing was not clear, and was not explicitly laid out in legal terms at the time. Based on both the SGP and on provisions Member States agreed to at subsequent European Council meetings, the rules for either convergence programmes (which non-participating countries file) or stability programmes (which euro area countries file) became clear. Member States would have to update their programmes yearly in the late autumn. The European Commission, for its part, would assess the programmes and make recommendations to the Council of Economic and Finance Ministers (henceforth "ECOFIN") on whether the programmes met European fiscal objectives, which in particular included the achievement of budget balances "close to balance or in surplus," and whether the goals themselves were realistic.

In order to move to the formal corrective arm of the Pact, a Member State would have to be found to have an "excessive deficit," and the procedure that was used here is important. The general 'ceiling' the Pact sets is a deficit of 3% of GDP. Prior to the reform of the Pact in March 2005, 'exceptional' circumstances, such as a decline in economic growth of 2% or, upon the ECOFIN Council's approval, a decline of between 0.75% and 2%, would be grounds for a country not to receive the "excessive deficit" label if it ran large deficits. Note that the Commission had to recommend that an excessive deficit existed and the ECOFIN Council would have to agree by qualified majority in order for a country to receive the "excessive deficit" label.

The corrective arm of the Pact was designed to encourage countries not to run excessive deficits in the first place. The original version of the SGP specified that, once a country had an excessive deficit, it had only a year to correct the deficit "unless there are special circumstances." If the Commission and the ECOFIN Council judged that the Member State was not making progress to eliminate the excessive deficit, they could require the country to make a non-interest bearing deposit with the Commission up to 0.5% of its GDP. If the country did not make correction, the deposit was eventually to become a fine.

Due to some difficulties in implementing the Pact, in March 2005 the Member States agreed to a revision that changed both the Pact's preventive and corrective mechanisms. On the preventive side, Member States now propose their own medium-term objectives as well as

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[3] Non participating Member States are required to comply with SGP requirements but they are not subject to sanctions.

the country-specific factors they face, including the future fiscal effects of major structural reforms. In terms of the corrective mechanism, the revision clarifies the definition of mitigating factors, such as a severe economic downturn or the fiscal consequences of European unification. Yet despite these revisions, the core elements of the Stability and Growth Pact, that is, the reliance on preventive and corrective arms and the 3% deficit limit, remain the same.[4]

How well has the Pact worked in maintaining fiscal discipline among European countries, and in particular in the euro area? The first way to think about this is in terms of the percentage share of countries in the euro area that have "excessive deficits." This measure, however, may not be adequate –if only a few small countries that together constitute a negligible share of the euro area economy have problems, the overall effects may be slight, while it could also be the case that few countries have excessive deficits but they are the largest economies. The second way to think about this is therefore in terms of the overall euro area economy; what percent of the euro area gross domestic product (GDP) is generated in countries with excessive deficits?

Graph 1 presents evidence for each of the indicators. Two stylized facts emerge from this simple picture. First, the number of euro area Member States with excessive deficits has increased over time, from none in the early years to 50% in 2005. The second fact is that the percentage of the euro area economy with an excessive deficit is almost always higher than the percent of countries, with almost 78% of the euro area economy in excessive deficit in 2005.

Graph 1. Percent of euro area countries and euro area GDP in Excessive Deficit Procedure
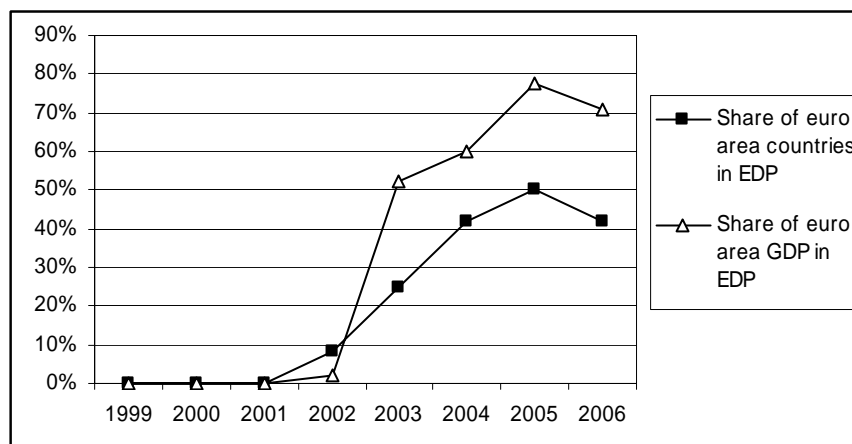
Data on GDP from the April 2006 AMECO database, while data on which countries had excessive deficits when is found at http://ec.europa.eu/economy_finance/about/activities/sgp/procedures_en.htm . The Netherlands is the country that no longer has an excessive deficit in 2006 based on the ECOFIN Council decision in June 2005.

Why has the SGP both in its original, and in its recently revised, form not restrained Member States from running excessive deficits? Moreover, why are large countries more likely to have excessive deficits than small ones? We seek to explain each of these stylized facts in this paper. The obvious place to begin an answer is with the incentives that the countries themselves face to behave one way or the other. Indeed, the language of "preventive" and

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[4] For a more detailed review of the SGP and the recent reforms, see Morris, Ongena, and Schuknecht 2006.

"corrective" mechanisms indicates that the intention of the Pact is to affect the incentives that governments face when they make fiscal policy decisions. What the incentives are in practice, however, is not explicit in EU documents, and they may not be obvious. Moreover, we know little about the strategy of the institution implementing European legislation in this framework.

To address these issues, the paper first considers the question how, and under what circumstances, efficient budgetary monitoring can enable populations to sanction governments given what the government does in fiscal policy. The literature on economic voting presumes that voters are retrospective. They observe the government's management of the economy. If the economy does well, they conclude that the government is competent and they re-elect it. If the economy does poorly, they conclude that the government is bad and they vote for the opposition. Consistent with the literature, our model assumes that voters decide that the government is competent in boom times and incompetent during busts. However, one important complication that retrospective models generally ignore is that governments do not have complete control over the economy. We presume that there is some random error that appears as part of the estimation of economic performance. At intermediate levels of performance, voters cannot deduce the government's type. It could be that a competent government experienced a negative economic shock or that an incompetent government experienced a positive shock. This means that voters may potentially keep incompetent governments that get lucky and vote out competent governments because of a negative exogenous shock. The game indicates that there is a functional need for an unbiased watchdog to send signals on the nature of economic shocks to voters, from which voters can deduce the government's type. When this watchdog exists, voters punish incompetent governments.

Under EMU, the design of the SGP suggests that its implementation depends on the number of governments that comply with it. If there are few sinners, the ECOFIN Council will sanction them, and governments have a reason to consolidate their budgets. If several countries, and especially the large ones, deviate simultaneously, the implementation of sanctions is likely to be much milder. This is due to the decision-making process at the ECOFIN Council: although a country facing sanctions is not allowed to take part in the vote on its own case, it has clear incentives to ally with other "bad pupils" to agree not to vote against each other. If the proportion of bad pupils in the Council reaches a critical level, their votes can be sufficient to gather a blocking minority.

An important twist to the story concerns the role of information in the European-level game. If it were clear who runs a large deficit and who does not, the coordination among the Member States on whether to implement the sanctions under the Pact or not would be clear. Moreover, there would be no role for a watchdog. Yet a watchdog may be relevant for providing information for two reasons. First, Member States probably do not have complete information about the developing fiscal situations in other countries, whereas a European watchdog may have better information about the fiscal situation in each country than the other countries. Second and more importantly, it is the watchdog that decides whether to begin a process of identifying a country as having an excessive deficit in the first place.[5] It also is the actor that recommends that a sanction be imposed. In close cases, Member States presumably are uncertain whether the watchdog will propose that a given country has an excessive deficit. It is therefore important to model the decision of the watchdog to reveal its

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[5] The European Court of Justice reaffirmed the Commission's agenda-setting role on these matters in its decision on July 13, 2004.

information given that the overall proportion of "sinners" affects whether the Pact will be enforced or not.

We argue that strategic considerations explain a dilemma inherent in the surveillance process: signalling bad pupils can have counterproductive implications on the behaviour of other countries and therefore a strategic watchdog will choose to send signals only when it is certain that they will be effective.

The paper is organised as follows. We first model the relationship between a population and a government on fiscal policy choices, as well as the role of a watchdog at the national level (Section 2). The game changes under EMU (Section 3), as domestic fiscal developments may also trigger sanctions under the SGP. This may result in a trade-off for governments between complying with voters' preferences and European commitments. Furthermore, as governments look for signals what the others will do when deciding whether to "sin" themselves, the watchdog acts strategically: it sends signals when there are only a few sinners, but will want to leave the uncertainty in place when it knows that there are more potential sinners (Section 4). The last section concludes.

2 DOMESTIC FISCAL SURVEILLANCE

We begin the domestic discussion with a principal-agent framework[6] (Figure 1). The principal is the population of a given country. The agent is the government. The problem for voters is that they cannot observe whether the government is competent or not. We presume that incompetence leads to both lower growth and to a lower budget balance. More formally, one can think of y^* as the economic potential of a given country (e.g. on the basis of average observed growth rates in the past), R as the incompetence level, and $y = (1-R)y^*$ as the observed level of performance in a given electoral term.[7] This means that, if voters choose "wrong" and $R > 0$, the country will experience lower economic growth and lower budget balances. Note that the principal in this case does not directly observe R but only y. To simplify the model for now, we assume that governments come in two types, those with $R=0$ (i.e., competent) and those with $R > 0$ (i.e., incompetent). The government type is chosen by nature and does not change once the government is in office. [8]

The literature on economic voting (e.g., Fiorina 1981, Ferejohn 1986, Auberger and Dubois 2005) considers such a relationship between voter expectations on the economy and election results. It presumes that voters are retrospective. They observe the government's management of the economy. If the economy does well, they conclude that the government is competent and they re-elect it. If the economy does poorly, they conclude that the government is bad and they vote for the opposition.[9] In our model, voters begin at Stage 1 with ex ante belief α that

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[6] There are several principal-agent models for the European Union. For specifically fiscal policy issues modeled under the Stability and Growth Pact, see Schuknecht (2004), Schelkle (2005), and Hodson (2005).

[7] One simplification that we make at this point is that y reflects both the economic and budgetary performance of government. A dynamic extension of the model would require a more solid analysis of the link between the deficit and growth.

[8] There are several reasons why competence could vary, but for now all that matters is that governments vary on competence and nature chooses the level of competence in any given case. A future paper could treat the level of R as a choice variable for the government rather than one chosen by nature.

[9] One can think of the application of this general model to topics beyond economic voting. In the American mid-term elections of 2006, there was a public debate about whether the government competently executed policy in Iraq. The Republican leadership argued that external shocks, such as the presence of Al Queda terrorist cells,

the government is competent and $1-\alpha$ that it is not – namely, $P(R=0)=\alpha$ and $P(R>0)=1-\alpha$.[10]

Figure 1. The domestic game
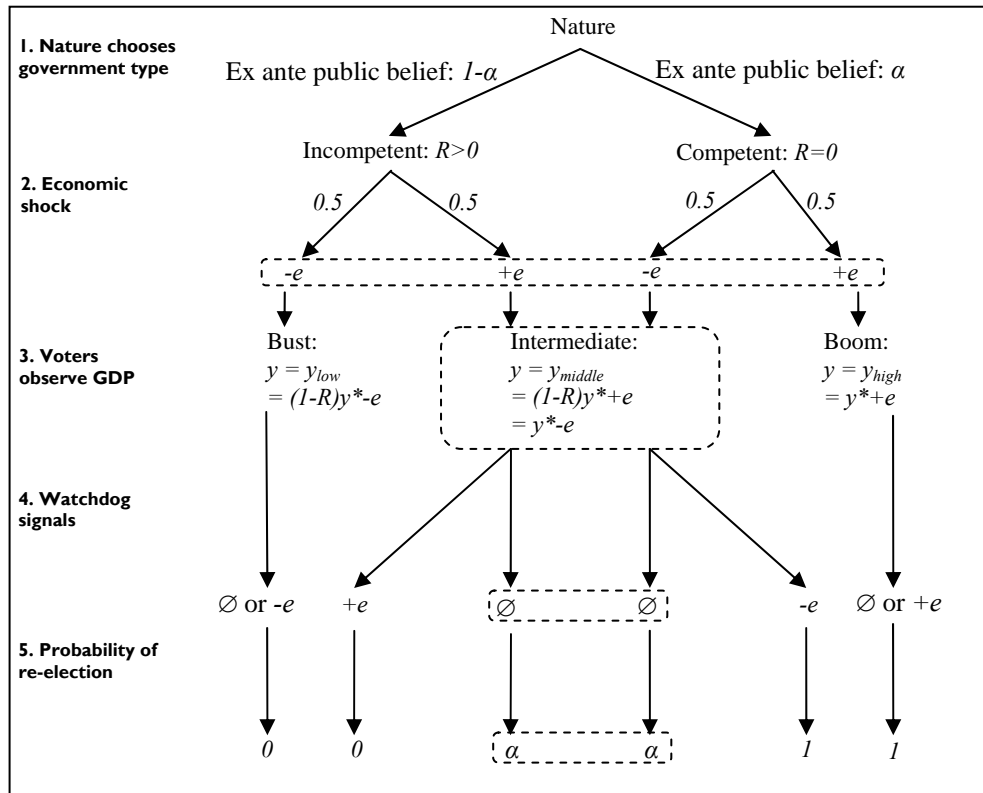
One important complication that some retrospective models ignore is that governments do not have complete control over the economy. Recent work (Duch and Stevenson 2006; Hellwig and Samuels forthcoming) suggests that economic voting may decline as the share of the international component of a given economy increases, while others (Alesina and Rosenthal 1995; Duch and Stevenson 2006, 2007) consider governments that experience both "exogenous" and "competency" shocks when making economic policy. In a similar spirit to the previous models, we presume that $y = (1-R)y^* + \varepsilon$, so that there is some random error ε that appears as part of the estimation of y. For simplicity, we assume that there are only two types of shocks, negative and positive: $\varepsilon = \{-e, +e\}$, with each having an equal probability of occurring.[11] Competent governments have an edge over incompetent ones, but random shocks mean that the outcomes that voters observe are not always clear. Specifically, we consider three cases: y_{high} when there is a boom, y_{middle} when economic performance is intermediate, and y_{low} when there is a bust, and we presume that competent governments have

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were responsible for the increase in violence in Iraq. The Democrats just as strenuously argued that the root cause of the deterioration of the situation was due to incompetence.

[10] Because this paper focuses on the strategic interaction of governments and a watchdog, we do not model strategic voters.

[11] This model is also similar to Debrun and Kumar (2006). In their model, governments suffer random failures in the provision of public goods. They also have some unobserved level of competence. Populations observe only fiscal outcomes, not the level of competence or the possible provision failure. They then derive optimal fiscal rules in this context, and in particular they suggest that a country-contingent deficit rule would be desirable.

only two outcomes, booms and intermediate performance, while incompetent governments have two potential outcomes, intermediate performance and bust.[12] Intermediate performance may result either from a competent government experiencing a negative shock, or an incompetent government with a positive shock: $y_{middle} = y^* - e = (1-R)y^* + e$. Voters do not observe the shock. They do, however, observe economic performance, and they know that the conditional probabilities for each value of y given the type of government are:

$$P(y = y_{low} \mid R = 0) = P(y = y_{high} \mid R > 0) = 0$$
$$P(y = y_{middle} \mid R = 0) = P(y = y_{high} \mid R = 0) = P(y = y_{low} \mid R > 0) = P(y = y_{middle} \mid R > 0) = \tfrac{1}{2}$$

One can now estimate the probability that a given government will be re-elected. While the economic voting literature notes simply that the probability of re-election increases with macro-economic health, we simplify these findings into a presumption that voters decide a government is competent in boom times and incompetent during busts. Indeed, in the model re-election depends on the voters' updated beliefs on the government's type. The probability of re-election is equal to the probability that voters attribute to the competent type after observing the level of GDP. If there is a bust, voters know that the government can only be incompetent and they dump it. Conversely, if there is a boom, the government can only be competent and it is re-elected. In the intermediate case, the level of economic performance does not bring any new information to voters and therefore the government is re-elected with probability α.

In other terms, booms or busts fully reveal the government's type, while at intermediate levels of performance, voters cannot deduce the government's type. It could be that a competent government experienced a negative shock or that an incompetent government experienced a positive shock. This means that voters may potentially keep incompetent governments that get lucky and vote out competent governments because of a negative exogenous shock.

An addition to the existing literature our model provides is the consideration of possible watchdogs. Such bodies could provide signals that help voters reveal the true type of government under intermediate economic performance. In terms of the model, voters lack the private information that the government has about its type, but there may be others who can provide useful information. In particular, it is possible for a watchdog to tell whether a shock is positive or negative. This in turn allows voters to conclude correctly the type of government in office. The relevance of the signal in practice depends upon the credibility of the sender in the eyes of the voter. Opposition leaders are expected to signal that shocks are positive, so even if they have accurate information their signal is not, by itself, persuasive. Similarly, the government spokesperson is expected to send signals that the economic shock is negative and will also not be believed. An unbiased sender, however, will be believed. Here, we suppose that if there is a watchdog, it is assumed to be unbiased and voters take its signal at face value. The watchdog's signal in case of a boom or a bust brings no new information to voters. However, in the intermediate case, if there is a signal, the probability of re-election becomes 1 if the signal is $-e$ and 0 if the signal is $+e$.

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[12] One could also assume probabilities of all three economic outcomes to both types of government. A competent government could experience a disastrous shock that leads to a bust, while an incompetent government could be so fortunate that it experiences a boom despite rent-seeking. These events would be rare, however, and would complicate the model without leading to any new insights.

Multilateral fiscal surveillance under the SGP introduces another level to the game. In the next two sections, we consider how it affects the strategies of governments and the watchdog.

3 MULTILATERAL FISCAL SURVEILLANCE

3.1 Presentation of the intergovernmental game

There are several key changes to the game when one adds a European level. In particular, the SGP establishes a framework that considers the fiscal performance of Member States. All models require simplification of the world, and we must leave out some details to make the model tractable. There is one dynamic that is crucial to the operationalization of the SGP, and for explaining the two stylized facts above – namely that the number of countries with excessive deficits has increased and it is disproportionately the large countries that have not been complying. While the watchdog sends the signal about a given country's finances, the Member States themselves (with the exception of the one Member State under consideration at a given point in time) determine whether sanctions will be applied. Furthermore, the SGP focuses on deficit levels. The budget balance is not only considered as an indicator of the government's economic performance but also as a criterion *per se*, and under the Pact a government can be punished for having an excessive deficit.

The first consequence of this focus on deficits is that the preferences of voters regarding the budget balance matter. How do populations view deficits? There is no cross-national study we know of that measures empirically the position of populations on deficits, but presumably populations may differ in their relative aversion to deficits.[13] We add a preliminary stage to the game (Stage 0) where Nature determines whether a population is Keynesian or Ricardian[14]. The population may expect fiscal deficits to be necessary to pick up economic growth, and it will reward governments that execute such policies. For exposition purposes, we consider such populations "Keynesian." A "Ricardian" population, in contrast, punishes governments that run large deficits. There are other intuitive ways one can think about these population types,[15] but the key is simply that populations differ on the desirability of the government to run deficits.

The second change is to evaluate what happens at the European level. Under the SGP, governments are required to monitor their budgets closely and the ECOFIN Council can choose to punish countries that have excessive deficits. This is reflected in the addition of an intergovernmental sub-game at Stage 6 of the game. We discuss how a government decides

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[13] One extension of the model would be to think of the "population" here as the median voter, and to consider populations with some proportion Keynesian and the remaining proportion Ricardian. These proportions would vary across countries and could also change over time in a dynamic model.

[14] For the time being, this is assumed to be known to all players. An interesting extension of the game could make the information on public opinion private to its own government.

[15] A "Ricardian" public opinion could also simply be in favour of the SGP. A public opinion that is reluctant to have high deficits because it expects that future taxes will increase would back the Pact. It can also be because the public opinion is particularly concerned about credibility issues (of government, of EMU, of the SGP). A "Keynesian" public opinion, in contrast, expects the government to implement an expansionary fiscal policy regardless of the Pact. Such a public opinion may be hostile to European sanctions if they reduce fiscal margins of manoeuvre and may encourage the government to breach the Pact. While we do not know of direct public opinion evidence for deficits, Scheve (2004) indicates that populations do differ systematically in their relative acceptance of inflation, with those found in countries with large financial sectors and with more past experience with price volatility the most inflation-averse.

whether to initiate a fiscal impulse and how the European-level sub-game affects the odds of its re-election. We also model how the ECOFIN Council decides on the implementation of sanctions, based on the assumption that the degree of toughness in the implementation of the SGP depends on the number of governments that comply with it. If there are few sinners, the Council will sanction them, and governments have a reason to consolidate their budgets. If several countries, and especially the large ones, deviate simultaneously, the implementation of sanctions is likely to be much milder. This is due to the decision-making process at the ECOFIN Council: although a country facing sanctions is not allowed to take part in the vote on its own case, it has clear incentives to ally with other "bad pupils" to agree not to vote against each other. If the proportion of bad pupils in the euro area reaches a critical level, their votes can be sufficient to gather a blocking minority.

Figure 2 below provides the complete game tree. The introduction of the intergovernmental sub-game has several implications for voters and governments. First, in the EMU context, the probability of re-election at Stage 5 is transitory, because it only depends on voters' beliefs on the government's type. The final probability of re-election, which voters calculate at Stage 7, also depends on the government's decision in the intergovernmental sub-game at Stage 6. Therefore, in the intergovernmental sub-game, governments need to consider how their decision on an additional fiscal impulse affects their final probability of re-election compared to Stage 5.
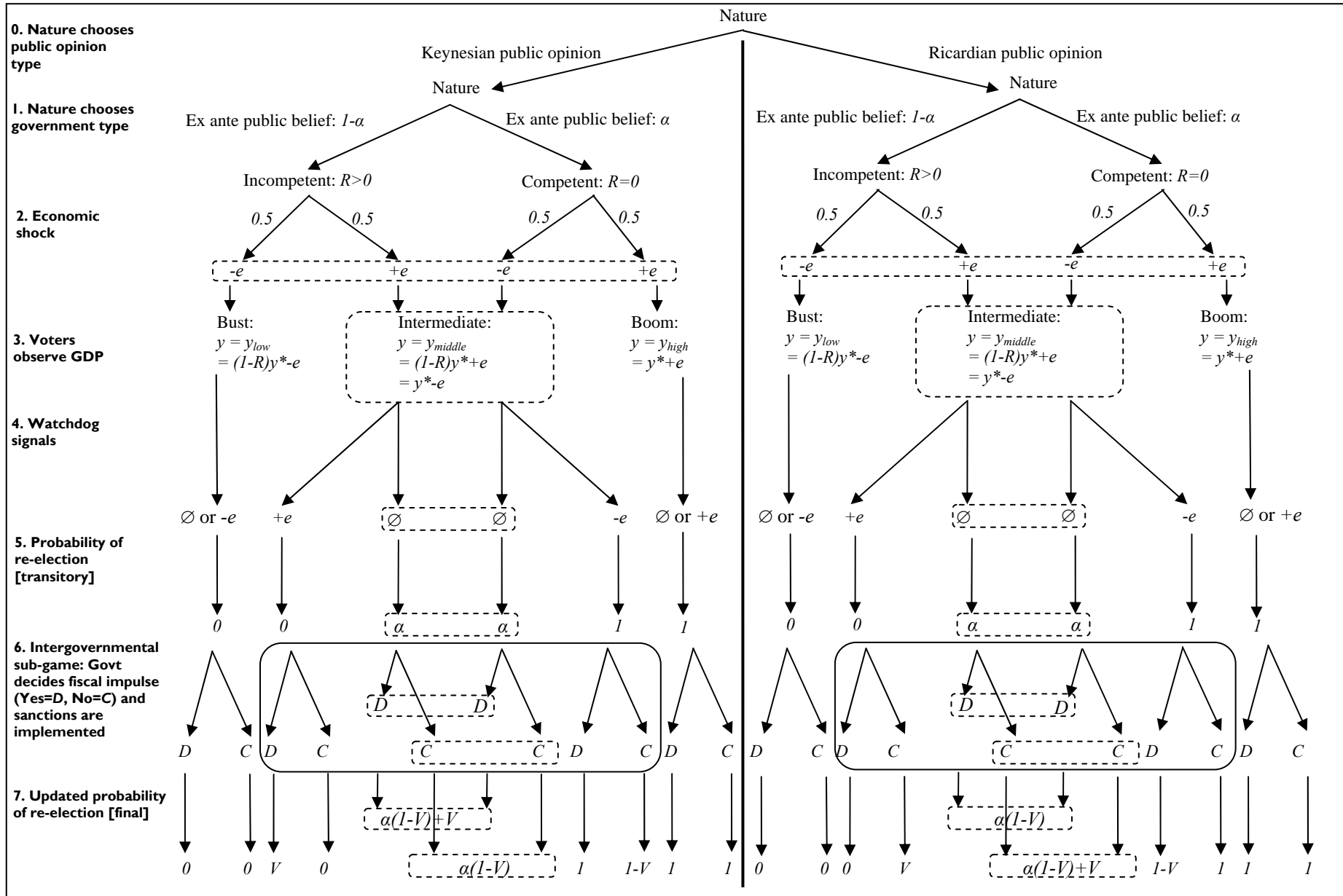
Following backward induction, we start to solve the SGP game by looking at Stages 6 and 7 in this section. We presume that in EMU voters still take the watchdog's signal at face value at Stage 5, as they are not aware of the intergovernmental game and its implications on the watchdog's signalling strategy (Stage 4), which we will discuss in Section 4.

The remainder of this section walks the reader through the intergovernmental sub-game. The overall message is intuitive. If voters in a given country want a balanced budget badly enough, they simply get it. If populations want fiscal impulses, the outcome depends upon several factors – the underlying distribution of Keynesian and Ricardian populations, the behaviour of other governments and whether governments care more about voters support or the overall cost of sanctions. Because of the political game in the ECOFIN Council, governments look for signals about whether other governments will comply with the Pact or defect. In some cases, if they know that enough of them will not comply and can constitute a blocking majority, they will not comply either.

3.2   The intergovernmental game with two players

At Stage 6, what influences a government's decision to either implement measures to avoid an excessive deficit or, on the contrary, provide an additional fiscal impulse and go further into deficit?

Figure 2. The multilateral fiscal game

Nature

0. Nature chooses public opinion type

Keynesian public opinion — Ricardian public opinion

Nature — Nature

1. Nature chooses government type

Ex ante public belief: $1-\alpha$ — Ex ante public belief: α — Ex ante public belief: $1-\alpha$ — Ex ante public belief: α

Incompetent: $R>0$ — Competent: $R=0$ — Incompetent: $R>0$ — Competent: $R=0$

2. Economic shock

0.5 — 0.5 — 0.5 — 0.5 — 0.5 — 0.5 — 0.5 — 0.5

$-e$ — $+e$ — $-e$ — $+e$ — $-e$ — $+e$ — $-e$ — $+e$

3. Voters observe GDP

Bust:
$y = y_{low}$
$= (1-R)y^*-e$

Intermediate:
$y = y_{middle}$
$= (1-R)y^*+e$
$= y^*-e$

Boom:
$y = y_{high}$
$= y^*+e$

Bust:
$y = y_{low}$
$= (1-R)y^*-e$

Intermediate:
$y = y_{middle}$
$= (1-R)y^*+e$
$= y^*-e$

Boom:
$y = y_{high}$
$= y^*+e$

4. Watchdog signals

$\varnothing$ or $-e$ — $+e$ — $\varnothing$ — $\varnothing$ — $-e$ — $\varnothing$ or $+e$ — $\varnothing$ or $-e$ — $+e$ — $\varnothing$ — $\varnothing$ — $-e$ — $\varnothing$ or $+e$

5. Probability of re-election [transitory]

0 — 0 — α — α — 1 — 1 — 0 — 0 — α — α — 1 — 1

6. Intergovernmental sub-game: Govt decides fiscal impulse (Yes=D, No=C) and sanctions are implemented

D — D

D — C — D — C — C — C — D — C — D — C — D — C — D — C — C — C — D — C — D — C

7. Updated probability of re-election [final]

$\alpha(1-V)+V$ — $\alpha(1-V)$

0 — 0 — V — 0 — $\alpha(1-V)$ — 1 — $1-V$ — 1 — 1 — 0 — 0 — 0 — V — $\alpha(1-V)+V$ — $1-V$ — 1 — 1 — 1

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The government's strategy in this sub-game depends on four factors. First, they consider their own budget decisions. At the European level, there are two possible actions – the government decides to have an additional deficit (*D*) or it complies with the SGP (*C*). Second, they consider the cost of sanctions (*S*) that come from the SGP if they choose *D*. Third, the government considers what other governments are doing. If enough of the others will choose *D* as well, the sanction from the SGP will not be imposed. Finally, the government considers the reaction of public opinion and how this reaction affects its electoral chances. Its decision regarding the fiscal impulse may have a positive or negative impact (*V*) on its chances of reelection compared to what they were at Stage 5.

Whatever the type of public opinion, there are no changes to the probability of re-election under booms or busts, as voters have such a clear-cut opinion on the government that they will always re-elect it or dump it regardless of its decision.[16] So the interesting case is again the intermediate one. Therefore the governments that we model below are supposed to have had an intermediate economic performance.

We assume that Keynesian public opinions would consider an additional deficit economically efficient and therefore would expect the government to initiate a fiscal impulse. So in the case of intermediate performance, even if a watchdog has signaled a positive economic shock, an incompetent government could improve its image in the eyes of a Keynesian population by playing *D*, thus raising its chances of reelection from *0* to *V* (where $V \in [0,1]$). On the other hand, a competent government experiencing a negative shock and yet complying with the Pact – i.e. playing *C* – would be punished for not supporting the economy and the odds of its re-election would fall from *1* to *1-V*.
Conversely, a Ricardian public opinion would reward an incompetent government playing *C* for not making the deficit worse than it already is, but would punish a competent government playing *D* for deepening the deficit.
When there is no signal, the probability of re-election is the average of the odds for both types of government weighted by their respective probability. If the population is Keynesian and the government plays *D*, its chances of re-election are *(1- α)V + α.1 = V + α(1-V)* and if it plays *C*, they are *(1- α).0 + α(1-V) = α(1-V)*. If the population is Ricardian, a government playing *D* will be re-elected with probability *(1- α).0 + α(1-V) = α(1-V)* and one playing *C* with probability *(1- α)V + α.1 = V + α(1-V)*.

In all the above cases, when the economic performance is intermediate, regardless of the economic shock and the voters' information, the difference in probability of re-election for the government between playing *C* and *D*, in absolute terms, is *V*. Hence, let *-V* denote the cost of going counter to voter preferences.
In the payoffs matrices below, we presume that the odds of re-election increase by V/2 if the government adopts a budgetary position consistent with the underlying population type and decrease by V/2 otherwise. The players' strategies would be exactly the same if the payoffs had been *0* and *-V*, *V* and *0* or any other intermediate combination: what matters is that the difference in terms of public support between playing *C* or *D* is always *V* (or *-V*).
If populations are completely indifferent about what governments do on budgets, V is equal to zero and the game reduces to the one in Figure 1.

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[16] We can assume that if there is a bust, it is likely that there is also a large deficit and that voters will always want to get rid of the government. Conversely, a large deficit is highly unlikely if there is a boom, and voters will nearly always be satisfied with the government. As a result, the extreme cases are trivial.

V is the election component of governments' payoffs. Furthermore, there is a second component that measures the cost of sanctions under the SGP:

$$\begin{cases} 0 \text{ if the government complies or if sanctions are not implemented} \\ -S \text{ otherwise} \end{cases}$$

Thus $-S$ is the cost of breaching the SGP if sanctions are implemented. By assumption, S is strictly positive. Note that a government with a budgetary surplus does not get any reward on the basis of the SGP. It may, however, be rewarded in terms of public opinion.

S partly reflects the level of financial sanctions under the SGP. It is, however, a broader concept. There may be clear reputation costs both to voters and to markets for violating the Pact. One can also imagine that ratings services could downgrade the value of a Member State's credit rating. S represents the overall cost of sanctions. Because S measures a threat, it is of the same order of magnitude as V, so that both parameters are homogeneous.[17]

We begin with a two-player game and present later a three-player version. In the two-player game, it is assumed that if only one government breaches the SGP, sanctions are applied, whereas if both governments are deviant, sanctions are blocked. Three settings are then possible, according to what types of public opinion prevail: two Ricardian public opinions, two Keynesian public opinions, or one of each type.

A Ricardian public opinion prefers the government to comply with the SGP, so it grants the government a positive payoff if it is in line with the SGP (C) and a negative payoff if it has a large deficit (D). The reaction of the Keynesian public opinion to compliance and deviance from the SGP is opposite to that of the Ricardian public opinion: it prefers the government to breach the SGP, so it gives the government a negative payoff if it is in line with the SGP (C) and a positive payoff if it has an large deficit (D).

Figure 3. Payoff matrices with at least one Ricardian public opinion

3.a. Two Ricardian public opinions   **3.b. Ricardian voters in country 1, Keynesian voters in 2**

If public opinions in both countries are favourable to the SGP (Figure 3.a), a government never has incentives to deviate from the rule because it would receive negative payoffs at least from public opinion and possibly also from the implementation of sanctions. The incentives coming from both voters and the SGP operate in the same direction. The Nash equilibrium is that both governments comply with the SGP.

In Figure 3.b, the first government (actions in rows) faces a Ricardian public opinion and the second government (actions in columns) a Keynesian public opinion. The government whose public opinion is reluctant to have a deficit never has an incentive to deviate from the SGP in this game. Note that the government whose public opinion requires an expansionary fiscal

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[17] In the model these parameters are static, but in a dynamic model they could of course vary over time.

policy even if it implies to breach the Pact is better off with a large deficit if sanctions are not implemented – but this is unlikely here, as the other government faces a Ricardian public opinion and will not run a high deficit. If sanctions are applied, the government in a Keynesian country may still have an incentive to breach the SGP provided that sanctions are low or that the public opinion reward is high enough to overcome the cost of sanctions, i.e. if $-V/2 < V/2-S$, or $V/S > 1$.

At this point, it is important to stress that the ratio V/S is the key parameter in this game, because it measures the relative importance of the voter reward compared to the European sanction. When deciding whether to comply with the Pact, governments face a trade-off between voter support (V) and threat of sanction (S). If V/S is high, governments have a higher incentive to follow first and foremost the preferences of voters. If V/S is low, the cost of possible sanctions is so high that governments may choose to go counter to the preferences of public opinion. We will see in the remainder of the paper that V/S also affects the equilibria and the watchdog's strategy.

As complying is always a dominant strategy for governments facing Ricardian populations, they never have an incentive to deviate. Let us therefore focus on the less straightforward interaction between two governments with Keynesian populations.

The outcome depends again on the relative levels of S and V. It may not be clear whether a government is better off complying or deviating when the other government is complying, especially if V is unobservable. However, if one government expects the other will breach the Pact, it will decide to deviate as well. In this setting, expectations are very important. Importantly, this situation results in self-fulfilling prophecies: if government 1 expects that government 2 will deviate, it will choose to deviate too, which in turn will lead government 2 to deviate.

When governments play mixed strategies, let p denote the probability that government 1 plays C, q the probability that government 2 plays C, and $u_i(.)$ the expected payoff of government i for a given action.

The expected payoffs of government 1 are as follows:

$$u_1 (C) = -V/2$$
$$u_1 (D) = q(V/2 - S) + (1-q)V/2 = V/2 - qS$$

If government 1 deviates, it always receives support from the population ($V/2$) and it has to bear the cost of a sanction S when government 2 complies, which happens with probability q.

Government 1 plays C if it yields a higher expected payoff:

$$-V/2 > V/2 - qS$$
$$\text{i.e. } q > V/S.$$

As the game is symmetric, similarly, government 2 plays C if $p > V/S$.

This is typically a coordination game whereby players are better off when they act similarly. Being the only one to defect is costly, so each government defects only if the probability that the other government defects too is high enough. Indeed, while choosing to defect has a favourable impact in terms of public opinion support, it can also imply a costly sanction if the other government does not defect. If the probability that the other government defects is high, the implementation of a sanction is less likely and is overcome by the gain from public opinion. Conversely, the higher the cost of the sanction and the lower the stake regarding public opinion, the more governments are willing to comply.

We can compute the game's best-response correspondences:

$$p^*(q) = \begin{cases} 0 & \text{if } q < V/S \\ [0,1] & \text{if } q = V/S \\ 1 & \text{if } q > V/S \end{cases} \qquad q^*(p) = \begin{cases} 0 & \text{if } p < V/S \\ [0,1] & \text{if } p = V/S \\ 1 & \text{if } p > V/S \end{cases}$$

The equilibria depend on the relative values of V and S (see proofs in Appendix 1).

Voter support matters more than international sanctions (V/S > 1)

The conditions $p<V/S$ and $q<V/S$ always hold. In consequence, there is only one equilibrium: *(p*=0, q*=0)*, meaning that all governments choose to have a large deficit.
Note that, in this case, if the amount of the sanction is low compared to the stakes in terms of public opinion, governments always have an incentive to have a high deficit. As a result, both governments deviate and avoid sanctions.

Voter support matters as much as international sanctions (V/S = 1)

The best responses are:

$$p^*(q) = \begin{cases} 0 & \text{if } q < 1 \\ [0,1] & \text{if } q = 1 \end{cases} \qquad q^*(p) = \begin{cases} 0 & \text{if } p < 1 \\ [0,1] & \text{if } p = 1 \end{cases}$$

As soon as there is a positive probability that the other government deviates, governments choose to deviate. In this case, there are two equilibria: *(p*=0, q*=0)* and *(p*=1, q*=1)*.

Voter support matters less than international sanctions (0 < V/S < 1)

This is the most general case. The above equilibria, *(p*=0, q*=0)* and *(p*=1, q*=1)*, are also equilibria in this case: governments either all comply or all deviate.
Furthermore, there is also a mixed-strategy equilibrium: *(p*=V/S, q*=V/S)*.

Voter support does not matter (V = 0)

This implies that V/S = 0 and that best responses are as follows:

$$p^*(q) = \begin{cases} [0,1] & \text{if } q = 0 \\ 1 & \text{if } q > 0 \end{cases} \qquad q^*(p) = \begin{cases} [0,1] & \text{if } p = 0 \\ 1 & \text{if } p > 0 \end{cases}$$

The payoff matrix is now:

		2		
		C	D	
1	C	0, 0	0, -S	*p*
	D	-S, 0	0, 0	*1-p*
		q	*1-q*	

Each government can intend to defect only if it is certain that the other government will defect too. Once again, there are two equilibria: *(p*=0, q*=0)* and *(p*=1, q*=1)*.

3.3   *The intergovernmental game with three players*

We now turn to the three-player game, where the implementation of sanctions on sinners depends on the proportion of sinners. If only one player breaches the Pact, it is sanctioned; if two or three players have high deficits, they can block sanctions.

The three-player game can be considered as a proxy for qualified majority voting, if one thinks of players not as single governments, but as groups of governments. One player would be smaller than a blocking minority, two players a group at least as large as a blocking minority or a winning majority, and three players would be unanimity. Adding more players would increase formal complexity with little gain in insight and realism.

3.3.a.   The game with Keynesian and Ricardian public opinions

The case of one Keynesian population (government 1) and two Ricardian populations (governments 2 and 3) is trivial (see below). Complying is always a dominant strategy for both Ricardian countries, so the options for the Keynesian country are simply either to comply or to have a high deficit and be sanctioned. The solution depends on the comparison between -*V/2* and *V/2 - S*, i.e. between *V* and *S* as previously.

		2	
		C	D
1	C	-V/2, V/2, V/2	-V/2, -V/2-S, V/2
	D	V/2-S, V/2, V/2	V/2, -V/2, V/2
		3 = C	

		2	
		C	D
1	C	-V/2, V/2, -V/2-S	-V/2, -V/2, -V/2
	D	V/2, V/2, -V/2	V/2, -V/2, -V/2
		3 = D	

Let us now consider a three-player game in which two governments face Keynesian public opinions and one (government 3) faces a Ricardian public opinion.

The payoff matrix is:

		2		
		C	D	
1	C	-V/2, -V/2, V/2	-V/2, V/2-S, V/2	*p*
	D	V/2-S, -V/2, V/2	V/2, V/2, V/2	*1-p*
		q	*1-q*	
		3 = C *r*		

		2		
		C	D	
1	C	-V/2, -V/2, -V/2-S	-V/2, V/2, -V/2	*p*
	D	V/2, -V/2, -V/2	V/2, V/2, -V/2	*1-p*
		q	*1-q*	
		3 = D *1-r*		

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C is a strictly dominant strategy for government 3 ($V/2 > -V/2$ and $V/2 > -V/2-S$) so the government with a Ricardian public opinion always plays *C*: $r^* = 1$ for any strategies of governments 1 and 2, where *r* is the probability that government 3 complies.

Therefore, the game is reduced to a 2-player game with Keynesian public opinions, as studied above. For governments with Keynesian public opinions, the strategy of the Ricardian country is not an issue, as they know with certainty that they will comply. In consequence, they anticipate the action of the other Keynesian country.

3.3.b. The game with only Keynesian public opinions

If all populations are Keynesian, the payoff matrix is:

		2					2		
		C	D				C	D	
1	C	-V/2, -V/2, -V/2	-V/2, V/2-S, -V/2	*p*	1	C	-V/2, -V/2, V/2-S	-V/2, V/2, V/2	*p*
	D	V/2-S, -V/2, -V/2	V/2, V/2, -V/2	*1-p*		D	V/2, -V/2, V/2	V/2, V/2, V/2	*1-p*
		q	*1-q*				*q*	*1-q*	
		3 = C *r*					3 = D *1-r*		

The expected payoffs of government 1 are as follows:

$$u_1 (C) = -V/2$$
$$u_1 (D) = qr(V/2 - S) + (1-q)rV/2 + (1-r)V/2 = V/2 - qrS$$

As in the two-player game, when government 1 defects, it receives *V/2* from the population, and the sanction *S* is implemented provided that both governments 2 and 3 comply, which happens with probability *qr*.

Government 1 plays *C* if it yields a higher expected payoff:

$$-V/2 > V/2 - qrS$$
$$\text{i.e. } qr > V/S.$$

As the game is symmetric, similarly, government 2 plays C if *pr > V/S* and government 3 plays C if *pq > V/S*.

As previously, this is a problem of coordination. This time, each government has to anticipate the behaviour of the other two governments, so it needs to calculate the product of probabilities that each of them complies. Note that the amount of information a player needs is greater in this case because the player must anticipate what two (rather than just one) player will do.

Once more, the equilibria depend on the relative importance of voter support and the cost of sanctions under the SGP. Appendix 2 presents the proofs and discussions for the different possible situations. A summary of the best responses and equilibria in the two- and three-players cases with Keynesian populations appears in Table 1. Graph 2 presents the equilibria in the three-player case.

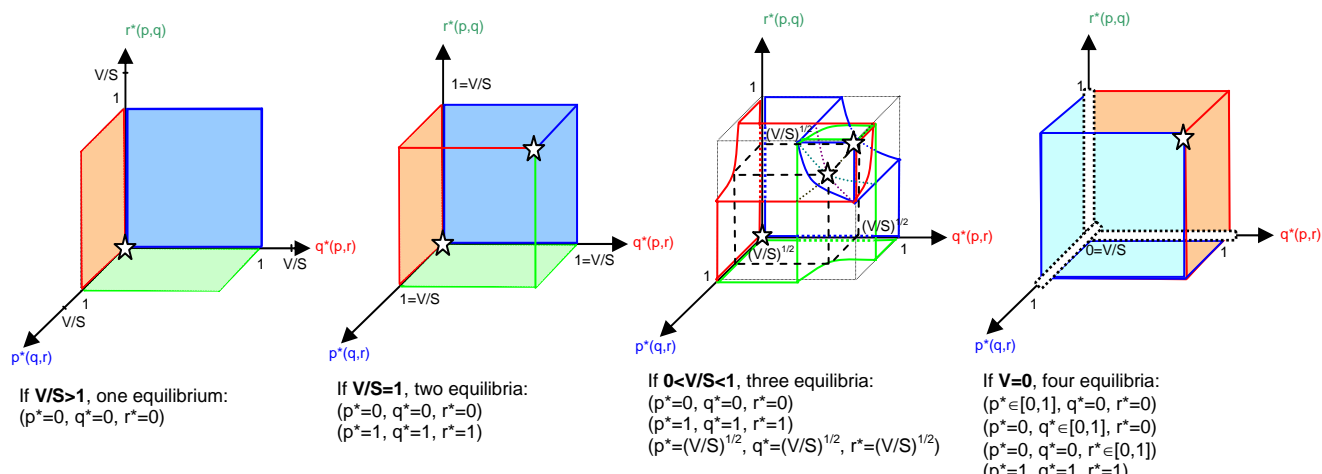## 3.4 Interpretation of the intergovernmental game

We have identified two sources of possibly conflicting incentives: incentives coming from voters (measured by V) and incentives resulting from the threat of sanctions under the SGP (measured by S). If voters are in favour of fiscal impulses and the electoral stakes are more pressing than the threat of sanctions under the SGP, then the incentives to breach the Pact are high. This is the case, for instance, just before an election (V high), or if the credibility associated to the financial and reputation cost of sanctions is low (S low).

Table 1. Overview of best responses and equilibria in two- and three-player games

(p, q, r : probability that government 1, 2, 3 complies with the SGP)

	Two gov'ts with Keynesian populations + possibly a government with a Ricardian population always playing r*= 1	Three gov'ts with Keynesian populations
$V/S > 1$	$p^*(q) = 0$ for all q $q^*(p) = 0$ for all p	$p^*(q,r) = 0$ for all q,r $q^*(p,r) = 0$ for all p,r $r^*(p,q) = 0$ for all p,q
	Eq.: (p*= q*= 0)	**Eq.: (p*= q*= r*= 0)**
$V/S = 1$	$p^*(q) = \begin{cases} 0 & if\ q < 1 \\ [0,1] & if\ q = 1 \end{cases}$ $q^*(p) = \begin{cases} 0 & if\ p < 1 \\ [0,1] & if\ p = 1 \end{cases}$	$p^*(q,r) = \begin{cases} 0 & if\ qr < 1 \\ [0,1] & if\ qr = 1 \end{cases}$ $q^*(p,r) = \begin{cases} 0 & if\ pr < 1 \\ [0,1] & if\ pr = 1 \end{cases}$ $r^*(p,q) = \begin{cases} 0 & if\ pq < 1 \\ [0,1] & if\ pq = 1 \end{cases}$
	Eq.: (p*= q*= 0), **(p*= q*= 1)**	**Eq.: (p*= q*= r*= 0),** **(p*= q*= r*= 1)**
$0 < V/S < 1$	$p^*(q) = \begin{cases} 0 & if\ q < V/S \\ [0,1] & if\ q = V/S \\ 1 & if\ q > V/S \end{cases}$ $q^*(p) = \begin{cases} 0 & if\ p < V/S \\ [0,1] & if\ p = V/S \\ 1 & if\ p > V/S \end{cases}$	$p^*(q,r) = \begin{cases} 0 & if\ qr < V/S \\ [0,1] & if\ qr = V/S \\ 1 & if\ qr > V/S \end{cases}$ $q^*(p,r) = \begin{cases} 0 & if\ pr < V/S \\ [0,1] & if\ pr = V/S \\ 1 & if\ pr > V/S \end{cases}$ $r^*(p,q) = \begin{cases} 0 & if\ pq < V/S \\ [0,1] & if\ pq = V/S \\ 1 & if\ pq > V/S \end{cases}$
	Eq.: (p*= q*= 0), **(p*= q*= 1),** **(p*= q*= V/S)**	**Eq.: (p*= q*= r*= 0)** **(p*= q*= r*= 1)** **(p*= q*= r*= $\sqrt{V/S}$), with $\sqrt{V/S} > V/S$**
$V = 0$	$p^*(q) = \begin{cases} [0,1] & if\ q = 0 \\ 1 & if\ q > 0 \end{cases}$ $q^*(p) = \begin{cases} [0,1] & if\ p = 0 \\ 1 & if\ p > 0 \end{cases}$	$p^*(q,r) = \begin{cases} [0,1] & if\ qr = 0 \\ 1 & if\ qr > 0 \end{cases}$ $q^*(p,r) = \begin{cases} [0,1] & if\ pr = 0 \\ 1 & if\ pr > 0 \end{cases}$ $r^*(p,q) = \begin{cases} [0,1] & if\ pq = 0 \\ 1 & if\ pq > 0 \end{cases}$
	Eq.: (p*= q*= 0) **(p*= q*= 1)**	**Eq.: (p*= q*= r*= 1)** **(p*≥ 0, q*= r*= 0)** **(p*= 0, q*≥ 0, r*= 0)** **(p*= 0, q*= 0, r*≥ 0)**

Graph 2. Equilibria with three Keynesian public opinions

If **V/S>1**, one equilibrium:
(p*=0, q*=0, r*=0)

If **V/S=1**, two equilibria:
(p*=0, q*=0, r*=0)
(p*=1, q*=1, r*=1)

If **0<V/S<1**, three equilibria:
(p*=0, q*=0, r*=0)
(p*=1, q*=1, r*=1)
(p*=(V/S)$^{1/2}$, q*=(V/S)$^{1/2}$, r*=(V/S)$^{1/2}$)

If **V=0**, four equilibria:
(p*∈[0,1], q*=0, r*=0)
(p*=0, q*∈[0,1], r*=0)
(p*=0, q*=0, r*∈[0,1])
(p*=1, q*=1, r*=1)

The second lesson from the intergovernmental game is the importance of expectations on what the other governments are doing. The problem for a government with a Keynesian population is that it does not want to be the only sinner. If the other governments seem to comply, it has an incentive to comply too. But any sign that a sufficient share of countries will deviate creates an incentive to deviate as well. In the two-country game, each government needs to guess what the other government will do; in the case of more players, each government needs to form expectations about all the other Member States.

Expectations are even more critical in the case of large Member States. Given the voting rule at the ECOFIN Council, the weight of larger countries is crucial to form a blocking minority. Information that the largest countries will record high deficits could be sufficient to insure that sanctions will not be implemented and incite more governments to deviate.

These outcomes capture well the two fore mentioned stylized facts: Germany, France and Italy have run high deficits simultaneously, which has also weakened the incentives for other countries to comply with the SGP, hence an increasing number of "sinners".

The strategies of governments in the intergovernmental sub-game underline the importance of expectations and asymmetric information. The next section investigates the implications for the watchdog's strategy.

4   THE WATCHDOG'S SIGNALLING STRATEGY

Going on with backward induction, this section now solves Stage 4 of the game. Here the watchdog has a strategic behaviour. In the purely domestic game, it had no reason not to send a true signal, whereas, as shown below, it may have incentives to remain silent in the multilateral game.

The domestic game indicated the benefit of having a watchdog provide clear signals about the nature of an economic shock. But the watchdog could also interfere in the intergovernmental game as it provides information about the intentions of the different governments to comply or not comply with the Pact. In the model, when there is a particularly large deficit, or when public finances are particularly sound, the information is known to all players. In borderline cases (i.e. intermediate performance), however, the watchdog has discretion. Under what circumstances would it send a signal that a given country will have difficulty complying?

Looking at the decision tree (Figure 2), let us consider for instance the case when the watchdog signals that a country that is likely to record a deficit around 3% of GDP (i.e. intermediate performance) has experienced a positive economic shock. The positive surprise on growth implies that the watchdog is likely to suggest sanctions if the deficit indeed reaches 3%, as there are no reasons to postpone sanctions on the ground of exceptional circumstances. Furthermore, as the signal is +e, voters will want to dump the government. The odds of re-election can however still be amended depending on the government's decision on the fiscal impulse. If voters are Keynesian, they will want the government to implement a fiscal impulse to improve growth. The government can only be re-elected if it goes further into deficit, and it will do so unless the threat of sanctions is so high that it more than offsets the cost of non re-election.

Let us work through different scenarios based on the reactions functions in Table 1 to determine the expected impact of signals on countries with Keynesian voters, from which we can deduce the watchdog's strategy when it internalizes the impact of its signals.

Signals are said to be *productive* if they incite governments to comply more than they would have in the absence of a signal. They are *counterproductive* if they have the opposite effect. They are *useless* if they do not affect the governments' budgetary decisions. The watchdog will want to send a signal only if it is productive.

If *voter support matters more than international sanctions (V/S > 1),* signals have no impact as all governments with Keynesian public opinions already know that they are all going to defect in the two- and three-player games. ***Signals are useless***.

If *voter support matters as much as international sanctions (V/S = 1)*, any signal that at least one of the other governments has a positive probability to defect leads all governments to defect as well. ***Signals are counterproductive.***

If *voter support matters less than international sanctions (0 < V/S < 1)*, governments may decide to comply with the SGP with probability 1 or at least with a positive probability provided that the probability that the other government(s) defect is low enough.
In the two-player game, signalling that the probability that one government defects is high (i.e. the probability that it complies is lower than V/S) incites the other government to defect with probability 1.
In the three-player game, even if there is a signal that one government has a high probability to defect, the uncertainty about the second government can still lead the third government to comply, and *vice versa*.
Signals are counterproductive in the two-player game. They may be productive in the three-player game provided that only one government is mentioned.

If *voter support does not matter (V = 0)*, all governments are likely to comply with a positive probability, if not with certainty. They will only defect with probability 1 if they find out that another government is going to defect with probability 1. ***Signals are counterproductive.***

We find that the one case when a signal may be productive is the three player game so long as only one player is mentioned. In all the other cases, signals are either useless or counterproductive. A signal on one country would not prevent defection, and it could even lead other countries to defect too. The implication is clear – if it wants to maximize the

chances of compliance with the Pact, paradoxically a strategic watchdog will provide few signals. There is a dilemma inherent in the surveillance process: signalling bad pupils can have counterproductive implications on the behaviour of other countries.

5   CONCLUSION

This paper analyses the strategy of a government facing both a domestic constraint and an international constraint. Starting with a purely domestic game, we assume that voters scrutinize the government's economic and budgetary performance and, on that basis, decide whether they want to re-elect it. When voters are imperfectly informed, an independent domestic watchdog can help them find out the type of government which is in office.
Moving on to the European level, governments are committed to fiscal discipline under the SGP. Multilateral surveillance implies that they can decide to punish governments found to record excessive deficits. This affects the strategies of governments and of the watchdog. There is now an intergovernmental game on top of the domestic games. On the one hand, governments seeking re-election may still have an incentive to overspend and go into deficit under pressure from voters, but on the other hand, running a large deficit may lead to costly sanctions at the international level. As a result, there is a trade-off between seeking voter support and compliance with European commitments. Sanctions, however, are voted by governments. One observation that emerges from past developments is that the implementation of the corrective arm of the SGP depends on the number of governments that comply with the Pact. Therefore governments look for signals what the others will do when deciding whether to "sin" themselves.

The question then becomes, under what circumstances would the watchdog want to send a signal about whether a given country is not complying with the Pact? Working through different scenarios, we find that, in all but one case, the signal is either useless or counterproductive. In most cases, a signal on one country would lead others to defect too. The implication is clear – if it internalizes the impact of its signals on the intergovernmental game, a strategic watchdog will provide signals when there are only a few sinners, but will want to leave the uncertainty in place when it knows that there are more potential sinners. The strategic behaviour means that under multilateral surveillance, a strategic watchdog provides information only when it is certain that its signal will be effective.

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Appendix 1: Proofs for the two-player game

Voter support matters as much as international sanctions (V/S = 1)

Let us assume that p = 1. The best response function of government 2 indicates q ∈ [0,1]. If q < 1, the best response of government 1 would be 0: contradiction. As a result, q = 1, which in turn implies p = 1.

Let us now assume that p < 1. We deduce from government 2's best response function that q = 0, which in turn implies p = 0.

Voter support matters less than international sanctions (0 < V/S < 1)

p = 1 ⇒ p > V/S ⇒ q = 1 ⇒ q > V/S ⇒ p = 1 and p = 0 ⇒ p < V/S ⇒ q = 0 ⇒ q < V/S ⇒ p = 0.

Proof for the mixed-strategy equilibrium:

Let us assume that p = V/S. The best response function of government 2 indicates q ∈ [0,1]. If q < V/S, the best response of government 1 would be 0: contradiction. If q > V/S, the best response of government 1 would be 1: contradiction. As a result, q = V/S, which in turn implies p = V/S for the same reasons.

Voter support does not matter (V = 0)

p = 1 ⇒ p > 0 ⇒ q = 1 ⇒ q > 0 ⇒ p = 1.

p = 0 $\Rightarrow$ q $\geq$ 0. If q > 0 then p = 1: contradiction. Consequently, q = 0, which in turn implies p = 0 for the same reasons.

Appendix 2: Proofs for the three-player game with only Keynesian public opinions

Voter support matters more than international sanctions (V/S > 1)

As *p < 1, q < 1* and *r < 1*, the conditions *qr < V/S, pr < V/S* and *pq < V/S* always hold. In consequence, there is a unique equilibrium: *(p*=0, q*=0, r*=0)*.

In this case, the stakes in terms of public opinion are so high relative to the level of the sanction that each government always has an incentive to have a high deficit. As a result, all governments deviate and avoid sanctions.

Voter support matters as much as international sanctions (V/S = 1)

The best responses are:

$$p^*(q,r) = \begin{cases} [0,1] & \text{if } qr = 1 \\ 0 & \text{if } qr < 1 \end{cases} \qquad q^*(p,r) = \begin{cases} [0,1] & \text{if } pr = 1 \\ 0 & \text{if } pr < 1 \end{cases}$$

$$r^*(p,q) = \begin{cases} [0,1] & \text{if } pq = 1 \\ 0 & \text{if } pq < 1 \end{cases}$$

As soon as there is a positive probability that at least one of the other governments deviates, governments choose to deviate with certainty. In this case, there are two equilibria: *(p*=0, q*=0, r*=0)* and *(p*=1, q*=1, r*=1)*.

Proof:

The condition *pr = 1* is equivalent to *p = r = 1* (and similarly for *qr = 1* and *pq = 1*).

Let us assume that *q = 1 and r = 1*. The best response function of government 1 indicates *p*$\in$ [0,1]*. If *p < 1*, then *pr < 1* and *pq < 1*. The best responses of governments 2 and 3 would be *q*=r*=0*: contradiction. As a result, *p = 1*, which in turn implies *p = 1 and r = 1*.

Let us now assume that *p < 1*, which implies *pr < 1* and *pq < 1*. We deduce from the best response functions of governments 2 and 3 that *q = 0 and r = 0*, which in turn implies *p = 0*.

Voter support matters less than international sanctions (0 < V/S < 1)

The above equilibria, *(p*=0, q*=0, r*=0)* and *(p*=1, q*=1, r*=1)*, are also equilibria in this case. Moreover, there is a third pure-strategy equilibrium: *(p*= $\sqrt{V/S}$, q*= $\sqrt{V/S}$, r*= $\sqrt{V/S}$)*.

Note that as *V/S < 1, $\sqrt{V/S}$ > V/S*.

Proof:

Let us assume that *p = 0. pq = 0 < V/S* implies *r = 0* and *pr = 0 < V/S* implies *q = 0*. Furthermore, *qr = 0 < V/S* implies *p = 0*. **Equilibrium:** *(p*=0, q*=0, r*=0)*.

Let us assume that *0 < p < V/S*. As *q $\leq$ 1, pq < V/S*, so *r = 0*, which implies *qr=0<V/S*, hence *p = 0*: contradiction.

Let us assume that *p = V/S*.

- If *q < 1, pq < V/S*, so *r = 0*, which implies *qr = 0 < V/S*, hence *p = 0*: contradiction.
- If *q = 1, pq = V/S*, so *r$\in$[0,1]*. If *r = 0, qr = 0* hence *p = 0*: contradiction. If *0 < r < 1, pr < V/S*, so *q = 0*: contradiction. If *r = 1, qr = 1 > V/S* so *p = 1*: contradiction.

Let us assume that *V/S < p < $\sqrt{V/S}$* . This implies *$\sqrt{V/S}$ < (V/S)/p < 1*.

- If *0 $\leq$ q < (V/S)/p* then *pq < V/S*. This implies *r = 0*, so *qr = 0* and *p = 0*: contradiction.
- If *q = (V/S)/p*, then *pq = V/S* and *r$\in$[0,1]*.
  - If *0 $\leq$ r < (V/S)/p* then *pr < V/S*, hence *q = 0*: contradiction.
  - If *r = (V/S)/p* then *qr = (V/S)²/p²*. Now, *(V/S)² < p² < V/S* so *V/S<(V/S)²/p² < 1. qr > V/S* implies *p= 1*: contradiction.
  - If *(V/S)/p < r $\leq$ 1, pr > V/S* so *q = 1*: contradiction as *q = (V/S)/p < 1*.

Let us assume that *p = $\sqrt{V/S}$* .

- If *0 $\leq$ q < $\sqrt{V/S}$* then *pq < V/S*, hence *r = 0*. This implies *qr = 0*, so *p = 0*: contradiction.
- If *q = $\sqrt{V/S}$* then *pq = V/S*, which implies *r$\in$[0,1]*.

- o   If $0 \leq r < \sqrt{V/S}$ then $qr < V/S$, so $p = 0$: contradiction.
- o   If $r = \sqrt{V/S}$ then $pr = qr = V/S$, implying $p \in [0,1]$ and $q \in [0,1]$, which is consistent with $p=q=\sqrt{V/S}$. **Equilibrium:** $(p^*=\sqrt{V/S}, q^*=\sqrt{V/S}, r^*=\sqrt{V/S})$.
- o   If $\sqrt{V/S} < r \leq 1$ then $qr > V/S$ so $p = 1$: contradiction.
- If $\sqrt{V/S} < q \leq 1$ then $pq > V/S$ so $r = 1$. This implies $qr > V/S$, hence $p = 1$: contradiction.

Let us assume that $\sqrt{V/S} < p < 1$. This implies $V/S < (V/S)/p < \sqrt{V/S} < 1$.
- If $0 \leq q < (V/S)/p$ then $pq < V/S$. This implies $r = 0$, so $qr = 0$ and $p = 0$: contradiction.
- If $q = (V/S)/p$, then $pq = V/S$ and $r \in [0,1]$.
  - o   If $0 \leq r < (V/S)/p$ then $pr < V/S$, hence $q = 0$: contradiction.
  - o   If $r = (V/S)/p$ then $qr = (V/S)^2/p^2$. Now, $V/S < p^2 < 1$ so $(V/S)^2 < (V/S)^2/p^2 < V/S$. $qr < V/S$ implies $p = 0$: contradiction.
  - o   If $(V/S)/p < r \leq 1$, $pr > V/S$ so $q = 1$: contradiction as $q = (V/S)/p < 1$.

Let us assume that $p = 1$.
- If $0 \leq q < V/S$ then $pq < V/S$, hence $r = 0$. This implies $qr = 0$, so $p = 0$: contradiction.
- If $q = V/S$ then $pq = V/S$ so $r \in [0,1]$.
  - o   If $0 \leq r < V/S$ then $qr \leq (V/S)^2 < V/S$, hence $p = 0$: contradiction.
  - o   If $V/S \leq r \leq 1$ then $pr > V/S$ so $q = 1$: contradiction.
- If $V/S < q \leq 1$, $pq > V/S$ so $r = 1$, which implies $pr = 1$ and $q = 1$. Consequently $qr=1$, so $p = 1$. **Equilibrium:** $(p^*=1, q^*=1, r^*=1)$.

Voter support does not matter (V = 0)

This implies that $V/S = 0$ and that best responses are as follows:

$$p^*(q,r) = \begin{cases} 1 & \text{if } qr > 0 \\ [0,1] & \text{if } qr = 0 \end{cases} \qquad q^*(p,r) = \begin{cases} 1 & \text{if } pr > 0 \\ [0,1] & \text{if } pr = 0 \end{cases}$$

$$r^*(p,q) = \begin{cases} 1 & \text{if } pq > 0 \\ [0,1] & \text{if } pq = 0 \end{cases}$$

The payoff matrix is now:

	2		
	C	D	
C	0, 0, 0	0, -S, 0	*p*
D	-S, 0, 0	0, 0, 0	*1-p*
	q	*1-q*	

1 ... 3 = C   *r*

	2		
	C	D	
C	0, 0, -S	0, 0, 0	*p*
D	0, 0, 0	0, 0, 0	*1-p*
	q	*1-q*	

1 ... 3 = D   *1-r*

Each government can intend to defect only if it is certain that the other two governments will defect too.
Once again, $(p^*=1, q^*=1, r^*=1)$ is a pure-strategy equilibrium. There are also three mixed-strategy equilibria: $(p^* \geq 0, q^*= r^*= 0)$, $(p^*= 0, q^* \geq 0, r^*= 0)$ and $(p^*= 0, q^*= 0, r^* \geq 0)$.

Proof:
Let us assume that $p > 0$. If $q > 0$ then $pq > 0$, hence $r=1$. Consequently, $pr>0$ (which implies $q = 1$) and $qr > 0$ (which implies $p = 1$).
Let us assume that $p = 0$ and $q = 0$. $pq = 0$, hence $r \geq 0$. For all $r \geq 0$, $pr = 0$ (consistent with $q=0$) and $qr = 0$ (consistent with $p = 0$).
The other two mixed-strategy equilibria are trivial by symmetry.