Do Individual Heterogeneity and Spatial Correlation Matter?

An Innovative Approach to the Characterisation of the European Political Space.*

Giovanna Iannantuoni[†], Elena Manzoni[‡]
and Francesca Rossi[§]

PRELIMINARY VERSION

The European Parliament is composed by legislators that are heterogeneous in several aspects, such as, for example, nationality, ideological position, rules of election, political experience and many others. Therefore, an analysis of the determinants of voting behavior of Members of the European Parliament (MEPs) should take into account their heterogeneity, as national identity and country-specific ideologies may play an important role in particular in early legislatures. In this paper we study the determinants of the European political space with a novel approach. Specifically, we introduce linguistic, geographical, institutional and cultural metrics to take into account heterogeneity and correlations among legislators by means of a spatial econometrics approach. In line with the existing literature we find that the first dimension of the European political space is mainly explained by the MEPs' ideological position on a left-right scale. We find that spatial correlations play an important role in interpreting the second dimension of the political space. We also show that the most relevant metric seems to be the institutional one, that is, MEPs that share similar institutional backgrounds influence each other strongly.

*We thank Jean-Francois Laslier and Shlomo Weber for helpful comments. We also thank Keith T. Poole for his support with the NOMINATE procedure. Elena Manzoni and Francesca Rossi gratefully acknowlege financial support from EIEF research grant.

†Department of Economics, Management and Statistics, University of Milan-Bicocca
‡Department of Economics, Management and Statistics, University of Milan-Bicocca
§Department of Economics, University of Verona

1 Introduction

Over the past few decades a growing literature in political economy has focused on the determinants of legislators' behaviour in the US Congress. Understanding the features of legislators that influence their voting behaviour is even more interesting in the European Parliament framework, where also national identity and country-specific ideologies may play an important role. Members of the European Parliament (MEPs) are elected in districts that do not cross national borders. As a consequence, they represent their countries and their national parties, as well as the European Political Group they belong to. Moreover, they are only accountable to their national electorate. Hence, potential spatial correlation across legislators, where space is intended here in a broad way that includes economics/cultural characteristics, may importantly affect their voting behavior.

In this paper, we focus on the key issue of the definition and interpretation of the European political space. Political scientists have analyzed the dimensions that characterize the European political space (see for example Hix, Noury and Roland 2006, Hooghe, Marks and Wilson 2002), and found that the European political space can be described has being characterised by two dimensions. Hix, Noury and Roland (2006) analyse the two dimensions considering as aggregating observation at the national party level. They show how the first dimension can be interpreted as related to the national party ideological positioning on a left-right scale, while the second one seems to be related with the position about European integration. In this paper we also consider the national party in each legislature as unit of observation. In order to refine the interpretation of the political space, we use spatial econometrics models to assess whether it is appropriate to take into account correlations across legislators' positions that might be driven by geographical, cultural or institutional proximities. We believe that points of interest and novelty in our work are not only the application of spatial models to complement existing results, but also the interpretation of causes that drive spatial correlations based on notions of economic and/or political distance between legislators.

The main scope of this paper is to provide an analysis of the possible correlations that may be at play in the European Parliament, and to refine the interpretation of the dimensions of the European political space. Understanding the characteristics of the main determinants of European legislators' behaviour may help to address many policy relevant questions, such as the polarization of the European Parliament or the responsiveness of European policies to national shocks.

2 Methodology

Following Hix, Noury and Roland (2006), the first step of our analysis is the positioning of legislators along two orthogonal dimensions of the political space using roll call votes data pertaining to the first five legislatures of the European Parliament. We adopt the methodology introduced by Poole and Rosenthal (e.g. Poole and Rosenthal (1997) and references therein), who developed a probabilistic framework of parliamentary voting based on a random utility model and applied a multidimensional scaling method (the so-called NOMINATE) to perform the parameters' estimation using a standard Maximum Likelihood-type of optimization. The clear advantage of Poole and Rosenthal approach is its suitability to handle very large datasets and a substantial number of unknown parameters, as well as its robustness to distributional mis-specification for the random utility function. Moreover, the NOMINATE scaling method has been extended and applied (c.f. Poole and Rosenthal (2001), among others) to a dynamic setting, so that several consecutive legislatures can be analysed at the same time. A very exhaustive description of NOMINATE can be found in Poole (2005). We use the dynamic version of NOMINATE to take full advantage of a larger dataset, but since we only deal with five legislatures probably the standard static model would deliver very similar results.

The scope of the NOMINATE technique is simply to assign coordinates to the legislators' position along a number (conjectured ex-ante and supported ex post by some goodness of fit measures) of orthogonal dimensions of the political space. However, the method offers no interpretation to the economic and political meaning of the dimension. Once the coordinates of legislators along the two dimensions, suggested *inter alia* by Hix, Noury and Roland (2006), have been determined, we use spatial autoregressions (SARs) to investigate the determinants of legislators' behaviour and thus to interpret the dimensions of the political space. The introduction of spatial components into the standard regression analysis helps to shed light on the role and the nature of the correlations among legislators belonging to different national parties.

SARs offer a useful, applicable framework for describing data which are generally irregularly spaced, without a natural ordering and/or a geographical interpretation, such as legislators' coordinates. In SAR models the notion of possible irregular spacing based on general economic distances, is embodied in an $n \times n$ weight matrix (n being sample size), denoted W, which needs to be chosen by the practitioner. In general, the economic distance between legislators i and j is defined as the distance between u_i and u_j, where u_i and u_j are vectors of characteristics pertaining to legislators i and j, respectively. The distance between u_i and u_j might be defined in an Euclidean sense. A vast choice of relevant economic distances among legislators is discussed in Section 3. Let w_{ij} be the $(i, j)-$th element of W. Conventionally, $w_{ii} = 0$ for $i = 1, ...n$, i.e. the spatial interaction of each legislator with itself is set to zero. Often, but not exclusively, w_{ij} is defined in terms of the inverse of an economic distance between units i and j. In other cases, as legislators belong to different regions or countries, W_n can be chosen according to a contiguity criterion, i.e. $w_{ij} = 1$ if their regions or countries share a border and $w_{ij} = 0$ otherwise. In our empirical analysis we also normalise W_n so that the entries in each row sum to one. For exhaustive surveys of spatial models and applications see for instance Anselin (1988) and Arbia (2006).

Let y be an $n \times 1$ vector of observations, X an $n \times k$ matrix of exogenous regressors of full column rank which might include a column of ones, and ϵ an $n \times 1$ vector of independent and identically distributed (iid) random variables, with mean zero and unknown variance σ^2. A standard spatial autoregression is defined as

$$y = \lambda W y + X\beta + \epsilon. \tag{1}$$

for some unknown scalar λ and some unknown $k \times 1$ vector β. According to (1), each y_i for $i = 1, ..., n$ not only is explained by its own vector of characteristcs, but also by a weighted average of y_j, with $j \neq i$.

Model (1) is a very parsimonious method of describing spatial dependence, conveniently depending only on economic distances rather than actual locations, which may be unknown or not relevant. Although a major drawback of SAR models is the ex ante specification of W_n, to which parameter estimates are sensitive, (1) has been widely used in practical applications because of its flexibility. The possibility of considering several specifications of W_n allows us to investigate the effects of multiple sources of interactions among legislators.

In our work, we also consider a slightly more general version of (1)

$$y = \lambda W y + X\beta + W X \gamma + \epsilon, \tag{2}$$

- where in addition to the endogenous spatial effect Wy we also add a direct exogenous interaction effect WX. A technical issue to consider is how to set the W entries between legislators with the same nationality. We set it equal to zero so that ideologies of co-national legislators only depend on their own characteristics and on their interactions with others' nationality MEP, but they are not impacted by cross-correlations among themselves.

3 Selection of economic distances

The main focus of this paper is the investigation of which correlations among legislators have greater influence on their voting choices. We therefore consider several distances to generate the proximity matrix W. In this way we are able to asses whether clustering among legislators are influenced by correlations across several national characteristics.

Geographical distances. We first start with two geographical distances: the distance in kilometers and in flight duration between capitals of European member states of legislators i and j.[1] The two distances are highly correlated. We consider both of them for robustness. The slight differences in the two measures are due to the fact that flight duration also depends on how connected is the capital of each member state, which may be considered a proxy for the integration level of the country. The matrices W are built with $w_{ij} = \frac{1}{Distance_{ij}}$.

Linguistic distance. The second choice of distance is based on a linguistic metric. We measure the distance between legislators on the basis of their home country languages. For a comprehensive analysis of the distances across languages we refer to Ginsburgh and Weber (2011). As they show, linguistic proximity has an effect on economic and political outcomes such as trade, immigration and voting behaviour. We build a linguistic proximity matrix based on the lexicostatistical distance by Dyen, Kruskal and Black (1992). Lexicostatistical distances are based on the vocabulary of a language, and they are built on words which share a common origin, what linguists call cognate words (such as the English *father* and the German *Vater*). Dyen, Kruskal and Black (1992) classify eighty-four Indo-European languages, collecting the words for a common "list of meanings", making cognate decisions on each pair of languages and then calculating lexicostatistical percentages, i.e. the percentage of cognates shared by every pair of languages. Such percentage of cognates is a proximity measure between languages, so we define w_{ij} in our matrix as the percentage of cognates between the official language of the countries of legislators i and j (multiplied by 1,000).[2] The measure is not available for pairs which involve legislators from Estonia, Finland, Hungary and Malta, as their official languages are not Indo-European. We set all these values to 0 (which corresponds to minimal proximity, or maximal distance). This is a satisfactory approximation for the proximity between the four above mentioned languages and the Indo-European ones, but not for the distance among the four languages. For this reason we plan to include an additional linguistic metric, based on cladistic distances, which can be built also for languages that are not Indo-European.

Institutional distance. The third choice of proximity matrix is based on the the Parliamentary Power Index by Fish and Kroenig (2009). The Legislative Power Survey performed by Fish and Kroenig identifies 32 possible powers that a legislature may have,

[1] Distance in km is the average of the shortests outbound and inbound routes suggested by Google Maps. Flight duration is measured as number of minutes of flight (excluding the time spent in connecting airports) (source: Google Maps). Few capitals are not connected by flight because they are too close. We arbitrarily set Wien-Bratislava (79 km) to 20', Bruxelles-Luxembourg (216 km) to 30', Bruxelles-Amsterdam (206 km) to 30', Tallinn-Helsinki (88 km) to 20'.

[2] For the construction of the linguistic matrix, French Belgium and Flemish Belgium were considered as separate countries.

such as the power to appointing the prime minister or the chairman of the central bank, or the power to grant pardons or amnesties, or the immunity from dissolution in case of dissolution of the government. The Parliamentary Power Index is the number of powers that a legislature has (out of 32), divided by 32. Using the PPI we create a matrix W_n which describes the institutional proximity of legislators' home countries, where $w_{ij} = \frac{1}{|PPI_i - PPI_j|}$.[3] The idea behind the choice of an institutional matrix is that the way in which the role of legislators is perceived and operated may be affected by the institutional setup where the MEP was raised, and that this view of the legislative duties may in turn affect how MEPs vote.

Cultural distances. A third set of W is based on cultural distances. We build six W matrices based on the six cultural indexes by Hofstede, Hofstede and Minkov (2010), which describe the attitudes of national cultures towards different issues that may influence legislative decision making. The six indexes are:

Power Distance Index. The PDI index measures the extent to which less powerful members of institutions expect and accept unequal distribution of powers. High PDI scores are correlated with a political spectrum with a weak center and strong right and left wings, and fewer parties.

Individualism Index. The IDV index classifies societies based on the quality and quantities of interpersonal ties. High IDV scores are correlated with societies where privacy and individual freedom prevail over collective interests.

Masculinity Index. The MAS index classifies societes based on the distinction (or absence of distinction) of emotional roles by gender. High MAS scores are correlated with preferences for equity (vs. equality), preference for large organizations (vs. small) and with the tendency of resolving conflicts by letting the strongest win.

Uncertainty Avoidance Index. The UAI index measures the extent to which members of a culture feel threatened by ambiguous or unknown situations. High UAI scores are correlated with the presence of many and precise laws, with a slow judiciary process and with a low participation in politics.

Long-Term Orientation Index. The LTO index measures the weight that societies give to virtues oriented towards future rewards (such as perseverance) as opposed to virtues related to the past and the present (such as respect for tradition). LTO scores are correlated with investment choices, nationalism and fundamentalisms.

Indulgence vs. Restraint Index The IVR index measures whether a culture as a tendency to allow relatively free gratification as opposed to the conviction that such gratification needs to be regulated by strict social norms. IVR scores are correlated with the importance of freedom of speech, the importance of mantaining order and the number of police officers.

[3]The PPI index is not available for Luxembourg and Malta. We set $w_{ij} = 0$ for any pair with at least a legislator from Malta or Luxembourg.

The W matrices originated by the cultural indexes are characterised by $w_{ij} = \frac{1}{|Index_i - Index_j|}$.[4]

4 Results

Let y_d, for $d = 1, 2$, denote respectively the first or the second coordinate of the mean points of legislators belonging to the same national party, obtained by NOMINATE. We consider three different specifications of (2), where only some of the exogenous regressors are spatially lagged, i.e.

$$y_d = \lambda W y_d + \beta_1 LR + \beta_2 EUint + \beta_3 W * LR + \beta_4 W * EUint + \gamma X + \epsilon, \quad (3)$$

where LR and $EUint$ represent indexes to indicate left-right political orientation and EU integration propensity, respectively, and X contains a set of dummy variables that vary across the three specifications we consider. In our first model (results reported in Tables 1 and 2), X includes country-specific dummy variables as well as variables to indicate whether the national party was in power during each legislature (taking value one if the national party was in power for the majority of the legislature and zero otherwise), and whether it had a European Commissioner during such period of time (taking value one if it had Commissioner for the whole period, 0.5 if it had a Commissioner for about half of the period, and zero otherwise). Our second model (results reported in Tables 3 and 4) differs from the first one as we add a set of binary variables to indicate which European Political Group each national party belongs to, while in our third specification (Tables 5 and 6) we further add legislature-specific dummies. Indexes related to political orientation and EU integration have been obtained from expert judgement data in Marks and Steenbergen (2004). We stack data pertaining to the first five legislatures so that we have the advantage of a larger dataset, but W is constructed so that spatial correlation across observations only affects units within the same legislature. Thus, all our choices of W have a block diagonal structure where each block reflects interactions of agents within each legislature.

Tables 1 and 3 and 5 report results of our three specifications along the first dimension, while Tables 2, 4 and 6 display results for the second dimension. Each Table reports coefficient values and t-statistics obtained for various choices of W, as described in Section 3.

The first two specifications allow us to compare results with Hix, Noury and Roland (2006). We find that their results are robust to the introduction of our spatial components, as the coefficients of their main regressors of interest, LR and EUint, have

[4] Cultural indexes IDV, MAS and UAI are available separately for French Belgium and Flemish Belgium, which have been treated as separate countries. Data for Cyprus is available only for index IVR; in all other cases entries w_{ij} where either i or j is Cyprus have been set to zero.

the same sign and level of significance in this paper. Specifically, in the model without dummies for the European Political Groups (EPGs) both the coefficients associated to LR and EUint are strongly significant (Tables 1 and 2), while by adding dummies for EPGs we replicate their main result that shows how the first dimension is explained by LR (Table 3). Both the coefficients of LR and EUint are relevant in interpreting the second dimension, as shown in Table 4. The aforementioned results hold regardless of which weight matrix we adopt. The spatial correlation coefficient reflecting endogenous interactions is never significant when dealing with the first dimension, supporting the clear role of the ideological position along the left-right scale (Hix, Noury and Roland, 2006). The exogenous spatial effect associated to LR and to EUint are instead is occasionally relevant for some choices of W, as shown by the estimates of β_3 and β_4 reported in Tables 1 and 3.

Interestingly, the spatial component plays a significant role in explaining the second dimension of the European Political Space. Specifically, λ is strongly signficant both in the first and second specification for most our W choices, as shown in Tables 2 and 4. This sheds more light on the interpretation of the second dimension. Moreover, the exogenous spatial effects due to LR and EUint and practically never significant along the second dimension, regardless of the choice of W. This lack of direct spatial effects along the second dimension and the strong significance of λ suggests that the legislators' position along the second dimension of the EU political space is explained by both LR and EUint, but also by some correlations across legislators' mean points driven by endogenous factors.

In order to further investigate the robustness of our results we run the third set of regressions, in which we also include the legislature dummies. Results are reported in Tables 5 and 6. The first point to make is that the effect of LR, EUint and the endogenous spatial component is unchanged in the first dimension, that is, the first dimension is even more clearly explained by LR. The (somewhat limited) spatial exogenous effect due to EUint we observed in Tables 1 and 3 disappears completely once we introduce the legislature dummies.

The most interesting results are obtained when considering the second dimension. The significance of λ vanishes when introducing the legislature dummies for most choices of W. A possible explanation of this finding lies in the historical evolution of the national composition of the European Union. As the European Union enlarged the national (and spatial) composition of the Parliament changed. As a consequence, the legislature dummies described also the spatial composition of the Parliament in that specific legislature. Thus, the correlation effects embedded by most choices of W seem to be captured by a fixed effect component that possibly reflects the size and country composition of each legislature.

Two notable exceptions are the coefficients of the matrices built using the Institutional and MAS distances. The coefficient λ of the Institutional matrix (Table 6,

Table 1: First dimension.

First	Km	Flight	Lang.	Inst.	PDI	IDV	MAS	UAI	LTO	IVR
Dimension	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
λ	0.0289	0.0721	0.0097	0.0932	0.0602	-0.1256	-0.0769	-0.0025	0.1318	-0.0132
	(0.14)	(0.33)	(0.04)	(0.52)	(0.40)	(-0.61)	(-0.53)	(-0.02)	(0.84)	(-0.08)
LR	1.5481	1.5491	1.5487	1.5509	1.5428	1.5488	1.5470	1.5466	1.5474	1.5500
	(27.76)***	(27.82)***	(27.76)***	(27.85)***	(27.57)***	(27.76)***	(27.83)***	(27.74)***	(27.85)***	(27.65)***
EUint	0.0270	0.0274	0.0275	0.0270	0.0270	0.0269	0.0261	0.0268	0.0278	0.0264
	(3.35)***	(3.39)***	(3.39)***	(3.34)***	(3.34)***	(3.34)***	(3.25)***	(3.32)***	(3.44)***	(3.26)***
$W * LR$	1.1653	1.1579	1.0377	1.2196	-0.2817	1.2399	0.7101	1.1055	-0.1213	0.6253
	(1.46)	1.27)	(0.96)	(1.57)	(-0.49)	(1.62)	(1.34)	(1.79)*	(-0.21)	(0.96)
$W * EUint$	-0.1551	-0.1834	-0.1269	-0.1304	-0.0153	-0.1311	-0.0194	-0.0833	-0.0321	-0.0587
	(-1.79)*	(-1.98)**	(-1.56)	(-1.82)*	(-0.30)	(-1.87)*	(-0.33)	(-1.50)	(-0.62)	(-0.98)
Const.	-0.7725	-0.6001	-0.8406	-0.8857	-0.8931	-0.9047	-1.1087	-1.1170	-0.6381	-1.0042
	(-3.15)***	(-1.91)*	(-2.74)***	(-5.30)***	(-7.59)***	(-5.56)***	(-10.16)***	(-7.45)***	(-3.24)***	(-6.26)***
N	347	347	347	347	347	347	347	347	347	347

Notes. t-statistics in parentheses. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Table 2: Second dimension.

Second	Km	Flight	Lang.	Inst.	PDI	IDV	MAS	UAI	LTO	IVR
Dimension	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
λ	0.4713	0.5020	0.5247	0.4218	0.3518	0.4358	0.3080	0.4880	0.5242	0.5361
	(3.26)***	(3.48)***	(3.85)***	(2.78)***	(2.54)**	(3.02)***	(2.38)***	(4.21)***	(4.85)***	(4.68)***
LR	-1.3853	-1.3860	-1.3880	-1.3854	-1.3878	-1.3843	-1.3909	-1.3875	-1.3946	-1.3844
	(-15.45)***	(-15.48)***	(-15.56)***	(-15.30)***	(-15.32)***	(-15.48)***	(-15.49)***	(-15.63)***	(-15.80)***	(-15.53)***
EUint	0.0473	0.0469	0.0471	0.0459	0.0473	0.0467	0.0457	0.0486	0.0493	0.0467
	(3.65)***	(3.62)***	(3.63)***	(3.50)***	(3.61)***	(3.61)***	(3.52)***	(3.78)***	(3.84)***	(3.63)***
$W * LR$	0.9843	1.7809	2.6202	1.6438	0.5560	2.2909	0.5845	2.0987	1.0467	0.8229
	(0.74)	(1.16)	(1.59)	(1.31)	(0.61)	(1.77)*	(0.69)	(2.14)**	(1.16)	(0.79)
$W * EUint$	0.0351	-0.0455	-0.1977	-0.1416	-0.1086	-0.1769	0.0484	-0.1690	-0.1440	-0.0113
	(0.25)	(-0.29)	(-1.52)	(-1.22)	(-1.32)	(-1.50)	(0.51)	(-1.93)*	(-1.76)*	(-0.12)
Const.	0.1371	0.0817	0.4136	0.6050	0.9776	0.6589	0.6085	0.5882	1.0729	0.4591
	(0.35)	(0.16)	(0.90)	(2.27)**	(5.23)***	(2.56)**	(3.45)***	(2.45)**	(3.45)***	(1.81)*
N	347	347	347	347	347	347	347	347	347	347

Notes. t-statistics in parentheses. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Table 3: First dimension with dummies for European Political Groups

First	Km	Flight	Lang.	Inst.	PDI	IDV	MAS	UAI	LTO	IVR
Dimension	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
λ	0.1846	0.2456	0.1402	0.1666	0.1925	-0.0697	0.0657	0.1902	0.1841	0.1268
	(1.07)	(1.36)	(0.71)	(1.09)	(1.41)	(-0.38)	(0.51)	(1.55)	(1.27)	(0.90)
LR	1.0787	1.0777	1.0792	1.0662	1.0783	1.0857	1.0735	1.0718	1.0998	1.0858
	(14.62)***	(14.64)***	(14.61)***	(14.44)***	(14.55)***	(14.59)***	(14.62)***	(14.52)***	(14.99)***	(14.61)***
EUint	0.0094	0.0100	0.0105	0.0888	0.0111	0.0098	0.0088	0.0106	0.0101	0.0098
	(1.04)	(1.10)	(1.16)	(0.97)	(1.22)	(1.07)	(0.97)	(1.17)	(1.11)	(1.07)
$W * LR$	1.1134	1.0872	1.1304	1.6862	-0.3666	1.1801	0.9154	0.9297	-0.2991	0.5300
	(1.80)*	(1.54)	(1.35)	(2.78)***	(-0.85)	(1.99)**	(2.26)**	(1.96)**	(-0.68)	(1.05)
$W * EUint$	-0.1546	-0.1810	-0.1352	-0.1460	-0.0137	-0.0967	-0.0433	-0.0711	-0.0206	-0.0519
	(-2.30)**	(-2.48)**	(-2.11)**	(-2.60)***	(-0.35)	(-1.77)*	(-0.96)	(-1.66)*	(-0.52)	(-1.11)
EPG	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Const.	0.0807	0.2510	-0.0129	-0.2396	-0.0397	-0.2018	-0.2615	-0.2482	0.2307	-0.1520
	(0.40)	(1.01)	(-0.05)	(-1.63)	(-0.32)	(-1.36)	(-2.21)**	(-1.75)*	(1.36)	(-1.02)
N	347	347	347	347	347	347	347	347	347	347

Notes. t-statistics in parentheses. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Table 4: Second dimension with dummies for European Political Groups

Second	Km	Flight	Lang.	Inst.	PDI	IDV	MAS	UAI	LTO	IVR
Dimension	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
λ	0.4864	0.5136	0.5617	0.3462	0.3647	0.4489	0.2309	0.4312	0.5195	0.5187
	(3.66)***	(3.86)***	(4.63)***	(2.23)**	(2.84)***	(3.35)***	(1.85)*	(3.71)***	(5.20)***	(4.76)***
LR	-0.6864	-0.6936	-0.6964	-0.7010	-0.6904	-0.6806	-0.6966	-0.7231	-0.6986	-0.6972
	(-5.08)***	(-5.14)***	(-5.20)***	(-5.08)***	(-5.05)***	(-5.07)***	(-5.13)***	(-5.37)***	(-5.29)***	(-5.23)***
EUint	0.0299	0.0297	0.0315	0.0287	0.0287	0.0300	0.0264	0.0324	0.0325	0.0294
	(1.80)*	(1.79)*	(1.91)*	(1.70)*	(1.71)*	(1.82)*	(1.58)	(1.96)**	(1.99)**	(1.80)*
$W * LR$	0.4032	1.0329	1.8064	1.1673	0.4743	1.9784	0.2863	1.8817	-0.1179	0.8541
	(0.34)	(0.75)	(1.25)	(1.04)	(0.60)	(1.66)*	(0.38)	(2.20)**	(0.64)	(0.93)
$W * EUint$	0.0646	-0.0043	-0.1284	-0.1225	-0.0740	-0.1983	0.0824	-0.1532	0.5088	0.0137
	(0.51)	(-0.03)	(-1.11)	(-1.17)	(-1.03)	(-1.83)*	(1.01)	(-1.99)*	(-1.63)	(0.16)
EPG	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Const.	-0.2773	-0.2945	-0.0885	0.3079	0.3928	0.3210	0.0882	0.1050	-0.7399	-0.1714
	(-0.76)	(-0.66)	(-0.21)	(1.13)	(1.76)*	(1.22)	(0.40)	(0.40)	(2.43)**	(-0.65)
N	347	347	347	347	347	347	347	347	347	347

Notes. t-statistics in parentheses. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

column (4)) remains large and strongly significant, therefore suggesting that legislators with similar institutional background influence each other voting choices in a relevant manner. Also the coefficient describing the exogenous spatial effect related to the cultural Masculinity index remains significant. As the Masculinity index is correlated with the presence (or absence) of women in politics, this finding could be due to a propension of legislators to be influenced by legislators of the same gender. We plan to further investigate this possible explanation including as additional regressor the fraction of women legislators in each national party in each legislature.

5 Discussion and conclusions

In this paper we analyzed the European Political Space with a novel approach. We introduced and discussed several metrics that may induce spatial correlation among the legislators. We showed how the first dimension, coherently with the existing literature, is explained by the ideological positioning along the left-right scale. Furthermore, we showed how a spatial component is at play in the second dimension of the political space, and we discussed why the Institutional metric built from the Parliamentary Power Index, and the cultural metric built from the Masculinity Index are the best performers in terms of the robustness of their effect on the second dimension. We suggested how the Masculinity index may be influenced by a gender effect that we plan to further investigate.

We plan to extend our work further. Among the interesting issues that can be tackled with this novel methodology, we highlight the link between legislators' accountability and their behaviour. Hix et al. (2009) have shown that members of the European Parliament voluntarily follow directions of transnational political groups even though legislators' are only accountable to their national electorate. Moreover, rules for the elections of the European Parliament change across member states and thus legislators of different nationalities are differently accountable for their behaviour. Furthermore, these rules are somehow correlated across countries and hence our methodology can help interpreting their effects more efficiently. The results of this analysis may have policy implications in the determination of the optimal combination of electoral rules which may include for example pan-European lists or country-specific features.

Table 5: First dimension with dummies for European Political Groups and legislatures.

First	Km	Flight	Lang.	Inst.	PDI	IDV	MAS	UAI	LTO	IVR
Dimension	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
λ	-0.2619	-0.3069	-0.2041	0.0316	0.0700	-0.3762	-0.0154	0.2057	-0.0316	-0.0179
	(-1.01)	(-1.01)	(-0.80)	(0.17)	(0.43)	(-1.65)*	(-0.10)	(1.35)	(-0.19)	(-0.11)
LR	1.0567	1.0565	1.0665	1.0490	1.0592	1.0559	1.0648	1.0628	1.0746	1.0634
	(14.65)***	(14.67)***	(14.67)***	(14.42)***	(14.61)***	(14.53)***	(14.65)***	(14.64)***	(14.95)***	(14.60)***
EUint	0.0125	0.0131	0.0124	0.0109	0.0135	0.0122	0.0111	0.0122	0.0112	0.0127
	(1.41)	(1.48)	(1.38)	(1.22)	(1.51)	(1.37)	(1.23)	(1.37)	(1.26)	(1.41)
$W * LR$	-1.1140	-2.0516	-0.5239	0.8192	-0.9243	-0.7810	0.5769	0.1789	-0.7570	-0.6038
	(-1.06)	(-1.44)	(-0.41)	(1.07)	(-1.84)*	(-0.83)	(1.25)	(0.32)	(-1.57)	(-0.96)
$W * EUint$	0.0093	0.0803	0.0113	-0.0448	0.0438	0.0844	-0.0418	0.0025	0.0248	0.0467
	(0.09)	(0.59)	(0.10)	(-0.59)	(0.94)	(0.97)	(-0.85)	(0.05)	(0.55)	(0.81)
EP2	-0.0503	-0.0696	-0.0595	-0.0072	-0.0363	-0.0652	-0.0155	-0.0025	-0.0422	-0.0382
	(-1.26)	(-1.66)*	(-1.37)	(-0.19)	(-0.99)	(-1.69)*	(-0.41)	(-0.06)	(-1.16)	(-1.01)
EP3	0.0640	0.0727	0.0190	0.0030	0.0239	0.0275	0.0130	0.0164	0.0294	0.0225
	(1.60)	(1.78)*	(0.51)	(0.09)	(0.68)	(0.66)	(0.38)	(0.47)	(0.84)	(0.63)
EP4	0.1489	0.1533	0.1004	0.1040	0.1027	0.1260	0.0839	0.0955	0.0990	0.1081
	(3.64)***	(3.60)***	(2.45)***	(2.86)***	(2.97)***	(3.05)***	(2.29)**	(2.79)***	(2.88)***	(3.06)***
EP5	0.0857	0.0850	0.0357	0.0664	0.0660	0.0659	0.0449	0.0743	0.0490	0.0665
	(1.93)**	(1.68)*	(0.73)	(1.69)	(1.83)*	(1.47)	(1.33)	(2.04)*	(1.42)	(1.82)*
EPG	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Const.	0.1389	0.2802	-0.497	-0.4883	-0.1640	-0.3946	-0.2780	-0.3814	1.1465	-0.2262
	(0.67)	(1.03)	(-0.15)	(-2.94)***	(-1.28)	(-2.52)**	(-2.28)**	(-2.45)**	(0.82)	(-1.50)
N	347	347	347	347	347	347	347	347	347	347

Notes. t-statistics in parentheses * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Table 6: Second dimension with dummies for European Political Groups and legislatures.

Second	Km	Flight	Lang.	Inst.	PDI	IDV	MAS	UAI	LTO	IVR
Dimension	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
λ	-0.2612	-0.4037	0.0416	-0.6855	-0.2043	0.1644	-0.3934	-0.0278	0.2197	0.0496
	(-1.04)	(-1.31)	(0.18)	(-3.23)***	(-1.19)	(0.88)	(-2.51)**	(-0.17)	(1.41)	(0.29)
LR	-0.7300	-0.7325	-0.7224	-0.7263	-0.7306	-0.7144	-0.7114	-0.7253	-0.7131	-0.7127
	(-5.52)***	(-5.56)***	(-5.44)***	(-5.52)***	(-5.48)***	(-5.33)***	(-5.43)***	(-5.45)***	(-5.40)***	(-5.39)***
EUint	0.0374	0.0381	0.0351	0.0356	0.0346	0.0333	0.0345	0.0334	0.0328	0.0351
	(2.29)**	(2.34)**	(2.14)**	(2.20)**	(2.11)**	(2.03)**	(2.13)**	(2.04)**	(2.02)**	(2.16)**
$W * LR$	-3.4756	-5.1001	-1.4564	-1.6661	-0.3958	0.0411	-0.9470	0.6452	-0.2569	-0.7328
	(-1.78)*	(-1.96)**	(-0.66)	(-1.23)	(-0.46)	(0.02)	(-1.16)	(0.63)	(-0.29)	(-0.65)
$W * EUint$	0.3720	0.5679	0.2490	0.1952	0.0397	-0.0160	0.1648	-0.0315	-0.0436	0.1601
	(1.99)**	(2.27)**	(1.31)	(1.48)	(0.49)	(-0.10)	(1.93)*	(-0.34)	(-0.53)	(1.55)
EP2	-0.0067	-0.0112	0.0212	0.0477	0.0259	0.0047	0.0242	0.0381	-0.0124	0.0023
	(-0.09)	(-0.15)	(0.27)	(0.71)	(0.39)	(0.07)	(0.36)	(0.55)	(-0.19)	(0.03)
EP3	0.1915	0.2254	0.1378	0.2334	0.1513	0.0910	0.1772	0.1240	0.0844	0.1090
	(2.33)**	(2.55)**	(1.76)*	(3.25)***	(2.17)**	(1.11)	(2.65)***	(1.82)*	(1.21)	(1.54)
EP4	0.4170	0.4941	0.3280	0.5145	0.3448	0.2145	0.3766	0.2786	0.1781	0.2676
	(3.87)***	(4.02)***	(3.09)***	(5.79)***	(4.06)***	(2.26)**	(4.32)***	(3.38)***	(2.14)**	(3.10)***
EP5	0.4162	0.5094	0.3456	0.4943	0.3192	0.1920	0.3741	0.2630	0.1455	0.2651
	(3.99)***	(4.25)***	(3.07)***	(5.63)***	(3.83)***	(2.03)**	(4.70)***	(3.30)**	(1.79)	(3.16)***
EUG	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Const.	-0.2473	-0.5128	-0.6610	-0.1780	-0.0015	0.1191	-0.2195	-0.1214	0.6598	-0.3549
	(-0.65)	(-1.03)	(-1.14)	(-0.59)	(-0.01)	(0.41)	(-0.98)	(-0.43)	(2.03)**	(-1.30)
N	347	347	347	347	347	347	347	347	347	347

Notes. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

References

[1]Anselin, L. (1988). *Spatial Econometrics: Methods and Models*. Kluwer Academic Publishers.

[2]Arbia, G. (2006). *Spatial Econometrics: Statistical Foundation and Applications to Regional Analysis*. Springer-Verlag, Berlin.

[3]Dyen, I., J.B. Kruskal and P. Black (1992). An Indo-European classification: A lexicostatistical experiment, *Transactions of the American Philosophical Society*, 82 (5).

[4]Fish M.S. and M. Kroenig (2009). *The Handbook of National Legislatures. A Global Survey.* Cambridge University Press.

[5]Ginsburg V. and S. Weber (2011). *How Many Languages Do We Need? The Economics of Linguistic Diversity.* Princeton University Press.

[6]Hix, S., 2001. Legislative behaviour and party competition in the European Parliament: an application of Nominate to the EU. *Journal of Common Market Studies* 39, 663-88.

[7]Hix, S., A. Noury and G. Roland (2006). Dimensions of Politics in the European Parliament, *American Journal of Political Science* 50(2) 494-511.

[8]Hix, S., A. Noury and G. Roland (2009). Voting Patterns and Alliance Formation in the European Parliament. *Philosophical Transactions of the Royal Society B* 364, 821-831.

[9]Hofstede G., Hofstede G.J. and M. Minkov (2010).*Cultures and organizations: software of the mind: intercultural cooperation and its importance for survival.* New York: McGraw Hill.

[10]Hooghe L., G. Marks and C.J. Wilson (2002). Does Left/Right Structure Party Positions on European Integration?, *Comparative Political Studies*, **35**, 965-989.

[11]Marks, G. and M. Steenbergen (2004). *Marks/Steenbergen Party Dataset*, Chapel Hill: University of North Carolina Chapel Hill, available at: http://www.unc.edu/∼gwmarks/data.htm

[12]Poole K.T. and H.Rosenthal (1997). *Congress: A Political-Economic History of Roll Call Voting* . New York: Oxford University Press.

[13]Poole K.T. and H. Rosenthal (2001). D-NOMINATE After 10 Years: a Comparative Update to Congress: A Political-Economic History of Roll Call Voting. *Legislative Studies Quarterly* 26, 5-26.

[14]Poole K.T. (2005). *Spatial Models for Parliamentary Voting.* Cambridge University Press.