The Effect of Power and Space on Foreign Diplomatic Presence in the United States: a Spatial Modeling Approach

Imam M. Xierali[1], Lin Liu[2,3]

[1]Georgia Division of Public Health, Office of Health Information and Policy, 2 Peachtree Street, Atlanta, Georgia, 30303
[2]Pepartment of Geography, University of Cincinnati, P.O.Box 210131, Cincinnati, OH 45221-0131
[3]School of Geography and Planning, Sun Yat-sen University, Guangzhou 510275, P.R.China
E-mail: lin.liu@uc.edu

Abstract
This article explains the variations in foreign diplomatic presence in the U.S. from 1980 to 2000 as a function of the national capabilities of and spatial relationship among nations. We decompose spatial effect into three measures: spatial proximity, spatial dependence, and spatial heterogeneity. We found significant spatial dependence both in the diplomatic interaction and capabilities of nations. Spatial variation in foreign diplomatic presence was adequately explained by national capabilities of U.S. diplomatic partners from 1980 to 1992. However, after 1992, international power distribution alone could no longer fully explain the spatial variations in the foreign diplomatic presence in the U.S.. Spatial effect must be taken into account when explaining the variations in the foreign diplomatic presence in the U.S..

Keywords
Diplomatic relations, national power, spatial interaction, the United States, spatial error model.

I. INTRODUCTION

In this paper we explain the variations in foreign diplomatic presence in the U.S. in relation to the power of nations and international spatial relationship. The diplomatic relations among nations are important to international relations (Dembinski, 1988). Diplomatic relationship reduces the chance for misperception of national capabilities and national intentions among nations. It provides an important venue for direct information flow between national governments. Diplomatic relations vary both in depth and over space and time. What explains the variations in foreign diplomatic presence among nations is an interesting and worthy question that deserves in-depth analysis. In this article we take the foreign diplomatic presence in the U.S. as a case to examine what explains the variations in foreign diplomatic interaction among nations. We quantify diplomatic relationships between nations by the size of foreign diplomatic presence among them. The number of diplomatic personnel is a viable measurement for diplomatic interaction among nations. This is illustrated by the significant correlation between foreign diplomatic presence in the U.S. and the U.S. Conflict and Cooperation scores as developed by O'Loughlin(2004). There are significant differences in foreign diplomatic presence in the U.S. Not only that major powers have larger diplomatic presence in the U.S., but also that foreign diplomatic presence in the U.S. presents significant spatial clustering at the international system.

Historically, some geographers and political scientists as well have studied political interactions among geographic units, which were criticized by Johnston as political geography without politics (Johnston, 1981). Others approach the political interaction among nations with a heavy tilt of political analysis to the extent of ignoring the effect of space, which we call politics without geography. Although these efforts to integrate geography with political analysis correspond to Gober's call for synthesis as the core of geography(Gober, 2000), these syntheses hardly result in a balanced mix of political and geographical analyses. Political interaction among nations is often explained with no regard to geographic factors such as proximity, the presence of spatial dependence, and spatial heterogeneity.

Diplomatic interaction is subject to the effect of spatial relationships among nations. O'Loughlin and Anselin (1992: 11) argue that "the behavior of states is related to a) their domestic attributes, b) spatial dependence, and c) spatial heterogeneity." They point out that it is necessary to use the specialized methodology of spatial analysis in order to allow the spatial element in international relations to appear. They refer spatial dependence as the situation where values at one location are in part determined by the values at neighboring locations. Spatial heterogeneity refers to the systematic variation over sub-regions (locations) in the data, i.e. the regional effect. Both of these situations are commonly referred to as exhibiting spatial effect.

In international system, the distribution of power is inherently spatial. Spatial relationships among nations affect international interaction, prioritize the importance of neighbors, and have significant implications for the study of international relations. This paper builds upon O'Loughlin's thesis that spatial context matters and extends the thesis to international relations using the spatial data analysis tools. It sheds light on the understanding of the variations in foreign diplomatic presence among nations.

This paper examines the effect of the distribution of power

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among nations on foreign diplomatic interaction with the U.S. in a spatial context. Using Anselin's (1988) spatial regression technique, we explicitly examine the effect of space on diplomatic interaction among nations. We decompose spatial relationships among nations into three components: spatial proximity, spatial dependence, and spatial heterogeneity. Spatial proximity is measured as the physical distance from the U.S. Spatial dependence is examined as neighborhood effect. Spatial heterogeneity refers to the regional effect.

II. DIPLOMATIC RELATIONS AS SPATIAL INTERACTION

In geography spatial interaction between places is a major theme in which interaction often refers to the flow of certain types such as information, goods, or services from place to place. According to Ullman (1956), for a spatial interaction to occur, three conditions must be met: existence of complementarity—there must exist a need in place A for certain goods in place B; lack of intervening opportunity—there is no place C that could provide goods for place A; and transferability—the goods are moveable in terms of transport cost. However, in political science, interaction among nations often refers to conflict and cooperation among nation states. Specifically, political scientists address interaction among nations by examining conflicting and cooperative engagement of actors in action-reaction type of international events. The interaction is then explained, for instance, by looking at national attribute and/or characteristics of international system such as anarchy and interdependence. After all, there is a clear difference between geography and political science on how to approach the issue of interaction. This paper synthesizes the two approaches to examine the observed diplomatic flows among nations; political interaction among nations here is narrowly defined as the spatial interaction of nations in the international diplomatic network.

The earliest quantitative analysis of diplomatic exchanges among nations probably is Singer's Correlates of War project. Russett and Lamb (1969) also studied the pattern of global diplomatic exchange. Challenging the state-centric analysis of world politics, Russett and Lamb argue that there are actors with political salience in-between the entire global system and pure inter-state system in international politics. That layer of actors is the international region or groups of nations. This differs from realists' perspective of nation states as the major actors in international system in that actors defined in terms of regions could project significant political influence in international relations[1]. Realists often build their theories upon propositions that national power and how power distributes in the international system are the key factors that explain the way nations interact with each other (Morgenthau, 1973; Waltz 1979; Baldwin, 1993; Meirsheimer, 2001).

Russett and Lamb (1969) argue that it is expected for a nation to maintain a large diplomatic staff in major neutrals or potential enemy states as well as in allied or friendly states, since it is sufficiently affected by the former's actions to require substantial information-gathering facilities in their capitals. They identified distinct international regions that are characterized by relatively high levels of mutual diplomatic representations.

A more recent research on diplomatic relations among nations is Nierop's study in 1994. Nierop's purpose is similar to Russett and Lamb's in that he also tries to identify clusters of nations that are politically homogenous in terms of interactions through diplomatic relationship, international organization membership, and trade. Nierop found that diplomatic exchange among nations is not symmetric. In terms of the factors that explain the regional element in diplomatic representation, Nierop points to geographic proximity and contiguity, culture, ideology, and the age of the states. He emphasizes that the size of a state's diplomatic apparatus is strongly connected with the length of its existence as an independent political actor.

The two studies of diplomatic network are not intended to answer why diplomatic relations vary but to find evidence for the existence of international regional groupings as international actors by examining actual interactions among nations rather than by examining the domestic attributes of nations. Their emphasis are on the identification of regions/ groups of nations as sub-systemic actors and consequently their analysis paid little attention to the underlying international spatial context for the variations in diplomatic exchange among nations. They marginally touched upon the geographic factors that may affect the patterns in diplomatic exchange among nation states, especially the importance of spatial effect in diplomatic exchange among nations is not examined. Their studies did not result in a theory or model that could explain the variations in diplomatic relations among nations. This gap in the explanation of the patterns of international diplomatic exchange is yet to be filled.

The distribution of power in international system is inherently spatial. Power is the key variable for realists in international rations study. Our focus on national power as one of the explanatory variables for the variations in diplomatic interaction among nations does not suggest that we ignore the importance of power in other political theories of international relations such as liberalism, nor does it imply that we ignore the intricate connection between different theories of international relations. However, we observe that different political theories of international relations often have different sets of assumptions of the nature of international system. In this paper we are looking at international relations from realist perspective and intentionally "ignore" other perspectives such as the liberal theories of international relations, because different theories of international relations have rather distinct assumptions and implications and thus need separate analysis for the spatial effect in politics among nations.

For most realists, power is the primary driving force in international relations. Power has been long regarded as an

important explanation for international relations. Thucydides (Strassler, 1996) argues that states are the key units in the international system; they are power seekers as a means to an end or as an end in itself, and they behave rationally. Power and morality are detached in international relations. Machiavelli (1985) regards power as an end in itself and as a separate value system, that is, everything to preserve the state is good. Morgenthau (1973) argues that politics among nations has its roots in human nature and interest defined as power is objective concept unaffected by circumstances of time and place; military strength is the most important form of power in terms of ability to influence other states' actions. Waltz (1979) rejects human nature as the causal factor; the key variable for Waltz is the systemic distribution of power—how the relationships among states are organized strongly affects state behavior towards one another; states are not the only actors, but the major actors; states are undifferentiated by functions and distinguished primarily by greater or lesser capabilities for performing similar tasks; the structure of the system changes with variations in the distribution of capabilities across the system's units. Mearsheimer (2001) argues that states in the international system fear each other; each state aims to guarantee its own survival; states aim to make their relative power position over others; the reason is that the greater the power one state has over others, the more secure it is.

Thus, the constant changing of the power basis of nations translates into the shifting of relative national power and changing of international structure. The change in the national power of one nation will have direct impact on other nations in the system, although the impact may vary toward different nations. However, the projection of national power is limited by the spatial relationships among nations. O'Sullivan (1986) argues the influence of one nation's power on other nations diminishes as the distance between them increases. Beyond distance, the relative location of nations complicates the projection of national power. Political interaction among nations does not take place in a vacuum, it takes place in the international spatial structure. International spatial structure does affect international relations. Therefore, how international spatial structure affects the interaction among nations is an important question that deserves better attentions from both the academia and national policy makers. It is the authors' hope that this paper would draw attentions to the importance of spatial analysis in the study of international relations.

III. HYPOTHESIS AND METHODOLOGY

The general hypothesis is that the foreign diplomatic presence in the U.S. is a function of the power of the foreign nation and the international spatial relationships. We decompose spatial relationships into three measures: spatial proximity measured as distance, spatial dependence measured as neighborhood effect, and spatial heterogeneity measured as regional effect. Distance is calculated from the capital city of a nation to Washington, D.C. along a great circle that passes the two capitals. The spatial dependence among nations is operationalized as a contiguity based matrix according to Correlates of War Direct Contiguity Data (Stinnett et al., 2002). We derived second order neighbors based on contiguity type one (separated by land or river border) and type two (separated by 12 miles of water or less) and combined them together in one spatial matrix. Highest weight is given to contiguity type one and lowest given to second order neighbors. The way we define a neighbor affects the spatial analysis results. In this paper, however, we take this neighbor rule as given and exclusively focus on the variations in power as an explanation for change in foreign diplomatic presence in the U.S. and how spatial relationships among nations affect the foreign diplomatic presence in the U.S..

Spatial heterogeneity is operationalized as dummy variables for functional and geographic regions. Functional regions that we examine include North Atlantic Treaty Organization (NATO), European Union (EU), The Organization of The Islamic Conference (OIC), and The Association of Southeast Asian Nations (ASEAN). Geographic regions that we examine are Africa, Americas, Middle East, and South Asia. We also test whether older nations sent larger diplomatic presence in the United States. The hypotheses are tested for each year from 1980 to 2000 in a regression model.

Proximity is essentially a measurement of spatial separation. There are various concepts of distance (Gatrell, 1983). Beyond distance, the spatial relationships among nations also matter for international relations. The spatial effect can now be explicitly modeled thanks to the new development in spatial modeling. "Most of the theoretical models of spatial effects turn out to be implemented as standard linear spatial regressions, either of the lag or error form." (Anselin, Florax, and Rey 2004: 6) The spatial lag model is appropriate when the focus of interest is the assessment of the existence and strength of spatial interaction, while "The spatial error model is appropriate when the concern is with correcting for the potentially biasing influence of the spatial autocorrelation, due to the use of spatial data" (Anselin 1999: 11).

Spatial regression model generally starts with an ordinary least squares (OLS) model. The residuals of the OLS model are tested for spatial dependence. We use Moran's I to test for the presence of spatial dependence. If the residual of the regression model are not spatially dependent, we can say that the spatial effect in the dependent variable is adequately explained by the independent variables. If the residuals are spatially dependent, we need to use spatial model to explicitly account for such dependence. Under this condition, we argue that spatial effect in the dependent variable cannot be fully explained by the independent variables and this dependence is transcended to the error terms of the regression model.

Formally, a spatial lag model is expressed as

$$y = \rho W_y + X_\beta + \varepsilon$$

where y is n by one matrix of the dependent variable, ρ is a

spatial autoregressive coefficient, W is the spatial neighborhood matrix, X is the matrix of the independent variables, beta is the regression coefficient matrix, ε the error terms, and μ the unaccounted variation after control for spatial dependence. In this form, the spatial lag W_y is correlated with the residual because of the followings:

$$y(I - \rho W) = X_\beta + \varepsilon$$

which can be transformed into

$$y = (I - \rho W)^{-1} X_\beta + (I - \rho W)^{-1} \varepsilon.$$

Ordinary Least Square method therefore will be biased and inconsistent due to the simultaneity bias (Anselin, 1988). Consequently, the spatial lag term must be treated as an endogenous variable and proper estimation methods such as maximum likelihood must account for such endogeneity.

In the spatial error model, the spatial process is said to exist in the error terms, therefore,

$$y = X_\beta + \varepsilon$$

and

$$\varepsilon = \lambda W \varepsilon + \mu.$$

Since

$$\varepsilon = (I - \lambda W)^{-1} \mu, \text{ we get}$$

$$y = X_\beta + (I - \lambda W)^{-1} \mu$$

which is transformed to

$$y = \lambda W_y + X_\beta - \lambda W X_\beta + \mu.$$

Ordinary Least Square approach remains unbiased but inefficient and the classical estimators for standard errors will be biased (Anselin, 1988). Therefore, other estimation methods such as maximum likelihood estimation method must be used.

IV. DATA

The size of foreign diplomatic presence in the U.S. is measured from *The Diplomatic List*—a U.S. State Department publication. The diplomatic personnel are counted by their positions in the foreign missions, and their spouse is not counted as diplomatic personnel. The number of diplomatic personnel listed in the last quarter of a year is generally used as the measure for that year. The number of diplomatic personnel is assigned zero for nations that have no diplomatic relations with the U.S. The U.S. has diplomatic relationships with about 90% of nation states in the world. U.S. diplomatic relationships with non-independent nations[1] dropped markedly from around

Table 1. Diplomatic relations of the U.S., 1980–2000

Year	Total US Diplomatic Relationship in *The Diplomatic List*(List)	COW Project Total Independent Nations in the World(World)	Total US Diplomatic Relationship with Independent Nations(UST)	US Diplomatic Relationship with Non-Independent Nations	Independent Nations without Diplomatic Relationship with the US	UST/World Percentage
1980	143	155	137	6	18	88%
1981	144	158	137	7	21	87%
1982	146	158	139	7	19	88%
1983	147	159	141	6	18	89%
1984	152	160	144	8	16	90%
1985	153	160	145	8	15	91%
1986	152	160	145	7	15	91%
1987	156	160	146	10	14	91%
1988	154	160	146	8	14	91%
1989	152	160	145	7	15	91%
1990	151	160	144	7	16	90%
1991	153	176	151	2	25	86%
1992	156	180	154	2	26	86%
1993	162	185	160	2	25	86%
1994	167	186	165	2	21	89%
1995	170	186	168	2	18	90%
1996	171	186	170	1	16	91%
1997	172	186	171	1	15	92%
1998	172	186	170	2	16	91%
1999	171	189	170	1	19	90%
2000	170	190	169	1	21	89%

[1] This research follows the standards of the Correlates of War Project 2005 for definition of independent nation. The State System Membership List Codebook (Version 2004.1) of The Correlates of War Project has two sets of criteria for identifying a membership in the international system. Correlates of War Project criteria to identify actors as state members of the international system since 1816 include: "1) prior to 1920, the entity must have population greater than 500,000 and have had diplomatic missions at or above the rank of charge d'affaires with Britain and France;
2) after 1920, the entity must be a member of the United Nations or League of Nations, or have population greater than 500,000 and receive diplomatic missions from two major powers."

ten in 1980 to just about two after 1990; however, diplomatic deadlock with certain independent nations such as Iran and Iraq had stayed at the same level during entire period except from 1991 to 1994(see Table 1).

Beside temporal variations, foreign diplomatic presence in the U.S. shows signs of spatial clustering at international level. For instance, Figure 1 shows the 2000 distribution of foreign diplomatic presence in the U.S. at international system. Northeastern Asia except North Korea, Western Europe, Saudi Arabia, Egypt, and Canada have larger diplomatic presence in the U.S. Central Asia, most of Middle East and Africa, eastern and central Europe, and Latin America have smaller diplomatic presence in the U.S.

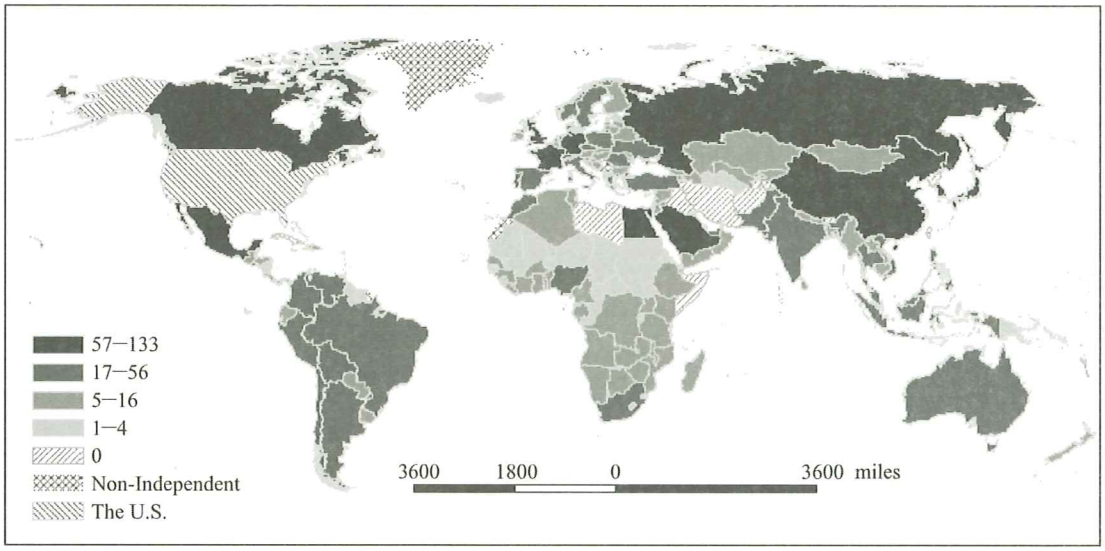

Figure 1. Foreign diplomatic presence in the U.S., 2000

In this paper, we employ the widely used Composite Index of National Capability (CINC) from the Correlate of War project (Singer et al., 1972) as a measurement for national power to predict the size of foreign diplomatic presence in the U.S. This index is based on the six variables that are deemed to highly associate with a nation's power capability. The six variables include total population, urban population, energy consumption, iron and steel production, military size, and military expenditure. This index is generally computed by summing all observations on each of the six capability components for a given year, converting each state's absolute component to a share of the international system, and then averaging across the six components. Figure 2 shows the 2000 distribution of national power at international system. North America, Northeastern Asia, India, Western Europe have high CINC index, whereas Southeastern Asia, African, Eastern Europe, and Latin America except Brazil have small CINC index. This indicates that power varies over space among nations.

The data of membership in international organizations is from

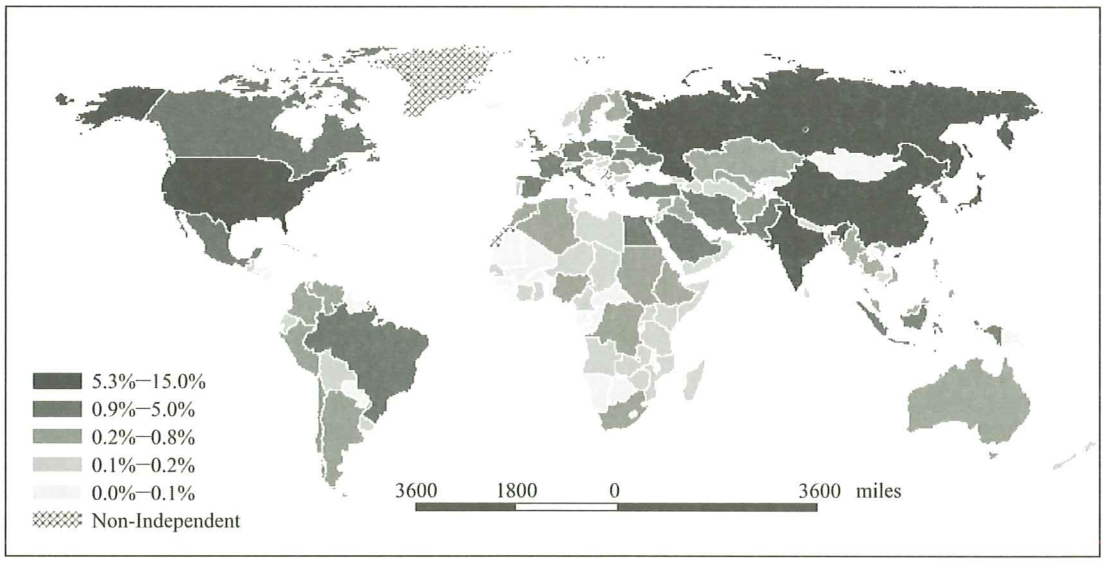

Figure 2. Composite Index of National Capabilities, 2000

Intergovernmental Organization (IGO) Data (V2.1) from the Correlates of War Project[2]. This dataset tracks the status and membership of intergovernmental organizations from 1815–2000. The physical distance between nations is measured as the shortest spherical distance between their capitals—the political centers.

V. ANALYSIS

The diplomatic personnel sent to the U.S. positively and significantly correlate with all independent variables except for physical distance. Although the distance does not significantly correlate with the dependent variable, the sign is negative, suggesting the impeding effect of distance on the foreign diplomatic presence in the U.S.

Log transformation results in linearity between dependent and independent variables. We focus on the Composite Index of National Capabilities (CINC) as the major explanatory variable for the U.S. foreign diplomatic relationship. The Composite Index of National Capabilities corrects the bias when one of the power ingredients is not typically available or biased for association with national power of a nation. The model is shown in the following equation:

$$\text{lndips} = \alpha + \beta_1 * \text{lncinc} + \beta_2 * \text{lndist} + \beta_3 * \text{age} + \beta_4 * \text{SAsia} + \beta_5 * \text{Americas} + \beta_6 * \text{Africa} + \beta_7 * \text{ASEAN} + \beta_8 * \text{EU} + \beta_9 * \text{NATO} + \beta_{10} * \text{OIC} + \beta_{11} * \text{MidEast}$$

Here lndips is the log form of the dependent variable. lncinc is the log form of CINC; lndist is the log of distance between Washington, D.C. and other nation's capital; age is the number of years since independence. The rest of the variables are dummy variables, SAsia stands for South Asia, ASEAN stands for Association of Southeast Asian Nations, and OIC stands for Organization for Islamic Conference. This model is used for each year to explain the variations in the foreign diplomatic presence in the U.S. over the years.

Regression model summary (Table 2) shows that the model is a robust one: R squares are between 0.720 and 0.817. At least seventy-two percent of variations in the diplomatic missions received by the U.S. are explained by the model. However, different years have a slightly different model fit. The R squares are higher in the mid-1980s, and they become lower during the transition period of the end of Cold War, especially between 1992 and 1995.

The coefficients of the regression (Table 3) show that the Power Index of the diplomat sending nation has always been positive and significant in determining the size of foreign diplomatic presence in the U.S. Physical distance, South Asian identity, and membership in European Union and the Organization for Islamic Conference (OIC) have been negative factors though not always significant factors in determining the size of the diplomatic missions. Older nations, nations in the Middle East, NATO members, and ASEAN members tend to have better relationship than those not, though this does not make significant difference in their diplomatic interaction with the U.S. Nations in Africa and Americas, however, have mixed signs: before 1994 African and American nations tend to send more diplomats than other nations, however, this has changed to the opposite after 1994. In terms of contribution to the explanation of the variation in the dependent variable, the power index stands out clearly as the single most important factor among those factors that we have considered in the analysis. This can be seen from the larger standardized beta value of the power index than that of the rest of variables.

Table 2. Ordinary Least Squares summary

Year	R Square	Adj. R Square	Std. Error	Resd. Moran's *I*
1980	0.776	0.757	0.534	−0.028
1981	0.778	0.759	0.531	−0.020
1982	0.817	0.801	0.487	−0.011
1983	0.804	0.788	0.520	−0.017
1984	0.775	0.757	0.555	−0.037
1985	0.802	0.785	0.529	−0.035
1986	0.805	0.789	0.526	−0.030
1987	0.787	0.770	0.544	−0.030
1988	0.785	0.767	0.547	−0.002
1989	0.797	0.781	0.535	0.037
1990	0.778	0.759	0.549	0.023
1991	0.768	0.749	0.574	0.027
1992	0.720	0.698	0.632	−0.002
1993	0.737	0.717	0.568	0.110 *
1994	0.726	0.707	0.607	0.137 **
1995	0.741	0.723	0.567	0.172 **
1996	0.766	0.749	0.538	0.190 **
1997	0.767	0.751	0.539	0.219 **
1998	0.756	0.739	0.549	0.217 **
1999	0.772	0.756	0.526	0.205 **
2000	0.772	0.756	0.516	0.219 **

Note: * = $P < 0.01$; ** = $P < 0.001$.

Considering the fact that the diplomatic missions and power distribution in the international system are inherently spatial, we need to check whether the regression residual residue are spatially autocorrelated. Moran's *I* index checks for the presence of spatial autocorrelations among data. Moran's *I* of the regression residuals (Table 2) confirm the presence of significant spatial autocorrelation among regression residuals after 1992. This means that regression residuals are spatially clustered in these years. Under this condition, one of the OLS regression assumption—independence of residue—is violated due to the effect of spatial relationship among nations. We need to account

[2] J. Pevehouse, T. Nordstrom, and K. Warnke(2004). Online at http://www.correlatesofwar.org.Last accessed on 8 April 2005.

Table 3. OLS regression coefficients

Year	Intercept	lnCinc	lnDist	Age	Africa	MidEast	Sasia	Americas	Asean	EU	NATO	OIC
1980	6.526**	0.439**	−0.159	0.003	0.077	0.345	−0.541*	0.077	0.396	−0.105	0.170	−0.102
1981	6.020**	0.440**	−0.095	0.002	0.081	0.320	−0.560*	0.081	0.382	−0.059	0.130	−0.184
1982	5.122**	0.435**	−0.009	0.003	0.185	0.389*	−0.491*	0.185*	0.532*	0.026	0.202	−0.121
1983	6.357**	0.441**	−0.139	0.003	0.235	0.415*	−0.600*	0.235*	0.738**	−0.026	0.231	−0.233
1984	5.936**	0.428**	−0.096	0.002	0.108	0.364	−0.630*	0.108*	0.690*	−0.060	0.265	−0.140
1985	5.584**	0.440**	−0.041	0.002	0.032	0.446*	−0.485	0.032**	0.690**	−0.058	0.252	−0.201
1986	5.869**	0.442**	−0.068	0.002	0.003	0.435**	−0.512*	0.003*	0.624*	−0.084	0.237	−0.209
1987	6.311**	0.427**	−0.125	0.002	-0.077	0.279	−0.589*	−0.077	0.482	−0.044	0.224	−0.098
1988	7.242**	0.430**	−0.226	0.002	0.009	0.428*	−0.512*	0.009	0.507	−0.231	0.347	−0.139
1989	7.358**	0.457**	−0.223	0.001	0.145	0.495*	−0.433	0.145	0.628*	−0.191	0.395	−0.202
1990	7.608**	0.440**	−0.261	0.001	0.051	0.250	−0.574*	0.051	0.641*	−0.176	0.340	−0.177
1991	5.635**	0.397**	−0.089	0.003	0.042	0.411	−0.564*	0.042	0.577*	−0.070	0.389	−0.157
1992	5.384**	0.358**	−0.113	0.004*	0.111	0.608*	−0.455	0.111	0.668*	−0.035	0.469	−0.215
1993	5.543**	0.356**	−0.130	0.004**	0.072	0.566**	−0.327	0.072	0.658*	0.005	0.374	−0.148
1994	5.852**	0.359**	−0.157	0.004**	−0.065	0.585**	−0.379	−0.065	0.614*	−0.131	0.433	−0.154
1995	5.140**	0.350**	−0.070	0.004*	−0.116	0.526*	−0.453	−0.116	0.319	−0.098	0.340	−0.248*
1996	5.879**	0.356**	−0.149	0.003*	−0.029	0.581**	−0.520*	−0.029	0.383	−0.018	0.339	−0.274*
1997	5.582**	0.371**	−0.097	0.003*	−0.143	0.410*	−0.572*	−0.143	0.116	−0.097	0.324	−0.188
1998	5.313**	0.355**	−0.080	0.004*	−0.189	0.444*	−0.500	−0.189	0.190	−0.090	0.289	−0.158
1999	5.415**	0.359**	−0.081	0.003*	−0.193	0.436*	−0.367	−0.193	0.027	−0.098	0.259	−0.210
2000	5.334**	0.355**	−0.075	0.003*	−0.146	0.432*	−0.421	−0.146	0.064	−0.054	0.256	−0.215*

Note: * = $P < 0.01$; ** = $P < 0.001$.

for this effect via a spatial regression model.

To explicitly incorporate spatial effect we consider two common ways as suggested by Anselin (1988). As we have discussed earlier, in the spatial lag model the average value of the neighboring observations becomes one of the explanatory variables. On the other hand, the spatial error model assumes that the prediction error for an observation is spatially dependent upon errors in neighboring observations. In the spatial lag model, we only consider the spatial lag of the dependent variable as the explanatory factor for spatial dependence, whereas in the spatial error model, we not only consider the spatial lag of the dependent variable but also control for the spatial lags of the independent variables to account for the spatial dependence.

Table 4. Spatial error model summary

Year	Lambda	LR Test	Resd. Moran	Log Likelihood
1993	0.255	4.433*	0.011	−115.198
1994	0.296	6.701*	0.002	−130.481
1995	0.344	10.087**	0.001	−118.864
1996	0.400	13.331**	0.012	−112.940
1997	0.449	18.036**	0.017	−114.974
1998	0.442	17.258**	0.019	−116.495
1999	0.440	16.143**	0.022	−109.776
2000	0.467	18.562**	0.018	−104.711

Note: * = $P < 0.01$; ** = $P < 0.001$.

Our implementation of the spatial lag model suggests that the residue still contain significant spatial dependence after 1992; rho—the spatial autoregressive coefficient—has been insignificant during the study period. Our implementation of the spatial error model suggests (see Table 4), however, that not only that the spatial autoregressive coefficient—lambda has been statistically significant after 1992, but also that the residual of the spatial error model do not contain significant spatial dependence. This indicates that the spatial error model can explain the spatial dependence in the dependent variable.

In general, it can be concluded that the spatial error model well explained the spatial dependence in the dependent variance (see Table 5). Note that in the spatial error model, the coefficients for South Asia and Americas become positive for all years since 1993. The error model tells a different story, that

Table 5. Spatial error model coefficients

Year	Intercept	lnCinc	lnDist	Age	Africa	MidEast	Sasia	Americas	Asean	EU	NATO	OIC	Lambda
1993	6.306**	0.404**	−0.183	0.003**	0.221	0.532*	−0.325	0.423	0.596*	0.085	0.382	−0.139	0.255*
1994	6.390**	0.408**	−0.180	0.003**	0.051	0.514*	−0.366	0.299	0.475	−0.078	0.440	−0.163	0.296**
1995	5.519**	0.395**	−0.081	0.003*	0.037	0.458	−0.428	0.373	0.140	−0.052	0.391	−0.270*	0.344**
1996	6.199**	0.391**	−0.163	0.003*	0.127	0.462	−0.540*	0.309	0.125	−0.004	0.351	−0.256*	0.400**
1997	5.512**	0.424**	−0.051	0.002*	0.034	0.294	−0.585*	0.423	−0.144	−0.149	0.340	−0.200	0.449**
1998	5.577**	0.407**	−0.078	0.003*	0.020	0.377	−0.528	0.401	0.055	−0.158	0.304	−0.160	0.442**
1999	5.783**	0.422**	−0.084	0.002	0.068	0.412	−0.401	0.454	−0.024	−0.075	0.276	−0.205*	0.440**
2000	5.535**	0.431**	−0.048	0.002	0.081	0.419	−0.464	0.557*	−0.044	−0.051	0.264	−0.240*	0.467**

Note: * = $P < 0.01$; ** = $P < 0.001$.

is, the error in one observation is spatially determined by the errors of the neighboring observations. These errors contain spatial effect that could not be accounted for by the independent variables without consideration of spatial dependence in the foreign diplomatic presence in the U.S..

In terms of comparison between model performances, we correlated the observed values of the dependent variable with the fitted values of three models. As Figure 3 shows, the correlation coefficients of the three models are almost the same from 1980 to 1992; however, the error model has higher correlation coefficients since 1993. Another measure for model fit comparison is the Akaike Information Criterion (AIC) scores. AIC assesses goodness-of-fit, which adjusts the Log Likelihood statistic for the number of terms in a model. A lower AIC score indicates a better model fit. The AIC scores of the three models suggest that the spatial error model has the smallest score since 1993, while the AIC scores of the three models are almost the same from 1980 to 1992. This means that the spatial error model has a better model fit than that of the OLS model and the spatial lag model since 1993.

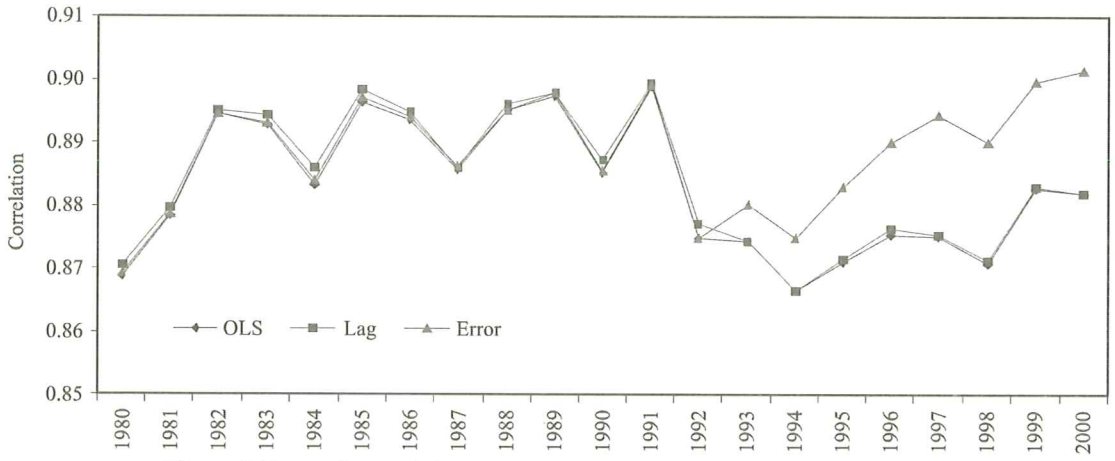

Figure 3. Pearson's correlation between the observed values and the fitted values

VI. DISCUSSION

Based on the results above, it is evident that spatial relationships among nations do affect the variations in the foreign diplomatic presence in the U.S.; however, that effect is subtle and profound. Although the amount of variations in foreign diplomatic presence explained by the spatial effect may not be that pronounced, spatial relationships among nations are necessary factors that we must consider. The begging question from the analysis is that why the significance of spatial dependence among foreign diplomatic presence in the U.S. has varied over the years. There are two possible explanations to this question.

First, the temporal variation may be resulted from the strategic reaction of the countries to the emergence of a uni-polar world order after the end of Cold War. Prior to 1993, the spatial effect within the dependent variable could be well explained by that of the independent variables, especially by the spatial effects in the distribution of power in the international system. The impact of the collapse of the Soviet Union and emergence of a uni-polar world order forced the members of the international state system to forge a better diplomatic relationship with the sole superpower by following the suit

Table 6. Global Moran's *I* of major continuous variables in OLS model

Year	lnDips	lnCinc	lnDist	Age
1980	0.155**	0.287**	0.796**	0.434**
1981	0.164**	0.276**	0.809**	0.432**
1982	0.153**	0.253**	0.812**	0.391**
1983	0.178**	0.303**	0.835**	0.413**
1984	0.183**	0.293**	0.838**	0.424**
1985	0.213**	0.284**	0.838**	0.421**
1986	0.213**	0.286**	0.838**	0.420**
1987	0.252**	0.276**	0.843**	0.415**
1988	0.269**	0.418**	0.850**	0.438**
1989	0.229**	0.383**	0.846**	0.442**
1990	0.201**	0.374**	0.841**	0.430**
1991	0.281**	0.429**	0.852**	0.440**
1992	0.248**	0.437**	0.848**	0.370**
1993	0.266**	0.429**	0.849**	0.352**
1994	0.305**	0.418**	0.846**	0.368**
1995	0.329**	0.419**	0.848**	0.367**
1996	0.331**	0.417**	0.848**	0.363**
1997	0.323**	0.422**	0.850**	0.366**
1998	0.336**	0.424**	0.850**	0.371**
1999	0.368**	0.487**	0.859**	0.383**
2000	0.334**	0.492**	0.858**	0.378**

Note: * = $P<0.01$; ** = $P<0.001$.

of their neighbors. To play the politics of choosing sides between the two superpowers was no longer a viable vein to gain political capitals for one's own interests in a uni-polar world system. Under the uni-polar world system, weaker states tend to bandwagon with the hegemonic power and this could reinforce their diplomatic presence in the U.S. With such state behavioral tendency, the spatial structure of international power distribution could no longer explain the spatial structure of diplomatic interaction between the superpower and the rest of the world. This could be the reason why the model residue show strong spatial dependence after 1992.

Second, spatial dependence in residual after 1992 could be due to the selective U.S. withdrew after the collapse of the Soviet Union. During the Cold War period, the U.S. was everywhere possible in the world, containing the Soviet influence. After the collapse of the Soviet Union, many countries had lost their "strategic value" to the U.S. This may account for the clustering of errors in the regression model after 1992.

To understand why the OLS residuals become spatially dependent after 1992, we calculated the Moran's *I* for all variables considered in regression model. Table 5 is the list of the Global Moran's *I* for major variables in each year during the study period. Each of the Moran's *I* values are statistically significant at $P = 0.01$ level. Moran's *I* for the diplomatic missions show a positive trend over the years, so does the national capabilities index. Residual Moran's *I* jumped in 1993, however, Moran's *I* of other major variables show a much smoother change from 1992 to 1993.

To understand the reason for the jump that occurred in 1993, we also calculated local Moran's *I* for each continuous variable. Then the local Moran's *I* of the dependent variable is correlated with local Moran's *I* of the other variables (Table 7). It is expected that correlation coefficient is large for the years before 1992, and correlation coefficient is small after 1992. It can be said that the spatial effects in two variables are similar if their local Moran's *I*s significantly correlate with each other. The correlation between the local Moran's *I* of the foreign diplomatic presence in the U.S. and the local Moran's *I* of the power index has a clear drop from 1987 to 1988 onward until 1999. This suggests that spatial effect in the foreign diplomatic presence was more similar to that in the power distribution in the international system in most of the 1980s, while it became less similar in the 1990s.

Table 7. Dependent variable local Moran's *I* correlation with local Moran's *I* of the major independent variables

InDips local Moran's *I* correlation coefficients				
Year	InCinc.li	Indist.li	Age.li	Residual.li
1980	0.687***	-0.039	0.120	0.273*
1981	0.695***	-0.032	0.131	0.198*
1982	0.727***	-0.087	0.176*	0.206*
1983	0.717***	-0.058	0.186*	0.316**
1984	0.722***	-0.060	0.178*	0.287**
1985	0.754***	-0.084	0.146	0.283**
1986	0.765***	-0.072	0.118	0.169
1987	0.775***	-0.060	0.125	0.346**
1988	0.639***	-0.007	0.094	0.332**
1989	0.629***	0.022	0.084	0.327**
1990	0.621***	0.061	0.083	0.351**
1991	0.643***	0.128	0.119	0.272*
1992	0.593***	0.129	0.173*	0.465**
1993	0.610***	0.106	0.135	0.408**
1994	0.565***	0.110	0.133	0.411**
1995	0.572***	0.102	0.128	0.430**
1996	0.558***	0.114	0.100	0.412**
1997	0.562***	0.142	0.139	0.402**
1998	0.539***	0.111	0.137	0.457**
1999	0.654***	0.105	0.122	0.358**
2000	0.631***	0.105	0.138*	0.369**

Note: *=$P<0.005$; **=$P<0.01$; ***=$P<0.001$

The fact that all variables show a significant spatial dependence does suggest significant spatial clustering in terms of the variable under the test. That the multiple regression residuals for each year show a Cold War effect (spatial dependence in residuals are only significant after 1992) suggests that the

spatial dependence in the U.S. foreign diplomatic relationship was a function of the spatial dependence in the independent variables before 1992. Therefore, the regression residuals do not contain spatial dependence during that period. After 1992, the spatial content of the dependent variable cannot be completely explained by the independent variables. In other words, these independent variables do not have the spatial effect / variations that could effectively explain the spatial dependence in the dependent variable; and thus the remaining spatial dependence in the dependent variable is transcended or passed to the error of the model. Therefore, the residuals become spatially dependent after 1992. The testing of the two commonly used spatial models—spatial lag and error models—confirms that the error model has effectively solved this problem.

As shown in Tables 8 and Table 9, the model over-predicted for Burundi for more than 8 years; whereas it under-predicted for Australia, Gabon, Japan, Liberia, St. Kitts and Nevis, and Saudi Arabia for more than 8 years. Australia, Japan, and Saudi Arabia are the most important ones. Especially noteworthy case here is Saudi Arabia, which is under-predicted for 16 years within the study period. This suggests that power bases of these countries do not match with their diplomatic presence in the U.S.

Table 8. Countries that are over predicted for more than 3 years between 1980–2000

Name	Frequency
Afghanistan	6
Brukina Faso	3
Burundi	8
Congo	3
Congo, Dem. Rep. of	3
Dominican Republic	4
Eqatorial Guinea	4
Eritrea	3
Ethiopia	3
Guinea-Bissau	4
Lao, People's Dem. Rep.	5
Luxembourg	4
Myanmar	5
Nicaragua	6
Romania	3
Syrian Arab Republic	6
Turkmanistan	4
Zaire	4

Table 9. Countries that are under predicted for more than 3 years between 1980–2000

Name	Frequency
Antigua and Barbuda	4
Australia	8
Barbados	7
Gabon	8
Japan	8
Liberia	8
Saudi Arabia	16
Somalia	4
St. Kitts and Nevis	8

VII. CONCLUSION

The analysis shows that national power is an important factor that explains the variations in the foreign diplomatic presence in the U.S. In general, the number of foreign diplomatic personnel sent to the U.S. is significantly and positively conditioned by the power of nations. The end of Cold War, however, makes the explanation of the U.S. foreign diplomatic relationship very interesting in that national power alone could no longer fully explain the variations in foreign diplomatic presence in the U.S. Spatial dependence is a significant factor for the variations in foreign diplomatic presence in the U.S. Although political scientists may have to think more carefully about how to better measure national power as it is a hard-to-measure concept (Stoll & Ward, 1989; Tellis et al., 2000), the Correlates of War project CINC index strongly associates with the concept of power in the mainstream International Relations theories. Notwithstanding the inexactness in political science about measurement of national power, the model of the diplomatic interaction here does have a good fit.

The study shows that the spatial relationship among nations is an important factor in terms of diplomatic interaction between the U.S. and the rest of the world. However, different components of the spatial relationship have varying degree of effect on the variations in foreign diplomatic presence in the U.S. Spatial proximity, often expected to exhibit an impediment effect on spatial interaction is not statistically significant in this study. In today's world, overcoming the physical distance is much easier than ever before, thanks to the technologies. The ease of traversing distance makes distance as a lesser explanatory variable to account for the variations in the diplomatic relationship of the U.S.

The regional effect on foreign diplomatic presence in the U.S. is not constant over space and over time. Different regions show up to be significant factors in different years. But in general, European Nations tend to send smaller diplomatic presence in the U.S. Nations in the Middle East, Africa, Americas, NATO, and ASEAN members tend to have more diplomatic presence in the U.S. than others, whereas nations in South Asia, EU, and OIC members tend to have less diplomatic presence in the U.S. After all, the regional factors explain small amount of the spatial variations in foreign diplomatic presence in the U.S.

We have found significant spatial dependence in the foreign diplomatic presence in the U.S. Foreign diplomatic presence in the U.S. is a function of national capabilities of the sending state, and it is also affected by the size of diplomatic missions sent from its neighboring states to the U.S. Spatial effect on the diplomatic presence in the U.S. was adequately explained

by national capabilities until 1992. After 1992, national capabilities could not fully explain the spatial effect on the foreign diplomatic presence in the U.S. without consideration of international spatial dependence.

We revealed some insights into the effect of the national power and international spatial relationships on political interaction among nations. We conclude that spatial relationships as a whole do matter to every factor that we have examined. However, spatial models are sensitive to the way neighbors are defined and how spatial weights are given. How to specify neighbors and what weights to choose is still largely decided by individual researchers according to their individual perceptions. The way how space is characterized and its implication on the international spatial relationships in the context of diplomatic interactions call for more research efforts in the future.

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