Long Abstract: The Diffusion of Democracy: What Type of Interactions Matter?

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Few issues in political science have received as much attention as the possible determinants of democracy. Most of the earlier democratization studies focus on estimating the effects of domestic socio-economic factors on democracy being one of the most suspected links that of economic development and democracy. The empirical question of whether economic development induces democratic transitions arises partly from the theory of modernization that Lipset (1959) posited half a century ago. Indeed, many scholars supported this idea of socio-economic development as a prerequisite of democratization (see Przeworski, 1997; Przeworski et al., 2000). However, different studies have identified a set of economic, social, cultural, demographic, political-historical and institutional factors as important causes (Diamon, 1992; Bueno de Mesquita et al., 2003; Acemoglu and Robinson, 2006) which suggests the process of democratization is driven by a multiplicity of factors.

Importantly, scholars of international relations and geography analyzing regime transitions find that (i) it is not possible to predict democratization accurately if we treat the levels of democracy across countries as independent outcomes and (ii) that neighbour's democratic outcomes and interactions among countries are key to explain democratic transitions. Early work on the diffusion of democracy focused on the geographical clus-

tering of the regimes However, these earlier spatial studies of democracy defined space narrowly as geographical space. Exogenous and non-time varying geographical distance matrices based on different functional forms of geographical distance were used to model the interaction between neighboring countries in democratic outcomes. In this regard, Gledistch and Ward (2006) and Tabellini (2009) are the first attempts in providing a model of regime transition to democracy and reversion to autocracy taking into account geographical neighbor's attributes by means of functional forms similar to that of the SLX.

However, to understand the key channels of interactions that give rise to the diffusion of democracy between sample units, it is worth taking a closer look at the performance of different W matrices, containing a richer set of information than geographical distance. This is because of democratic spillovers might be something more than a function of spatial proximity. This is the approach of Beck, Gledistch and Beardsley (2006) who estimates a two-regime spatial lag cross-section using as W, trade and geographical distances to model political regime transitions.

In order to analyze the process of democratic diffusion, in this study we investigate the statistical significance of a variety of spatial lag terms in a multi-regime spatial panel model using as W matrices weights based on geographical distance, the intensity of trade relations, cultural/ linguistic and genetic similarities. To that end, we employ the efficient GMM estimator developed by Lee and Yu (2014) for dynamic spatial panels of the form:

$$Y_t = \mu + \iota_N \alpha_t + \tau Y_{t-1} + \sum_p \rho_p W_p Y_t + \sum_p \eta_p W_p Y_{t-1} + X_t \beta + \sum_p \theta_p W_p X_t + \epsilon_t \, (1)$$

where Y_t is a $N \times 1$ vector consisting of observations for the democratic score in country $i = 1, \ldots, N$ at a particular point in time $t = 1, \ldots, T$, X_t, is an $N \times K$ matrix of exogenous aggregate socioeconomic and economic covariates with associated response

parameters β contained in a $K \times 1$ vector that are assumed to influence the democratic level in i. τ, the response parameter of the lagged dependent variable Y_{t-1} is assumed to be restricted to the interval $(-1, 1)$ and $\epsilon_t = (\epsilon_{1t}, \ldots, \epsilon_{Nt})'$ is a $N \times 1$ vector that represents the corresponding disturbance term which is assumed to be i.i.d with zero mean and finite variance σ^2. The variables WY_t and WY_{t-1} denote contemporaneous and lagged endogenous interaction effects among the dependent variable. In turn, ρ is called the spatial auto-regressive coefficient. W_p are a $N \times N$ matrices of known constants describing the degree of connectivity of the countries in the sample according to different distance metrics. $\mu = (\mu_1, \ldots, \mu_N)'$ is a vector of region fixed effects, $\alpha_t = (\alpha_1, ..., \alpha_T)'$ denote time specific effects and ι_N is a $N \times 1$ vector of ones. Region fixed effects control for all region-specific time invariant variables whose omission could bias the estimates, while time-period fixed effects control for all time-specific, space invariant variables whose omission could bias the estimates in a typical time series (Elhorst, 2014). With this model it is possible to analyze both: endogenous and exogenous diffusion effects.

1) Endogenous diffusion.

In order to explore the relevance of the different democratic diffusion multipliers it is sufficient to estimate model of Equation (1) and use estimated parameters $\hat{\rho}_k$. For instance, assuming three different W_p such that $W_1 = W_{geo}$ is the geographical distance matrix, $W_2 = W_{trade}$ is the trade distance based matrix and $W_3 = W_{cult}$ is the cultural distance matrix. Finding $\rho_{geo} < \rho_{trade}$ suggests that trade interactions are more relevant ones and if we find that $\hat{\rho}_{cult} > \hat{\rho}_{trade}$ it could be possible to conclude that the main channel of diffusion of democracy from country j to country i is the cultural one. That is to say, it is more likely that any country i becomes democratic if countries j that are more similar in their cultural characteristics become democratic or increase their democratic depth than if the same transitions occur in trading partners or in geographically close areas.

2) Exogenous diffusion.

In order to investigate how changes in different determinants affect short run democratic outcomes and its diffusion it is necessary to simulate the structural form of the previous model, which is given by:

$$\frac{\partial Y_t}{\partial X_t^{(k)}} = \left[I_n - \sum_p \rho_p W_k \right]^{-1} \left[\mu + \iota_N \alpha_t + \tau Y_{t-1} + \sum_p \eta_p W_p Y_{t-1} + \beta^{(k)} + \sum_p \theta^{(k)} W_p \right] (2)$$

To obtain the dynamic multipliers up to time T:

$$\frac{\partial Y_{t+T}}{\partial X_t^{(k)}} = \sum_{s=1}^{T} \left[(-1)^s \left(B^{-1} C \right)^s B^{-1} \right] \left[\mu + \iota_N \alpha_t + \beta^{(k)} + \sum_p \theta_p^{(k)} W_p \right] \quad (3)$$

where $C = -\left(\tau + \sum_p \eta_p W_p \right)$ and $B = \left(I_N - \sum_p \rho_p W_p \right)$. Finally, long run diffusion effects caused by a regressor X^k can be investigated computing:

$$\frac{\partial Y_t}{\partial X_t^{(k)}} = \left[(1-\tau) I_n - \left(\sum_p \rho_p W_p + \sum_p \eta_p W_p \right) \right]^{-1} \left[\mu + \iota_N \alpha_t + \beta^{(k)} + \sum_p \theta^{(k)} W_p \right] (4)$$

To see why it is relevant to account for the various channels of diffusion W_p, consider the distinct cases of income ($X^{(k1)}$) and education ($X^{(k2)}$) effects in democracy . If the effect of education in country j in the level of democracy of country i operates through the cultural space while the effect of income operates through the trade linkages, a model omitting the $\rho_{cult} W_{cult}$ term but including $\rho_{trade} W_{trade}$ term will understimate the effect of education with respect that of income leading to wrong conclusions since in such a case estimated impacts will likely deliver a higher partial derivative for income: $\frac{\partial Y_t}{\partial X_t^{(1)}} > \frac{\partial Y_t}{\partial X_t^{(2)}}$.

Another important difference in these models with respect traditional one regime models is that it extends its possibilities of interpretation. In one-single regime spatial econometric models to analyze diffusion, it is usual to decompose the total effeect $\frac{\partial Y_t}{\partial X_t^{(k)}}$

into direct and indirect effects.Direct effects (diagonal terms in Equations (2) and (4) capture the effect on democracy in i caused by a one unit change in an exogenous variable X_k in i. In turn, the *indirect effect* (off-diagonal terms) can be interpreted as the effect of a change in X_k in all other countries $j \neq i$ on the democratic depth in i. However in our context it is possible to shut down specific channels of interactions by setting $\rho_p, \theta^{(k)} W_p$ which allows to perform the following decomposition:

$$
\begin{aligned}
DE = & DE_1 + DE_2 + DE_3 = diag\left(\frac{\partial Y_t}{\partial X_t^{(k)}}\right) = \\
& diag\left(\left[(1-\tau)\, I_n - (\rho_1 W_1 + \eta_1 W_1)\right]^{-1}\left[\mu + \iota_N \alpha_t + \beta^{(k)} + \theta^{(k)} W_1\right]\right)_1 + \\
& diag\left(\left[(1-\tau)\, I_n - (\rho_2 W_2 + \eta_2 W_2)\right]^{-1}\left[\mu + \iota_N \alpha_t + \beta^{(k)} + \theta^{(k)} W_2\right]\right)_2 + \\
& diag\left(\left[(1-\tau)\, I_n - (\rho_3 W_3 + \eta_3 W_3)\right]^{-1}\left[\mu + \iota_N \alpha_t + \beta^{(k)} + \theta^{(k)} W_3\right]\right)_3
\end{aligned}
$$

The previous expression allows to decompose the effect on democracy in i caused by a one unit change in an exogenous variable X_k in i into the effect operating through the geographic space, the cultural space and the trade space. Similarly, the indirect effects can be computed as:

$$
\begin{aligned}
IE = & IE_1 + IE_2 + IE_3 = ndiag\left(\frac{\partial Y_t}{\partial X_t^{(k)}}\right) = \\
& ndiag\left(\left[(1-\tau)\, I_n - (\rho_1 W_1 + \eta_1 W_1)\right]^{-1}\left[\mu + \iota_N \alpha_t + \beta^{(k)} + \theta^{(k)} W_1\right]\right)_1 + \\
& ndiag\left(\left[(1-\tau)\, I_n - (\rho_2 W_2 + \eta_2 W_2)\right]^{-1}\left[\mu + \iota_N \alpha_t + \beta^{(k)} + \theta^{(k)} W_2\right]\right)_2 + \\
& ndiag\left(\left[(1-\tau)\, I_n - (\rho_3 W_3 + \eta_3 W_3)\right]^{-1}\left[\mu + \iota_N \alpha_t + \beta^{(k)} + \theta^{(k)} W_3\right]\right)_3
\end{aligned}
$$

The set of controls employed in this study to investigate diffusion effects are based on a review of the literature. We consider different groups of variables that may affect democratic levels. First, to control for institutional characteristics we include (1) a rule-of-law-index, (2) a corruption index and a (3) bureaucratic quality index taken from the ICRG database. Second, to control for political stability determinants we use data

on (4) riots, (5) general strikes and (6) revolutions from the Databanks International's CNTS Data Archive.To control for the demographic characteristics we include indicators of (7) school enrollment, (8) population, (9) urbanization rates and (10) life expectancy taken from the World Bank database. Finally, to control for economic characteristics we use (11) the GDP per capita, (12) share of employment in industry and (13) agriculture, (14) the degree of trade openness taken from the World Bank and (15) the degree of income inequality taken from the World Income Inequality Database.

Therefore, this paper distinguishes itself from earlier studies in democratic diffusion in three major methodological aspects:

First, we take as our benchmark specification a multi-regime *Dynamic Spatial Durbin Model* (DSDM) containing both endogenous and exogenous spatial interactions. This model contrasts with static and more restrictive SLM specifications adopted by Beck, Gledistch and Beardsley (2006). Similarly, the adoption of a dynamic specification instead of a static one, allows for richer time-dynamics than in previous studies. Moreover, in order to check the validity of this specification, we perform a careful model selection strategy over different functional forms and over different spatial weight matrices by means of Bayesian econometric methods, which is intended to find the most plausible specification to describe the evolution of democracy around the world.

Second, unlike previous studies based on cross-sectional data our analysis is based on panel data. The employment of panel data leads usually to a greater availability of degrees of freedom, thus reducing the collinearity among explanatory variables and improving the efficiency of the estimates (Hsiao, 2003). Furthermore, given the strong cross-sectional variability of country attributes, the inclusion of spatial fixed effects in order to capture unobserved heterogeneity specific to the country is recommended.

Third, while previous studies present point estimates to analyze the effect of the different regressors we use the partial derivative interpretation of the impact from changes

to the variables of the model as it represents a more valid basis for testing the existence of spatial spillovers (LeSage and Pace, 2009). An important feature allowed by the model employed in this study is that we can perform counter-factual simulations by shutting down to zero a specific channel of diffusion.

The innovative contributions of this modeling approach are: *i)* the unrealistic assumption of democratic outcomes to be independent over space and time is relaxed, *ii)* the magnitude and significance of spillovers operating through different channels can be investigated and *iii)* the importance of the determinants of local democracy can be analyzed taking into account that some variables effects might be channeled differently through different types of space.

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