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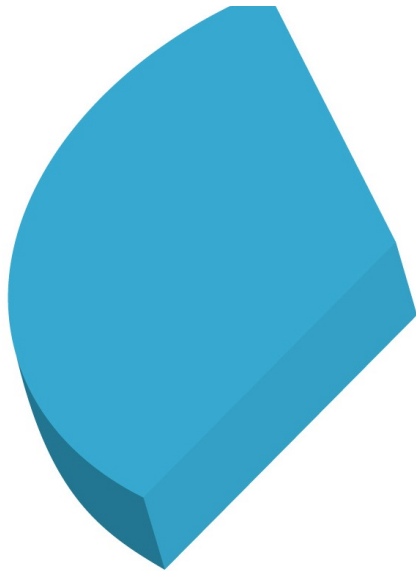
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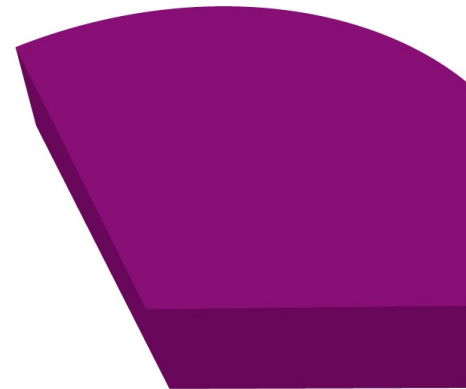
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Abstract

De jure fiscal rules have known a rapidly increasing popularity worldwide. This paper aims at analysing their spatial diffusion in 108 countries over the period 2001-2015 using a pooled version of the Bayesian SAR probit model. Using two different types of weighting (geographic proximity and bilateral trade) and desegregating the results for specific rules, I find a significant and positive spatial lag in line with the imitation (strategic complementarity) hypothesis. Rational imitation, deriving from a race to fiscal credibility, is preferred over the blind imitation hypothesis as the mimetic behaviour is revealed only in countries facing weaker fiscal reputation. Amongst control variables, the low-inflation/low-growth environment as well as higher levels of democracy and government fragmentation (as suggested by the common pool theory) promote the adoption of a fiscal rule.

Keywords: • Fiscal rules • Policy diffusion • Bayesian SAR probit model

• Imitation • Spatial auto-correlation • Strategic complements

JEL Classification: • E62 • P48 • D78 • H87

1 Introduction

Despite increasing popularity over the past decades—the number of countries having adopted at least one national fiscal rule has grown from 9 in 1985 to 94 in 2015¹—rule-based fiscal policy is challenged more than ever. Indeed, as outlined by the IMF², many countries were constrained to suspend their fiscal rules after the record debt and deficits caused by the sanitary crisis. In a joint press article³, Mario Draghi and Emmanuel Macron even declared that EU’s fiscal rules needed to be reformed prior to the pandemic as “they are too obscure and excessively complex”. In light of these multiple challenges, this particular period seems appropriate to reconsider what triggered fiscal rules ?

One attractive argument favouring this increasing number of fiscal rules worldwide could be their effectiveness in addressing the deficit bias (e.g., caused by the common pool problem, Von Hagen and Harden, 1995). Nevertheless, the literature on the effects of fiscal rules on deficits remains quite mixed in its results. The debate was early opened by Alesina and Bayoumi (1996), who argue that Budget Balance Rules adoption across the United States allow to raise the fiscal balance and reduce its volatility without impacting the business cycles variability. This initial result was contested by Levinson (1998) who finds that, when taking into account the individual States characteristics, stricter rules are associated with a higher variability in the

¹Davoodi et al. (2022).

²See <https://blogs.imf.org/2022/01/27/pandemic-tests-resilience-and-credibility-of-fiscal-rules/>.

³See <https://www.ft.com/content/ecbdd1ad-fcb0-4908-a29a-5a3e14185966>.

business cycles⁴.

This controversy found an echo in the subsequent contributions, some arguing that fiscal rules implementation leads to fiscal gimmickry, artificial manipulations of fiscal aggregates (e.g., Creative Accounting) in order to respect the target set by the fiscal rule (Milesi-Ferretti, 2004 ; Von Hagen and Wolff, 2006 ; Buti, Martins, and Turrini, 2007) and other authors highlighting rules' efficiency to reduce fiscal deficits conditionally on: the degree of countries centralisation (Foremny, 2014), the presence of independent fiscal councils (Maltritz and Wüste, 2015), the degree to which rules are easy to understand and monitor (Bergman, Hutchison, and Jensen, 2016), the coupling of fiscal rules with inflation targeting (Combes et al., 2018) or simply the type of rule in place (Barbier-Gauchard, Baret, and Minea, 2021). More recently, Caselli and Reynaud (2020) contributed to this literature showing a lower efficiency of fiscal rules in reducing fiscal deficits when accounting for the potential endogeneity of the adoption. To do so, Caselli and Reynaud use the rate of adoption in the neighbouring countries as an instrument for the adoption in a specific country.

This argument of interdependence appears to arise from a correct intuition, and while the literature is well documented and nuanced on the effects of fiscal rules, it is surprising to observe that little attention has been paid to the determinants of fiscal rules adoption. Therefore, this article expands Caselli and Reynaud's intuition and crosses the literature on fiscal rules determinants and policy diffusion to highlight strategic interactions in the adoption of fiscal rules. Using a Bayesian SAR Probit model on a large panel of 108 countries observed over the period 2001-2015, I find evidence of mimetic behaviour (strategic complementarity) in adopting *de jure* fiscal rules based on geographic proximity and bilateral trade intensity. The imitation

⁴Badinger (2009) later found that fiscal rules are associated with lower output volatility among OECD countries.

hypothesis is robust to desegregation of the results by specific types of fiscal rules and holds among countries with lower creditworthiness while it is rejected within countries benefiting from better sovereign credit rating. I argue that this mimetic behaviour is triggered by a race to signal fiscal credibility (as expressed by more advantageous access to sovereign credit), thus explaining why this "imitation game" does not occur within countries already benefiting from a solid fiscal reputation (and therefore already good access to sovereign credit). On another note, some results among the covariates are in line with the existing literature on the determinants such as the low-inflation/low-growth environment as well as higher levels of democracy and government fragmentation (as suggested by the common pool theory), increasing the probability to adopt of a fiscal rule.

The following section reviews the existing literature on determinants and frames the hypotheses to be tested. Section 3 presents the data and model to be used in the empirical analysis (section 4) while section 5 provides concluding remarks.

2 Literature and hypotheses

2.1 Fiscal rules determinants

As stated before, the literature on the determinants of fiscal rule adoption is relatively little furnished compared to the literature on their effect over various budgetary aggregates. To the best of my knowledge, the literature on the determinants finds roots in the article from Calderón and Schmidt-Hebbel (2008), which tests how different economic variables shape the probability of adopting a national rule. Among these variables, they find that a better fiscal balance and a higher government stability are associated with a higher probability of adopting a fiscal rule, while the depen-

dency ratio negatively affects this probability. This indicates that a higher dependent population makes it less likely for a government to constrain its fiscal policy as it must support the young and the elderly through public spending. In 2009, the IMF dedicated an appendix to the analysis of the determinants of fiscal rules. The study also finds that countries are more likely to adopt fiscal rules when their initial fiscal and economic performance is strong. Thus, a higher fiscal balance is still found to be increasing the probability of adoption (in line with Debrun and Kumar, 2009) while higher levels of inflation decrease it.

Elbadawi, Schmidt-Hebbel, and Soto (2015) expand the list of factors positively affecting the probability of adopting a fiscal rule by adding, *inter alia*, democracy, inflation targeting and fixed-exchange-rate regimes. Democracy, by enhancing the level of administrative process transparency, sets a favourable path to rule-based fiscal policy. The rationale behind the inflation targeting and fixed-exchange rate is the same as in Altunbaş and Thornton (2017). Combes et al. (2018) find that the joint adoption of fiscal rules and inflation targets improves fiscal outcomes to a greater extent than when adopted separately. In addition, in a theoretical model, Minea and Villieu (2009) suggest that IT encourages governments to improve institutional quality to enhance tax revenue performance further (later verified empirically by Lucotte, 2012; but also extended empirically by Minea, Tapsoba, and Villieu, 2021). These two contributions allow the assertion that the adoption of inflation targets by central banks brings incentives for fiscal rules adoption as well. The reasoning provided by Elbadawi, Schmidt-Hebbel, and Soto (2015) regarding the exchange regime is that, under a fixed exchange rate regime, lax fiscal policy might be risky as it could lead to speculative attacks eventually provoking a currency devaluation (Giavazzi and Pagano, 1988 ; Masson, Goldstein, and Frenkel, 1991). As devaluating the currency is associated with considerable political costs, pegs should be associated with more

disciplined fiscal policies, somewhat embodied by fiscal rules.

Altunbaş and Thornton (2017), who study more specifically the adoption of rules constraining the level of debt, find evidence contrasting with the intuition of the IMF (2009). While the IMF argues that rules should not be adopted in a uncertain environment of *inter alia* low output growth and increasing debt, Altunbaş and Thornton find that countries with low debt levels and high output growth rates are less likely to adopt debt rules. This could result from pro-cyclical demands from voters as they do not trust corrupt governments, thus asking for immediate additional government spending (tax cut) in case of a positive shock on the economy (Alesina, Campante, and Tabellini, 2008). In addition, Altunbaş and Thornton's article also suggests that trade openness, through better integration into world markets, should increase access external debt financing (in line with Rose and Spiegel, 2002). This in turn triggers closer scrutiny of fiscal sustainability by rating agencies modifying the odds of adopting fiscal rules, which signal fiscal prudence and solvency. Interestingly, the authors introduce the idea that the adoption of debt rules might not be independent across countries. They therefore build a popularity index (the number of other countries with a debt rule in place) and find it to increase the likelihood of adopting a rule significantly.

In 2017, Badinger and Reuter proposed an analysis of the determinants of the stringency of fiscal rules this time. In accordance with the common pool theory (Von Hagen and Harden, 1995; Roubini and Sachs, 1989), the authors show that higher government fragmentation (and thus potentially more specific interest groups) raise the stringency of fiscal rules to limit the deficit bias. Badinger and Reuter also consider the role of monetary unions, under which governments would not necessarily internalise all spillover costs, therefore, increasing the stringency of rules. In a more recent article, Deyal et al. (2020) add to the previous factors, the presence of more

development partners and ongoing IMF programs that are positively correlated to the likelihood of adopting a fiscal rule (those two variables being to some extent related to the coercion concept in the policy diffusion literature).

2.2 Main hypotheses

As outlined in the introduction, Caselli and Reynaud (2020) tie up with Altunbaş and Thornton’s popularity index in arguing that the adoption of fiscal rules in different countries is interdependent. This interdependence hypothesis provides the authors with a rationale for using the average rate of fiscal rule adoption in the neighbouring countries as an instrument to treat the endogeneity in the relationship between rules and deficits. The intuition is then that policymakers tend to pay attention to the adoption in the neighbouring countries before making their own decision. More specifically, the higher popularity of fiscal rules in the neighbouring countries tends to raise the odds of adoption in a given country. Caselli and Reynaud even provide practical roots to this argument by reminding that in Uruguay, the examples of Brazil and Chile were cited in a bill proposing the adoption of a rule.

This positive interdependence in the choice to adopt rules is of course also linked to the strategic complementarity concept presented in several spheres of the economic literature. This is notably the case for international environmental agreements, where Murdoch, Sandler, and Vijverberg (2003) find that the decisions to participate in the Helsinki Protocol are strategic complements among the neighbouring countries while Beron, Murdoch, and Vijverberg (2003) find no evidence of interdependence in the ratification of the Montreal Protocol. Later, Sauquet (2014) assumes that decisions to ratify the Kyoto Protocol could be strategic complements among specific peers. He finds no evidence for the strategic complementarity hypothesis in neighbouring coun-

tries (despite being often cultural similar and social proximate) while the hypothesis holds among trade partners. This question of strategic interaction was also raised in the literature on property tax decisions with Ollé (2003) finding strategic complementarity among Spanish municipalities, Allers and Elhorst (2005) among Dutch municipalities (these two papers instead use the term mimicking) and Fiva and Rattsø (2007) among Norwegian municipalities (motivated by yardstick competition).

Consequently, I bring particularly adapted tools from spatial econometrics on discrete choice, namely Bayesian spatial probit estimation (as in Fiva and Rattsø, 2007, but in a pooled version *à la* Porto and Revelli, 2013, and Caruso, Pontarollo, and Ricciuti, 2020), in order to expand Caselli and Reynaud's intuition. The first hypothesis to be tested therefore becomes:

Hypothesis 1 Policymakers tend to imitate their peers from neighbouring countries and trade partners countries in their choice to adopt a fiscal rule (i.e., fiscal rule adoption decisions are strategic complements in neighbouring and trade partner countries)

It is worth reminding that this strategic complementarity can be associated with both a race to the bottom or the top, as noted by Davies and Vadlamannati (2013) who interpreted the downward trend in labour standards over time as evidence for a race to the bottom. While the first hypothesis simply aims at testing the presence of strategic complementarity over the choice to implement fiscal rules, the analysis deserves to be deepened to unveil the rationale of such mimetic behaviour. Caselli and Reynaud turn to the political science field to provide rationales for this positive interdependence. They *inter alia* suggest that (without testing it), as fiscal rules are being seen as efficient tools to improve borrowing terms (Poterba, Rueben, et al., 1999 ; Johnson and Kriz, 2005 ; Iara and Wolff, 2014 ; and more recently Sawadogo,

2020)⁵, policymakers are incited to imitate rule adopters. It is interesting that Doray-Demers and Foucault (2017) previously used the same intuition, but to argue that the competition hypothesis could not hold in their sample as the countries included were already benefiting from good access to sovereign credit.

Indeed, there are generally four channels for the diffusion of policies in the political science literature: learning, competition, emulation (or imitation) and coercion. Nevertheless, as Blatter, Portmann, and Rausis (2021) pointed out, these channels suffer from multiple limitations, among which the fact that they are not mutually exclusive. This limitation may explain that Caselli and Reynaud and Doray-Demers and Foucault propose two different channels (respectively imitation and competition) despite giving the same explanation. Furthermore, imitation and competition can sometimes express the exact same phenomenon as perfectly illustrated by Ollé who associates mimicking with yardstick competition in the property taxation in Spain. Some authors would even slightly modify the four above cited channels in the political science field. It is in this fashion that Baturu and Gray (2009) mention "rational emulation", where countries, observing the situation in neighbouring countries, are also keen to signal "a business-friendly type", which increases their probability of adopting a flat tax. The rationale in the case of fiscal rules may be similar: in response to rules adoption in other countries (which serves as a yardstick for comparison), policymakers are hoping to signal their fiscal credibility (as symbolised by lower borrowing costs) as well, which therefore increases their probability to adopt a fiscal rule.

Alternatively, the traditional concept of imitation in political science implies that mimicking occurs regardless the policy outcome (as explained by Doray-Demers and Foucault (2017)). Therefore, a purely blind imitation effect would imply that countries mimic other countries regardless of the effects of rules on their own fiscal credi-

⁵It is worth noting the homogeneity of the results in this part of the literature.

bility. Conversely, if the rational imitation assumption holds, this mimetic behaviour should be less salient (or at best nonexistent) in countries where fiscal credibility has already been achieved. This leads to the formulation of the second hypothesis to be tested in this paper :

Hypothesis 2 Strategic complementarity in the adoption of rules is explained by rational imitation, being triggered by a race to signal fiscal credibility, rather than blind imitation.

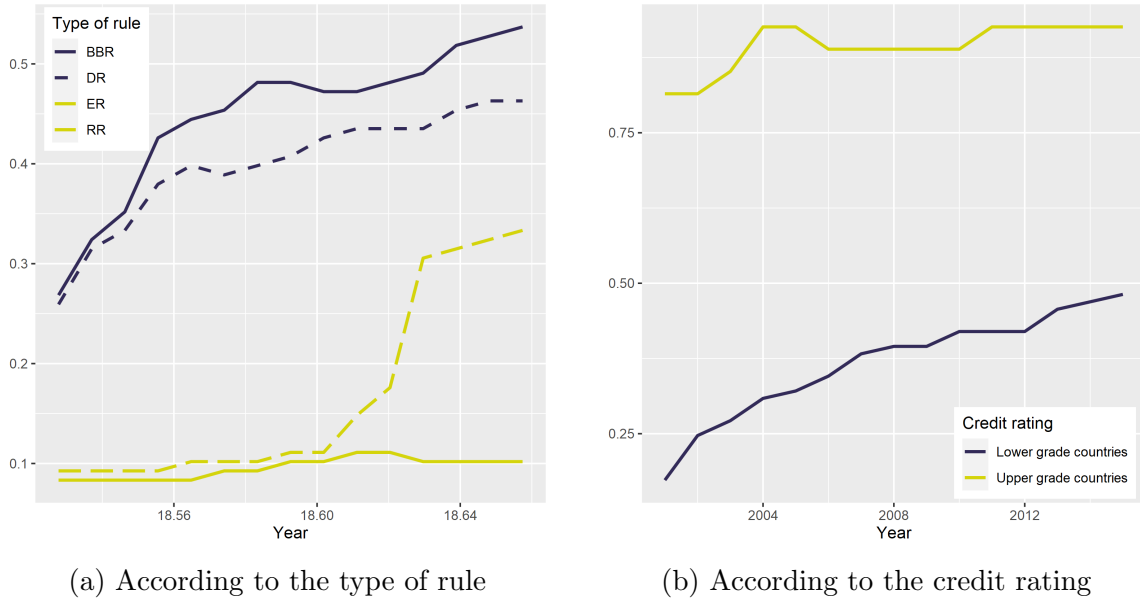
3 Data and model

3.1 Data

The retained dataset to test those hypotheses comprises a panel of 108 countries over the period 2001-2015. The countries and the period were selected in order to obtain a perfectly balanced panel dataset over a sufficient number of explanatory variables. Indeed, as explained by Caruso, Pontarollo, and Ricciuti (2020), the trade-off is between a long time span and a large set of covariates. To better control the spatial dependence, and given the number of determinants in the literature, I go in favour of the second.

The dependent variable is a dummy variable indicating the adoption (coded 1) of at least one national *de jure* fiscal rule. The data for this dummy variable stems from the Fiscal Rules Dataset (1985-2015) built by the IMF. For robustness purposes, dummy variables indicating the adoption of specific fiscal rules will also be used. Indeed, the IMF distinguishes four different types of fiscal rules based on the budgetary aggregate aimed to be constrained : Debt Rules (DR), Budget Balance Rules (BBR), Expenditure Rules (ER) and Revenue Rules (RR).

Figure 1: Share of countries having adopted at least one fiscal rule in the sample



The retained period and countries give a similar picture of the evolution of fiscal rules adoption observed by Davoodi et al. (2022) on an even larger scale. Indeed, the adoption of all types of fiscal rules has known an upward trend over 2001-2015, with lower popularity for Revenue Rules. In order to specifically test the second hypothesis presented in section 2.2, the countries are further divided into two subsamples according to their long-term sovereign debt ratings. The credit rating variable originates from Kose et al. (2017) and ranges between 1 (the worst rating) and 21 (the best one), taking the average rating from the three main rating agencies (Moody’s, Standard & Poor’s and Fitch Ratings). To construct the group benefiting from a solid fiscal reputation, I keep the countries with an average rating of 15 or above (from A- to AAA) in 2001 (first year of the sample). The other countries (BBB+ or lower) are included in the lower grade group⁶.

⁶Countries without rating in 2001 are supposed to be part of the lower grade group (BBB+ or lower). This assumption is in line with the shadow ratings determined by Ratha, De, and Mohapatra (2011). The list of classified countries is presented in table A.1.

When taking into account the aggregate FR, which equals one when at least one rule is implemented, the trend is positive in the Lower grade countries while it remains stabler in economies benefiting from a more solid fiscal reputation, with three more countries having adopted a rule over the period 2001-2015.

The variable of interest in this paper is the spatial lag. It catches the influence exerted by other countries ($j \neq i$) on a specific country (i) in adopting a fiscal rule. Naturally this influence may be expressed through many channels. The most common channel to catch this influence in the spatial econometrics literature is the geographical proximity. I chose to model the geographic proximity by using the inverse distance between the countries most central points. The data on the so called centroids stems from Gavin Rehkemper's open data⁷. As an alternative weighting scheme I also use the commercial relations between the countries of the sample (the two weightings are further explained in section 3.2). The data used for this purpose are the exports Free on Board computed by the Direction of Trade Statistics (DOTS) of the IMF.

The control variables primarily originate from the literature on determinants presented in section 2 and are presented in detail in table A.2. Table A.3 provides summary statistics regarding the two rating groups in the sample. Fiscal rules are more popular amongst Upper-grade countries with an average adoption rate regardless the type of rule of 89.4% falling to 36.7% in the lower grade group. Lower grade economies are characterised by higher growth rates on average and higher but more volatile inflation rates while they seem to be less open to trade and face lower debt levels. Inflation targets are more adopted in Highly rated countries and the rate of belonging to monetary union is also higher, certainly driven by the eurozone countries in this sub-sample.

⁷See <https://gavinr.com/open-data/world-countries-centroids>.

3.2 Model

One main contribution of this paper to the literature on the determinants of fiscal rules is the use of spatial econometrics techniques to catch the interdependences between different countries. As stated by Calabrese and Elkink (2014), the presence of spatial dependence in the case of a binary dependent variable leads the the standard probit and logit models using the maximum likelihood to produce inconsistent and inefficient estimates. Several alternatives to the Maximum Likelihood have therefore been suggested in the literature among which the EM-algorithm-based estimation procedure (McMillen, 1992), the GMM approach from Pinkse and Slade (1998), and the bayesian MCMC procedure (LeSage and Pace, 2009). I align with the most commonly used approach in the literature using spatial dependence in a binary dependent variable context and therefore use the Bayesian MCMC procedure.

Hence, I specify the following Spatial Auto-Regressive (SAR) probit model in a panel context:

$$FR_{i,t} = \theta + \rho \sum_{j \neq i} \omega_{j,i,t} FR_{j,t} + \beta X_{i,t-1} + \nu g_t + \epsilon_{i,t} \quad (1)$$

where $FR_{i,t}$ is the dependent variable indicating if a fiscal rule is in place in country i ($i = 1, \dots, N$) in period t ($t = 1, \dots, T$). ρ is the spatial coefficient (coefficient of interest) and catches the effect of the other countries decision whether to adopt or not on country i 's decision. $\sum_{j \neq i} \omega_{j,i,t} FR_{j,t}$ is the spatial lag, i.e., the weighted average adoption of rules among countries j .

As mentioned above, I use two different types of weighting to build the spatial lag. The first one (the most common in the literature using spatial econometrics) is the geographic proximity and uses the inverse distance between countries i and j 's most central points. Indeed, it is frequently assumed that policymakers pay more

attention to the situation in neighbouring countries than far-off countries (due to social proximity and cultural similarities notably, as explained by Sauquet, 2014). This implies the following weighting :

$$\omega_{j,i,t} = \frac{1/\text{Distance}_{i,j}}{\sum_{k \neq i} 1/\text{Distance}_{i,k}} \quad (2)$$

The alternative weighting used to validate the robustness⁸ of the results is based on bilateral trade. I use the exports Free on Board to determine the bilateral trade (the imports of i from j being assumed to equal the exports from j to i). The intuition is here that trade could catch other relationships between two countries than the simple geographical proximity, such as economic importance of course (the initial gravity model from Isard, 1956), similar institutions (De Groot et al., 2004), short linguistic distance (Hutchinson, 2005) or even the sharing of a religious culture (Lewer and Berg, 2007). All those reasons could prompt the policymakers to pay increasing attention to the choices made by their essential trade partners. Nevertheless, to limit concerns over the endogeneity of the weighting, I use the average bilateral trade over the first three years of the sample. The weighting formula thus becomes :

$$\omega_{j,i,t} = \frac{\sum_{t=1}^3 \text{Trade}_{i,j,t}/3}{\sum_{k \neq i} \sum_{t=1}^3 \text{Trade}_{i,k,t}/3} \quad (3)$$

As understood from the denominators in equations 2 and 3, both weighting matrices (further noted W^g and W^t respectively) are row-standardised so that weightings are comprised between 0 and 1. Thirdly, I follow Case, Rosen, and Hines Jr (1993) (and later, Lockwood and Migali, 2009 ; Sauquet, 2014) and construct a random weighting matrix (randomly generated values by software) to carry out placebo tests.

⁸The bilateral trade weighting is also particularly useful to overcome the issue faced by the geographic proximity weighting due to relatively isolated countries after sub-sampling.

Caruso, Pontarollo, and Ricciuti (2020) noted that there are no established econometrics techniques to deal with spatial probit models using panel data. Following the authors, I use a pooled version of the Bayesian spatial probit model. This implies that the weighting matrix W (of size $N \times N$) is simply multiplied with an identity matrix I_T of size $T \times T$ using the Kronecker product (noted \otimes)⁹. The final weighting matrices are subsequently given by : $W_{NT} = I_T \otimes W$.¹⁰

In equation 1, the vector $X_{i,t-1}$ includes a set of control variables drawn from the literature. Of course, the debate over the sign of the coefficient associated to some of these variables (β) is still open while others seem to reach consensus. This is notably the case for inflation, which is associated with an unstable environment and thus decreases the likelihood of adopting a rule, while democratic regimes set favourable conditions for rule-based fiscal policy. Almost all control variables are one-year lagged to avoid concerns over potential endogeneity. I only keep the contemporary values for the membership to monetary unions and the presence of IMF programs as these variables are aimed at catching coercion effects (which more easily apply on a contemporary basis) and are less likely to suffer from endogeneity (especially though simultaneity) issues. The regressions also include dummies for the world regions (defined by the World Bank) and dummies dividing the sample in 3-year periods. The 3-year period dummies are particularly important to the validity of my results. Indeed, as underlined by Davies and Vadlamannati (2013), the spatial lags can capture the impact of some common movements (or common shocks), here the increasing rate of adoption across countries (and subsequently increasing spatial lags). The inclusion of these 3-year period dummies allows to limit the concerns over the common movement hypothesis and therefore to focus on the imitation effect. To

⁹The same procedure is used by Hall, Lacombe, and Tackett (2020) in a Spatial Durbin Model.

¹⁰Detailed information on the simulation approach proposed by LeSage and Pace (2009) adapted to the panel context is given in Caruso, Pontarollo, and Ricciuti (2020).

further rule out the omitted common shocks hypothesis, leading to model misspecification, the use of random weightings is particularly useful. Indeed, the presence of common shocks simultaneously favouring the adoption of fiscal rules in the sample could be confounded with the (rational) imitation hypothesis (based on geographic proximity and bilateral trade intensity bases). In that respect, in presence of omitted common shocks, the strategic interaction should hold when using randomly generated weights. If so, the first hypothesis of this paper is rejected.

4 Results

4.1 Baseline results

The baseline model (from equation 1) is estimated in the first two columns of table 1¹¹. Column (1) assumes explicitly geographic proximity as the channel through which policymakers exert influence over their peers in other countries. The spatial coefficient (ρ) is positive and significantly different from 0 at the 1% threshold. This confirms that policymakers pay attention to the situation in nearby countries and are tempted to imitate their decision to adopt fiscal rules. Of course, mimetic behaviour (strategic complementarity) is not the only determinant of the adoption of a rule.

Thus, some results of the literature on the determinants hold. This is notably the case for lower inflation rates, more democratic regimes, inflation targets in place and better fiscal balances that are associated with a higher probability of adopting

¹¹The coefficients presented in the tables do not correspond to the marginal effects. Indeed, the purpose of this paper is essentially to investigate the presence of strategic complementarity rather than interpreting the amplitude of the coefficients. In addition, "standard spatial autoregressive (SAR) probit models restrict the direct, indirect, and total effects to the same sign" as stated by Hall, Lacombe, and Tackett (2020). Following Caruso, Pontarollo, and Ricciuti (2020), the stationarity of the continuous variables was previously verified using the Levin-Lin-Chu Unit-Root test, the results are available upon request.

a fiscal rule regardless the type (IMF, 2009; Elbadawi, Schmidt-Hebbel, and Soto, 2015). Two results from the literature on rules' stringency determinants are also extended to the adoption. While the membership to a monetary union and the higher government fragmentation increase the stringency of fiscal rules, they also increase the probability of adopting a fiscal rule. This confirms a monetary union's coercion effect through pressure on policymakers to adopt stricter fiscal policy measures as one member's fiscal situation can affect all other members. The latter result is in line with the common pool theory where diverging interests among governments lead to larger deficits and *in fine* to fiscal rules as a response. Finally, the openness to international trade is associated with a lower probability of adopting a rule (as in Altunbaş and Thornton for DR when they include a monetary union dummy).

As argued above, despite being more subject to endogeneity, the bilateral trade weighting is an interesting complement to the geographic proximity weighting alone as it is influenced by other dimensions (such as economic influence, cultural proximity, language similarity, ...). Column (2) therefore specifies exactly the same model than column (1) but using the bilateral trade weighting instead of the geographic proximity. The results using this alternative weighting scheme remain unchanged. Indeed, the determinants keep their sign and statistical significance but most importantly the spatial lag is still positively and significantly correlated to the probability of adopting a fiscal rule in country i . This means that the mimetic behaviour hypothesis holds when assuming that policymakers would pay increasing attention to their trade partners' decision.

After having checked the validity of the imitation behaviour regarding the adoption of fiscal rules using two distinct weightings, one could argue that policymakers would not only reproduce the fact to have a rule-based fiscal policy but would replicate the same type of fiscal rule in place in influencing (yardstick-for-comparison)

countries. To test the robustness of the mimetic behaviour hypothesis, I therefore consider three specific types (the most common) of fiscal rules as the dependent variables¹². Columns (3) to (8) are dedicated to this purpose using naturally the two different weighting schemes for each dependent variable. The imitation hypothesis caught by the significantly (at the 1% level) positive spatial coefficient holds across all the specifications. Furthermore, it is interesting to note that some determinants vary across the different type of rules. As such, the level of debt and the position of the fiscal balance do not affect the probability to adopt a debt rule (DR) nor an expenditure rule (ER) but do increase the probability to adopt rules constraining the fiscal balance (BBR). In line with Altunbaş and Thornton, fixed exchange rates are associated with a higher probability of adopting a debt rule to avoid speculative attacks due to lax fiscal policy.

As discussed in section 3.2, 3-year period dummies were included to limit the concerns over common movements (common shocks). While this solution is appropriate to limit a potential model misspecification, it does not allow to definitely rule out the common shock hypothesis. To do so, the results presented in table 1 are replicated in table A.4 using randomly generated weights. If the common shocks were driving the previous results, the spatial coefficients should remain significant in these placebo tests. This is not the case, the spatial coefficients are found to be insignificant across all specifications (and reassuringly the goodnesses of fit are diminished as depicted by lower log-likelihoods). The imitation (strategic complementarity) hypothesis based on geographic proximity and trade intensity cannot be rejected. Lastly, a parallel with Davies and Vadlamannati (2013) can be drawn by pairing this strategic complementarity with the upward trend of fiscal rule adoptions in the sample (figure 1).

¹²Revenue rules are not considered here as their spatial diffusion is strongly limited with only 11 countries in the sample adopted this type of rule by the end of 2015.

While the authors opted for a race to the bottom in labour standards, there appears to be a race to the top in fiscal rule adoptions.

Table 1: Total sample results

	FR			DR			BBR			ER		
	W^g (1)	W^t (2)	W^g (3)	W^t (4)	W^g (5)	W^t (6)	W^g (7)	W^t (8)				
Intercept	-1.177 (0.400)	** -1.667 (0.401)	*** -0.514 (0.473)	-0.834 (0.465)	-2.182 (0.446)	*** -2.803 (0.445)	*** -2.357 (0.624)	*** -3.394 (0.607)				
GDP growth	-0.034 (0.011)	** -0.036 (0.011)	** -0.036 (0.012)	** -0.035 (0.012)	** -0.032 (0.011)	** -0.027 (0.012)	* -0.030 (0.014)	* -0.032 (0.014)				
Inflation	-0.033 (0.007)	*** -0.037 (0.009)	*** -0.029 (0.009)	** -0.030 (0.010)	** -0.071 (0.010)	*** -0.077 (0.011)	** -0.025 (0.012)	** -0.037 (0.014)				
Trade openness	-0.003 (0.001)	** -0.003 (0.001)	* -0.001 (0.001)	0.000 (0.001)	0.003 (0.001)	* 0.003 (0.001)	0.000 (0.001)	0.000 (0.001)				
Debt	0.002 (0.001)	0.002 (0.001)	0.002 (0.001)	0.001 (0.001)	0.003 (0.001)	** 0.003 (0.001)	0.003 (0.001)	* 0.003 (0.002)				
Fiscal balance	0.021 (0.010)	* 0.020 (0.010)	* 0.010 (0.011)	0.008 (0.011)	0.042 (0.011)	*** 0.041 (0.011)	0.015 (0.013)	0.008 (0.013)				
Exchange rate regime	-0.090 (0.061)	-0.066 (0.062)	*** -0.649 (0.071)	*** -0.636 (0.072)	*** -0.167 (0.067)	* -0.108 (0.069)	0.089 (0.076)	0.138 (0.081)				
Political regime	0.085 (0.010)	*** 0.083 (0.010)	*** 0.081 (0.011)	*** 0.079 (0.011)	*** 0.118 (0.012)	*** 0.116 (0.012)	0.176 (0.028)	0.194 (0.029)				
Monetary union	1.357 (0.115)	*** 1.292 (0.115)	*** 1.196 (0.118)	*** 1.153 (0.121)	*** 1.233 (0.117)	*** 1.145 (0.118)	0.308 (0.127)	* 0.343 (0.134)				
Inflation targeting	0.288 (0.112)	* 0.265 (0.112)	* 0.795 (0.128)	*** 0.797 (0.128)	*** 0.438 (0.116)	*** 0.369 (0.116)	-0.067 (0.136)	-0.100 (0.135)				
IMF programme	-0.262 (0.134)	-0.260 (0.137)	0.044 (0.151)	0.043 (0.155)	-0.217 (0.145)	-0.204 (0.149)	0.039 (0.171)	0.095 (0.180)				
Age dependency	-0.004 (0.004)	-0.004 (0.004)	0.003 (0.005)	0.002 (0.005)	0.011 (0.004)	* 0.011 (0.005)	-0.018 (0.007)	** -0.018 (0.007)				
Government fragmentation	1.515 (0.247)	*** 1.528 (0.249)	*** 1.445 (0.282)	*** 1.482 (0.282)	*** 1.202 (0.270)	*** 1.192 (0.271)	1.698 (0.442)	2.065 (0.440)				
Spatial coefficient (ρ)	0.452 (0.095)	*** 0.296 (0.072)	*** 0.387 (0.098)	*** 0.301 (0.071)	*** 0.528 (0.079)	*** 0.443 (0.072)	** 0.373 (0.121)	*** 0.382 (0.104)				
Region dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes				
3-year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes				
Observations	1620	1620	1620	1620	1620	1620	1620	1620				
Log Likelihood	-710.593	-719.568	-598.084	-605.456	-649.894	-656.995	-475.540	-472.673				

Notes: ***p<0.001, **p<0.01, *p<0.05. Standard errors in parentheses.

4.2 Sensitivity analysis

As discussed above, two competing hypotheses are plausible to explain the mimetic behaviour highlighted in section 2.2. The first advances a blind imitation behaviour from policy makers, i.e., replicating another country’s policy without considering its outcome (usual interpretation of emulation in the policy diffusion literature, e.g., Doray-Demers and Foucault, 2017). The second hypothesis states that a race to fiscal credibility triggers the mimetic behaviour. Thus, the policymakers, observing the adoption of a rule in neighbouring countries (or trade partners) associated (or supposed to be associated) with enhanced fiscal credibility, hope to signal fiscal credibility by adopting a rule as well (similar to the rational emulation in Baturo and Gray, 2009, and in line with yardstick competition).

In order to differentiate between those two hypotheses, I choose to use sub-samples. Indeed, while blind imitation would imply a positive and significant spatial coefficient across all samples, the race to fiscal credibility hypothesis implies that imitation occurs mainly (or only) in the countries that already lack this fiscal credibility. I therefore build two sub-samples based on long-term sovereign debt ratings. The countries rated A- or above (i.e., upper medium grade or above) in 2001 are considered to benefit from a solid fiscal reputation. Countries rated BBB+ or lower (i.e., lower medium grade or below) are naturally considered to face lower fiscal credibility.

Table 2 presents the results on both sub-samples and using the two weighting schemes. Columns (1) and (2) show upper-grade economies’ estimated coefficients. The spatial coefficient alternates signs depending on the weighting scheme but remains non-significant. In other words, whether to adopt or not a fiscal rule is not interdependent amongst highly rated countries meaning naturally that the imitation hypothesis does not hold. The early adoption waves (before 2001) of rules in higher-

grade economies could nevertheless cast doubt upon the absence of interdependence in this sub-sample. To ensure the validity of this result, I expanded the period by 10 years (1991-2015) for 23 highly-rated countries (of which 4 already had a rule in 1991) and dropped the fiscal balance control variable (due to data availability). The results on this expanded time span still suggest the absence of strategic complementarity¹³. On the other hand, the spatial coefficient is still positive and significant amongst the lower grade countries. Therefore, these results plead for the second hypothesis in which the mimetic behaviour is triggered by a race to fiscal credibility explaining why highly rated countries do not take part into this "imitation game" as they already benefit from solid fiscal reputation.

Regarding the control variables, fixed exchange rates, democratic regimes, and belonging to a monetary union are associated with a higher probability to adopt a rule in both groups. The low inflation environment promoting the adoption of a rule holds for the lower grade group. Interestingly, the dependency ratio has opposite effects depending on the group. While the pressure it generates on public expenditure discourages rule-based fiscal policy in lower grade economies, it promotes a stricter fiscal policy among highly rated countries.

Following Altunbaş and Thornton (2017), who argue that High-income economies are generally benefiting from enhanced fiscal credibility, I additionally test the sensitivity of the results using income level groups based on year 2001. The results (reported in table A.5) remain unchanged. Finally, placebo tests using random weightings rule out the common shocks hypothesis on the sub-samples as well, the spatial lag being non-significant¹⁴.

¹³These results are available upon demand.

¹⁴Results available upon demand

Table 2: Sub-samples results

	Upper grade countries		Lower grade countries	
	W^g (1)	W^t (2)	W^g (3)	W^t (4)
Intercept	-17.244 *** (4.605)	-16.905 *** (3.899)	-0.520 (0.536)	0.063 (0.570)
GDP growth	-0.004 (0.069)	-0.011 (0.067)	-0.019 (0.011)	-0.021 (0.011)
Inflation	0.080 (0.090)	0.041 (0.090)	-0.020 * (0.008)	-0.026 *** (0.008)
Trade openness	0.007 (0.007)	0.007 (0.007)	-0.006 *** (0.002)	-0.007 *** (0.002)
Debt	-0.013 (0.010)	-0.015 (0.010)	0.001 (0.001)	0.000 (0.001)
Fiscal balance	0.071 (0.045)	0.092 (0.050)	0.009 (0.012)	0.012 (0.012)
Exchange rate regime	-0.857 ** (0.304)	-0.865 *** (0.259)	-0.184 * (0.073)	-0.190 * (0.076)
Political regime	0.879 *** (0.233)	0.739 * (0.335)	0.046 *** (0.011)	0.044 *** (0.011)
Monetary union	1.235 (0.744)	2.017 * (0.901)	1.526 *** (0.147)	1.422 *** (0.143)
Inflation targeting	0.487 (0.486)	1.236 (0.654)	0.120 (0.131)	0.094 (0.133)
IMF programme	3.887 (3.360)	4.249 (3.845)	-0.072 (0.141)	-0.051 (0.142)
Age dependency	0.205 ** (0.072)	0.170 ** (0.061)	-0.013 ** (0.005)	-0.020 *** (0.005)
Government fragmentation	1.113 (2.631)	3.210 * (3.266)	1.692 *** (0.265)	1.706 *** (0.266)
Spatial coefficient (ρ)	-0.288 (0.447)	0.328 (0.169)	0.270 ** (0.083)	0.318 *** (0.075)
Region dummies	Yes	Yes	Yes	Yes
3-year dummies	Yes	Yes	Yes	Yes
Observations	405	405	1215	1215
Log Likelihood	-53.595	-47.941	-561.163	-565.908

Notes: ***p<0.001, **p<0.01, *p<0.05. Standard errors in parentheses.

5 Conclusion

In light of the increasing popularity of fiscal rules over the past decades, this paper proposes an analysis of the spatial diffusion of fiscal rules through two interdependent hypotheses. To catch the influence one country can exert on another, I use two weighting schemes: geographic proximity and bilateral trade intensity. I align with the literature on the spatial diffusion of a discrete choice and consequently use a Bayesian SAR Probit model. The spatial lag is found to be significant and positive in accordance with the imitation (strategic complementarity) hypothesis.

A concern could be related to the isolation of some small clusters of countries in the geographic weighting scheme. Indeed, this could lead to the confirmation of the imitation hypothesis based on a coincidence in the adoption of fiscal rules in this limited set of isolated countries. Nevertheless, the additional use of the bilateral trade weighting attenuates this concern as one country's trade partners do not necessarily match its neighbouring countries. In addition, the model appears to be robust to the common shock hypothesis. Indeed, the baseline results are replicated using randomly generated weights and the strategic interaction does not hold anymore.

Policymakers, therefore, tend to imitate their peers in neighbouring countries and trade partner countries (yardsticks for comparison) regarding the decision to adopt a fiscal rule. To test the robustness of the results I further desegregate the results for the three most commonly adopted types of rule, and the spatial lag is still significant and positive. A parallel can also be with Davies and Vadlamannati (2013), and the conjunction between the strategic complementarity and the upward trend suggests a race to the top in fiscal rule adoptions.

To specifically address the second hypothesis (the triggering factor of such a mimetic behaviour), I use the long-term sovereign debt rating to separate countries

likely to benefit from a solid fiscal reputation and those facing a lower fiscal credibility. The imitation hypothesis is only confirmed in the second group, which leads to preferring a rational imitation, triggered by a race to signal fiscal credibility, over the blind imitation hypothesis (i.e., regardless the potential outcome of the policy). The results hold when using a slightly different classification based on income level. Eventually, even if one might expect rules adopted through mimicking to be less constraining than those resulting from conviction, it is necessary to remind that this paper, of course, tells nothing on this conditional efficiency.

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Appendix

Table A.1: List of countries by sovereign debt rating

<i>Upper grade countries</i>		
Australia	Austria	Belgium
Botswana	Canada	Cyprus
Denmark	France	Germany
Greece	Hungary	Ireland
Israel	Italy	Japan
Kuwait	Luxembourg	Netherlands
New Zealand	Norway	Portugal
Slovenia	Spain	Sweden
Switzerland	United Kingdom	United States
 <i>Lower grade countries</i>		
Albania	Algeria	Angola
Armenia	Azerbaijan	Bahrain
Bangladesh	Belarus	Bhutan
Bolivia	Brazil	Burkina Faso
Burundi	Cambodia	Cameroon
Central African Republic	Chad	Chile
China	Colombia	Congo
Congo DRC	Costa Rica	Croatia
Czech Republic	Dominican Republic	Ecuador
El Salvador	Estonia	Eswatini
Gabon	Gambia	Georgia
Ghana	Guatemala	Guinea-Bissau
Haiti	Honduras	India
Iran	Jamaica	Jordan
Kazakhstan	Kenya	Kyrgyzstan
Laos	Latvia	Lithuania
Madagascar	Malaysia	Mali
Mauritania	Mexico	Moldova
Morocco	Nepal	Nicaragua
Niger	Nigeria	North Macedonia
Pakistan	Panama	Paraguay
Philippines	Poland	Romania
Russian Federation	Saudi Arabia	Slovakia
South Africa	South Korea	Sri Lanka
Thailand	Togo	Tunisia
Turkey	Uganda	Ukraine
Uruguay	Vietnam	Zambia

Table A.2: Sources and description of control variables

Variable	Source	Description
GDP growth	World Bank, World Development Indicators	Annual percentage growth rate of GDP
Inflation	World Bank, World Development Indicators	Annual variation of the Consumer Price Index (in %)
Trade openness	World Bank, World Development Indicators	Sum of exports and imports of goods and services (in % of GDP)
Debt	IMF, Historical Public Debt Database	General Government debt (in % of GDP)
Fiscal balance	IMF, Fiscal Monitor	Primary net lending/borrowing (in % of GDP)
Exchange rate regime	Ilzetzki, Reinhart, and Rogoff (2017)	Coarse classification of regimes on a scale of 1-6, from the most rigid to 'freely falling'
Political regime	Our World in Data, Polity 2	Indicator ranging from -10 (autocracy) to +10 (full democracy)
Monetary union	De Sousa (2012)	Dummy variable with 1 if the country belongs to a monetary union and 0 otherwise
Inflation targeting	IMF, based on Hammond (2012) and Roger (2010)	Dummy variable with 1 if the country has adopted an inflation target and 0 otherwise
IMF programme	Dreher (2006)	Dummy variable equals 1 if there is an IMF Standby Arrangement in effect for at least 5 months in a particular year, and 0 otherwise
Age dependency	World Bank, World Development Indicators	Population aged below 15 or above 64 (% of population aged 15-64)
Government fragmentation	Cruz, Database of Political Institutions	Government fractionalization index

Table A.3: Descriptive statistics

Statistic	N	Mean	St. Dev.	Min	Max
<i>Upper grade countries</i>					
FR	405	0.894	0.308	0	1
DR	405	0.728	0.445	0	1
BBR	405	0.864	0.343	0	1
ER	405	0.459	0.499	0	1
RR	405	0.126	0.332	0	1
GDP growth	405	2.048	3.003	-9.132	17.326
Inflation	405	2.447	2.019	-4.478	12.702
Trade openness	405	92.456	57.066	19.798	392.804
Debt	405	63.735	41.681	6.440	249.114
Fiscal balance	405	0.416	5.674	-29.901	26.516
Exchange rate regime	405	1.933	1.134	1	4
Political regime	405	9.072	3.275	-7	10
Monetary union	405	0.486	0.500	0	1
Inflation targeting	405	0.296	0.457	0	1
IMF programme	405	0.012	0.111	0	1
Age dependency	405	49.980	5.715	30.992	72.145
Government fragmentation	405	0.684	0.126	0.304	0.903
<i>Lower grade countries</i>					
FR	1,215	0.367	0.482	0	1
DR	1,215	0.290	0.454	0	1
BBR	1,215	0.310	0.463	0	1
ER	1,215	0.069	0.254	0	1
RR	1,215	0.086	0.280	0	1
GDP growth	1,215	4.632	4.143	-36.392	34.466
Inflation	1,215	7.985	22.471	-18.109	513.907
Trade openness	1,215	79.595	35.622	20.964	220.407
Debt	1,215	49.761	39.978	1.567	344.374
Fiscal balance	1,215	0.007	4.391	-13.027	31.314
Exchange rate regime	1,215	1.929	0.884	1	5
Political regime	1,215	3.230	6.028	-10	10
Monetary union	1,215	0.210	0.407	0	1
Inflation targeting	1,215	0.173	0.378	0	1
IMF programme	1,215	0.106	0.308	0	1
Age dependency	1,215	64.363	19.841	28.852	111.939
Government fragmentation	1,215	0.577	0.238	0.000	0.999

Table A.4: Placebo tests using random weighting

	FR		DR		BBR		ER	
	(1)		(2)		(3)		(4)	
Intercept	-1.746	***	-1.422	**	-2.697	***	-2.922	***
	(0.418)		(0.522)		(0.469)		(0.651)	
GDP growth	-0.040	***	-0.043	***	-0.036	**	-0.032	*
	(0.011)		(0.012)		(0.012)		(0.014)	
Inflation	-0.035	***	-0.027	**	-0.076	***	-0.025	*
	(0.007)		(0.009)		(0.010)		(0.011)	
Trade openness	-0.003	**	-0.001		0.002		0.001	
	(0.001)		(0.001)		(0.001)		(0.001)	
Debt	0.002		0.002		0.003	*	0.003	*
	(0.001)		(0.001)		(0.001)		(0.001)	
Fiscal balance	0.020	*	0.009		0.040	***	0.013	
	(0.010)		(0.010)		(0.010)		(0.012)	
Exchange rate regime	-0.089		-0.639	***	-0.163	*	0.081	
	(0.060)		(0.072)		(0.066)		(0.073)	
Political regime	0.088	***	0.084	***	0.121	***	0.158	***
	(0.010)		(0.011)		(0.012)		(0.033)	
Monetary union	1.358	***	1.210	***	1.227	***	0.335	**
	(0.114)		(0.118)		(0.116)		(0.129)	
Inflation targeting	0.290	**	0.805	***	0.424	***	-0.053	
	(0.111)		(0.132)		(0.131)		(0.135)	
IMF programme	-0.267	*	0.023		-0.260		0.007	
	(0.134)		(0.150)		(0.144)		(0.170)	
Age dependency	-0.003		0.005		0.012	**	-0.015	*
	(0.004)		(0.005)		(0.004)		(0.007)	
Government fragmentation	1.490	***	1.395	***	1.139	***	1.583	***
	(0.245)		(0.277)		(0.265)		(0.477)	
Spatial coefficient (ρ)	-0.099		-0.171		0.201		0.130	
	(0.238)		(0.267)		(0.158)		(0.291)	
Region dummies	Yes		Yes		Yes		Yes	
3-year dummies	Yes		Yes		Yes		Yes	
Observations	1620		1620		1620		1620	
Log Likelihood	-723.987		-609.083		-663.936		-481.666	

Notes: ***p<0.001, **p<0.01, *p<0.05. Standard errors in parentheses.

Table A.5: Sub-samples results using income levels

	High-income countries		Lower income countries	
	W^g (1)	W^t (2)	W^g (3)	W^t (4)
Intercept	-43.403 *** (11.245)	-53.285 *** (13.158)	-0.140 (0.528)	0.684 (0.551)
GDP growth	-0.148 (0.126)	-0.084 (0.094)	-0.024 * (0.011)	-0.025 * (0.011)
Inflation	0.242 (0.144)	0.221 (0.145)	-0.023 ** (0.009)	-0.032 *** (0.008)
Trade openness	0.007 (0.010)	0.007 (0.008)	-0.003 * (0.002)	-0.004 * (0.002)
Debt	0.001 (0.010)	0.004 (0.009)	0.000 (0.001)	0.000 (0.001)
Fiscal balance	0.068 (0.060)	0.072 (0.066)	0.011 (0.011)	0.015 (0.012)
Exchange rate regime	-1.120 ** (0.363)	-0.854 ** (0.270)	-0.182 * (0.072)	-0.189 * (0.074)
Political regime	2.082 ** (0.741)	2.581 *** (0.758)	0.054 *** (0.011)	0.053 *** (0.011)
Monetary union	1.520 * (0.764)	2.759 * (1.206)	1.244 *** (0.139)	1.147 *** (0.135)
Inflation targeting	0.697 (0.640)	1.899 (1.034)	0.201 (0.131)	0.149 (0.130)
IMF programme	1.472 (5.710)	6.051 (7.051)	-0.074 (0.141)	-0.059 (0.140)
Age dependency	0.425 *** (0.109)	0.415 *** (0.104)	-0.018 *** (0.005)	-0.027 *** (0.005)
Government fragmentation	8.561 (4.700)	10.974 * (5.533)	1.423 *** (0.258)	1.371 *** (0.255)
Spatial coefficient (ρ)	-0.432 (0.357)	0.171 (0.183)	0.365 ** (0.113)	0.369 *** (0.074)
Region dummies	Yes	Yes	Yes	Yes
3-year dummies	Yes	Yes	Yes	Yes
Observations	405	405	1215	1215
Log Likelihood	-40.135	-37.557	-581.049	-589.235

Notes: ***p<0.001, **p<0.01, *p<0.05. Standard errors in parentheses.

This additional classification does not strongly differ from the previous. Botswana and Hungary move from Upper grade to Lower income while Bahrain and South Korea move from Lower grade to High-income.