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Categories, Creditworthiness, and Contagion: How Investors' Shortcuts Affect Sovereign Debt Markets

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We assess how investors evaluate sovereign borrowers, arguing that sovereign risk is less "sovereign" than previous research assumes. Investors evaluate governments based not only on what they do, but also on investors' views of similar, "peer" countries. Professional investors use investment categorizations (geography, sovereign credit rating, or level of market development) as a heuristic device. As a result, peer country effects, as well as country-specific and global factors (booms, crises, or shocks), should explain sovereign interest rates. The peer effects we expect are regular features of international capital markets, rather than phenomena that occur in periods of market turmoil. We assess our expectations using error correction models of monthly sovereign risk premiums, which reveal significant interdependencies in sovereign risk assessments among countries, net of global and domestic predictors. Such contagion emerges principally in the short term, although we also find robust, long-term ties in sovereign risk assessments among countries sharing common regional classifications. Hence, our evidence suggests that professional investors' reliance on country categorizations facilitates the transmission of market sentiments—which include lower as well as higher risk premiums charged—across groups of countries, even when countries differ in key measures of creditworthiness. Our analyses highlight the importance of investors' ideas regarding country categorizations; they call into question the efficiency of sovereign debt markets.

How much control do national governments have over their capacity to access sovereign credit markets? In this article, we suggest that professional investors rely on a country's peer-group as a decision-making shortcut; they evaluate borrowing governments based not only on what they do, but also on the riskiness of other sovereign borrowers that fall into the same category. This tendency of investors to rely on categories as heuristic devices can either increase or decrease the cost of market access. It also reduces borrowing governments' control over market sentiment: Governments often do not select the peer groups into which investors place them. Our statistical analyses lend evidence to our claim that ostensibly "sovereign" risk evaluations are, in fact, to a significant degree interdependent, as peer-group risk premiums offer a significant source of the variation in market constraints.

Professional investors' use of categories as heuristic devices also calls into question the extent to which private markets assess risk and allocate capital in ways that reflect underlying economic and political fundamentals. The Eurozone provides an instructive example: In the mid-1990s, the interest rates on Greek government bonds were 10% points higher than those on German debt.[1] As Greece prepared to join EMU in 2001, rates converged dramatically; by 2001, the Greek–German interest rate spread was less than 0.5%. This pattern—shrinking risk premiums in the late 1990s, followed by many years of very small spreads against high-quality German bonds—also characterized the sovereign debt issued by Italy, Portugal, and Spain. In 2008 and 2009, as investors' attention turned to fiscal and financial problems in these southern European countries, the "Eurozone" bonus disappeared: Rates skyrocketed, with the Greek–German spread reaching 13% in 2011 and 20 percent in 2012. While economic policy outcomes can explain part of the shrinking (and then expanding) spreads, especially on the fiscal side, the premiums went far beyond what economic fundamentals would predict. Rather, the movement of Greece from "emerging Europe" in the 1990s, to "Eurozone" in the 2000s, to a "PIIGS country" (referring to its new peripheral categorization with Portugal, Italy, Ireland, Greece, and Spain) after 2008, profoundly affected Greece's capacity to access credit markets. Being placed in the company of creditworthy countries meant cheaper access to government borrowing, while being associated with economically risky nations led to dramatic increases in

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[1] Interest rates on government bonds are taken from Eurostat; they reflect annual data on government bond yields for ten-year instruments, defined according to the Maastricht convergence criteria.

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borrowing costs. Hence, it is not surprising that governments of peripheral EU nations went to great lengths—albeit with limited success—to convince capital markets that they, and their crises, were different from their neighbors.

It is this sort of categorization, in which investors place sovereign borrowers into broad groups and then use these groups as part of their risk assessment, that we investigate. Extant research demonstrates that country-specific economic factors—such as inflation and accumulated debt—heavily influence governments' access to and cost of financing. Risk premiums also reflect the ideology of the governing party, the degree of democratic governance (Saiegh 2005; Vaaler, Schrage, and Block 2006; Archer, Biglaiser, and DeRouen 2007), and the occurrence of elections (Jensen and Schmith 2005; Vaaler, Schrage, and Block 2005; Hardie 2006; Bechtel 2009; Spanakos and Renno 2009). In addition, global market conditions affect governments' access to financing: High global liquidity and risk acceptance allows for easier access, while system-wide risk aversion or capital shortages result in more expensive access and perhaps, even, credit rationing (Eichengreen and Mody 2000). We also know that global capital market constraints vary across types of governments—for instance, developed versus developing nations; commodity versus manufacturing exporters; or governments that borrow from commercial banks versus from bond markets (Mosley 2003; Wibbels 2006; Campello 2012; Kaplan 2012).

We posit that a third set of factors affect the price and availability of sovereign credit. Net of domestic fundamentals and global trends, professional investors also sort sovereign borrowers into distinct categories, on the basis of geography, market development, or broad credit quality. Our logic is generally similar to that of Gray and Hicks (2014), who find that countries' international ties and associations inform their research subjects' assessments of country risk. We focus, however, on categorizations generated and used by market actors, rather than on membership in international economic agreements. We argue that by providing cognitive shortcuts to facilitate investment decisions for market actors, country categorizations may obscure variation in creditworthiness *within* categories and thus may influence the cost of borrowing beyond what is predicted by economic fundamentals.

Our theoretical focus on country categorizations suggests that a sovereign borrower with "responsible, risk-free" peers will be treated differently than one with "frontier market, risky" peers, even if the general economic and political profiles of both countries are identical. Investors thus may evaluate Turkey differently when it is placed in "emerging Europe" or among "future EU members," than when investors view it as a member of "Middle East/North Africa," "West Asia," or "emerging markets." Similarly, investors may have assessed Brazil quite differently as it came to be known as one of the high-growth "BRICS" countries, compared to when it was lumped alongside other Latin American countries with legacies of sovereign defaults and inflation (Eichengreen, Hausmann, and Panizza 2005; :13). While investors' use of heuristics may reflect a rational cognitive shortcut to facilitate decision making in the face abundant information, categories also may be understood as a sort of "rational fiction" (McNamara 2002) emerging from shared practices in the investment community, rather than objective investment criteria. The result of such categorization is that markets often fall short of the efficiency with which they are assumed to operate (for example, MacKenzie 2006). Our findings therefore give further reason to question the distributional consequences of private market-based frameworks of assessment, including sovereign credit ratings (Sinclair 2005) as well as country groupings such as "BRICS" or "frontier markets."

Moreover, by identifying country categorizations as a mechanism for the transmission of sovereign spreads, our research contributes to recent literature on peer effects and diffusion in international relations (see Simmons and Elkins 2004; Brooks 2005; Plümper, Troeger, and Winner 2009; Brooks and Kurtz 2012; Gilardi 2012). Much of this diffusion research focuses either on the mechanisms through which state choices are tied, such as competition, emulation, or learning (Simmons, Dobbin, and Garrett 2006) or on spatial contagion associated with proximity or cross-national linkages (Buhaug and Gleditsch 2008). By contrast, we bring attention to a mechanism through which decentralized decisions by market actors are tied together through common reliance on country categorizations. The common use of heuristics yields interdependent outcomes in the price of borrowing for governments, net of domestic fundamentals and common shocks.

We first present the logic of our claim that country categorizations serve as a channel for the evaluation and transmission of sovereign risk and as a heuristic device for professional investors. We then assess empirically the effect of country categorizations on the risk premiums paid by sovereign borrowers. Our analysis of credit default swap prices and sovereign credit spreads for 15 countries from 2000 to 2010 shows that the risk premium on a given country's sovereign debt is predicted not only by its own fundamentals, but also by market assessments of other countries with which it is categorized. "Peer group effects" can therefore allow crises—or, at least, higher risk premiums—to spread within groups of countries, sometimes affecting borrowers that have experienced few changes in their objective circumstances. Moreover, the spread of risk premiums among peer countries appears in crisis as well as non-crisis periods and in developed as well as developing countries. The long-term transmission of market sentiment among peer categories persists in bond markets, while risk contagion in derivative markets occurs through a variety of short-term mechanisms. We therefore conclude that "sovereign" risk may be even less in the control of individual governments than previously assumed.

Investors, Sovereign Borrowing, and Government Policies

Contemporary financial globalization presents governments with opportunities as well as constraints.[2] Reduced barriers to cross-border capital flows offer governments—as well as their citizens and firms—access to a wide set of potential investors. These investors, which include banks, mutual and hedge funds, individual (retail) investors, and official entities (such as foreign central banks), provide capital that allows governments to issue debt, finance their fiscal policies, and smooth consumption. Market access, however, comes with a cost: In order to borrow at

[2] On the determinants of capital account liberalization, see Brooks (2004), Brooks and Kurtz (2007), Chwieroth (2007), Simmons and Elkins (2004), Quinn and Toyoda (2007), Mukherjee and Singer (2010).

favorable rates of interest, governments attend to the preferences of international investors, which reflect investors' consideration of risk and reward. Because risk is often difficult to measure objectively and accurately (for example, Gray 2013), however, investors' assessments of borrowers also embody their ideas about which economic and political behaviors and institutions are most appropriate. Investors' ideas do not necessarily move in lockstep with material conditions and, indeed, can themselves affect the operation of markets (MacKenzie 2006) and perceptions of economic interests, especially in response to crises (Blyth 2002).

In material terms, investors are concerned with minimizing the risk of sovereign default and the loss of real value of their assets (Mosley 2003; Bernhard and Leblang 2006; Tomz 2007). They assess the prospects for future inflation (which may be affected by current monetary policy, the institutional structure of monetary institutions, and the level of public debt), as well as the willingness and ability of governments to repay their obligations. Investors may pressure borrowing governments to pursue monetary restraint, limit budget deficits and debt levels, and in some instances, enact neoliberal-oriented reforms.

Investors' assessments of sovereign borrowers, however, vary both across groups of countries and over time. During most of the contemporary era of financial globalization, investors have assumed that wealthy, established democracies are very unlikely to default on their sovereign obligations. As a result, investors looked only at overall macroeconomic outcomes when making investment decisions. And because developed countries were free from the "original sin" that tainted emerging market sovereign debt (Eichengreen et al. 2005), governments of developed democracies could borrow in their own currencies, at relatively long maturities. Hence, investors treated developed and developing countries differently, even when their economic fundamentals were very similar (Mosley 2005). A "developed nation discount" existed in private capital markets, where investors placed a country ("developed," "emerged," "emerging") helped to determine its access to global capital markets. This served to insulate developed governments somewhat from shifts in market sentiment, and they facilitated continued cross-national divergence in many policy areas (Mosley 2003; Wibbels 2006).

In the post-structural adjustment era of the 1990s, developing countries' governments also were able to access international capital markets, but they did under greater scrutiny.[3] Investors worried about default and currency, as well as inflation and risk. This meant sustained attention to a wide array of government policies (a "broad" financial market constraint; see Hardie 2006) as well as the frequent need to borrow in foreign currencies and at shorter maturities. Among developing nations, those that rely less on borrowing in private capital markets—perhaps, for instance, because they are natural resource exporters and therefore have fewer financing needs (Campello 2012)—are less exposed to pressures from investors. Additionally, if bank lenders evaluate sovereign borrowers less stringently than do portfolio market lenders (see Devlin 1989; Kaplan 2012), then governments that rely more heavily on bond market-based financing will be more constrained.

Financial market pressures also vary over time. When global liquidity is higher, investors are typically more risk acceptant, and the premiums they charge for "suboptimal" government policies are smaller, thus expanding governments' autonomy vis-à-vis capital markets (Campello 2012). When global liquidity is lower, investors behave more cautiously. They seek low-risk, low-return assets, and they exact large penalties for policies and events that appear to increase default risk. At the extreme, investors' "flight to quality" leads to credit rationing for riskier sovereign borrowers. Indeed, in periods of low liquidity, even the "prettiest" (to invoke Keynes' "beauty contest" analogy) borrowers may find themselves unable to tap global credit markets (Kindleberger 1978:15).

Beyond noting the differences in market treatment of developed and developing nations, scholars have done little to explore the effects of such categorizations on sovereign access to credit, or the mechanisms by which investment professionals classify and reclassify countries. The "original sin" argument, for instance, implies that due to their categorical association with past default, all countries labeled "developing" will have difficulty accessing markets. This common categorization ignores the wide variation in the economic fundamentals and political systems of developing nations; the categorization therefore advantages some borrowers and penalizes others. Our article engages this gap by considering the impact of peer countries' creditworthiness—that is, that of other nations in a shared category—on sovereign risk. Our analysis also highlights the ways in which ideas about categories of countries, and about the investment risk associated with these ideas, play a role in the international political economy. These ideas are far from neutral in their impact (for example, Blyth 2002; McNamara 2002; Best 2005; Sinclair 2005; Chwieroth 2009), and they do not always align with actual economic behavior or policy outcomes (also see Gray 2013). Moreover, just as geographic and cultural groupings can facilitate the diffusion of policies among national governments, peer country groupings represent a channel for the diffusion of market pressures.

Origins and Consequences of Country Categorizations

Professional investors are tasked with allocating assets over a range of instruments in a way that balances their (and their clients') tolerance for risk and their appetite for reward. They tend to have short time horizons, to worry about performance relative to other investors, and to face a wide menu of potential investment opportunities. Given the profusion of information available about the extensive array of investment choices, market actors confront vastly larger sums of data than they could reasonably process in a time-constrained environment. Thus, it is not surprising that asset prices often systematically deviate from the axioms of expected utility theory and market efficiency (Camerer 1995:166; Stracca 2004:375).

Nevertheless, market actors have devised an array of strategies, such as reliance on sovereign risk ratings, which enable them to shortcut the task of processing this profusion of information in order to make investment decisions. Research in behavioral finance draws upon studies of bounded rationality (Simon 1955, 2000; Conlisk 1996), in which limitations on computational and

[3] The pressures generated by financial openness often do not overwhelm the impact of domestic institutions and ideology, even among developing countries (Avelino, Brown, and Hunter 2005; Brooks 2009; Plümper, Troeger, and Winner 2009).

information-processing capabilities lead agents to rely on decision heuristics—or cognitive shortcuts—to solve complex problems of choice and judgment (Quattrone and Tversky 1988). These heuristic devices offer the promise of "good enough" decisions; it also is rational—given relative performance evaluation—for investors in a market to converge on a similar set of decision-making criteria. One such heuristic is category-based reasoning. Social psychologists have shown that categorization is a cognitive shortcut through which individuals associate groups with a given set of characteristics in order to make sense of a complex environment (Taylor 1981; Wilder 1986). Categorization serves to accentuate perceived differences between groups and to minimize perceived differences within groups (Tajfel and Wilkes 1963; McGarty and Penny 1988).

In this sense, country categories may be understood as a response to the problem of information overload that increases the efficiency of international bond markets, in line with predictions of market liberalism. But these categories may not necessarily improve market efficiency, as they can group together countries that are disparate in many ways (for instance, BRICS and PIIGS). Such uses of categories more closely approximate the treatment of ideas in constructivist scholarship, in which ideas play a key role in political actors' choices of policies, particularly in environments of uncertainty or ambiguity. In this view, institutions are conditioned not only by the interests of their key constituents, but also by broader ideas about the desirability of policies and policy frameworks that are shared within a social system (McNamara 2001, 2002; Best 2005; Chwieroth 2007, 2009). But, whereas this scholarship tends to focus on ideas regarding economic policy and institutions (heuristics in a broader sense), our analysis is oriented toward categories as decision-making tools. The common thread is that heuristics allow actors to deal cognitively with complicated and multi-faceted issues and to make decisions in uncertain environments (Blyth 2002). And, these decisions have distributional consequences—in our case, for sovereign borrowers whose price of market access is affected by the behavior of countries with which they are categorized.

Categorization, we posit, operates therefore as a cognitive shortcut through which market actors cope with the abundance of information available about sovereign creditworthiness across a highly diversified portfolio. The professional investors who purchase sovereign debt often manage portfolios that include a range of asset types—not only sovereign debt, but also corporate debt, equities, derivatives, and cash—and they often invest in a range of locations. The need to compare across countries, assets, and issues leads to a reliance on information shortcuts. For instance, investment professionals may use outcomes on and trends in overall macroeconomic indicators—budget deficits, debt, and inflation—as indicative of a country's investment risk. Reliance on a limited set of indicators is particularly a common practice when assessing sovereign debt issued by advanced democracies, where default risk has been assumed (until the Great Recession and the subsequent European debt crisis, at least) to be minimal (Mosley 2003).

Although previous research establishes the importance of country-specific events and policies, as well as global market liquidity and attitudes, to sovereign risk assessments (for example, Campello 2012), we draw attention to an intermediate level of influences. Investors are more sensitive to what is happening in a given sovereign borrower's "neighborhood" (see below) than they are to what happens in the world as a whole. We expect that these country categories are meaningful, above and beyond the economic and political characteristics that may typically be associated with them. Even if a country is placed in a category for reasons related to its policy profile (so that categories might seem endogenous to country characteristics), the stickiness of these categories and the diversity of countries within these categories render such peer-group classifications important in a way that goes beyond economic fundamentals.

One empirical implication of the use of peer categories, which we test below, is that the effects of country category on sovereign borrowing rates are more than mere reflections of shocks—in commodity prices or interest rates, for instance—that might affect a set of similar nations. Rather, even once we control for common shocks, we expect to observe an effect of peer-group (membership in a common category) on individual borrowers' cost of market access. The tendency for market actors to rely on country categories to assess the riskiness of a particular asset means that sovereign risk evaluations are to some degree interdependent, rather than independent, or "sovereign."

Cross-country contagion—of enthusiasm or pessimism—occurs therefore not only at the global level, but also at the peer-group level. When a crisis prompts private investors or credit ratings agencies to reassess similar borrowers, it is borrowers in the same category—rather than sovereign borrowers generally—who are reassessed. Crucially, our argument is not limited to the short run, nor is it limited to times of crisis, panic, or high uncertainty. Rather, professional investors face constraints and incentives that result in the widespread use of country categorizations as a heuristic device. The rational incentives to assume commonalities among peer countries—and to assume that other investment professionals also expect such commonalities—result in the diffusion of sovereign risk assessment among countries in the same group, across the cycle of market sentiment. Again, we test—and find support for—this assertion: The effects of peer countries' sovereign spreads exist in both the short and the long run, and they occur across market cycles of mania, panic, and normal operation.

Which types of peer groups or "neighborhoods" do investors utilize? Peer groups may be geographic (as in the East Asian financial crisis of the late 1990s), or they may be based on structural position in the world economy (commodity exporters, emerging markets). Investment professionals appear to rely on a range of categorizations, reflecting geography, market development, and perceived creditworthiness. These groupings have in common that they are largely exogenous to governments' actions: Governments cannot act to change their spatial location and, while they request assessment by ratings agencies, they do not determine the ratings they get. Nor can governments choose, at least in the short to medium run, whether they are deemed "frontier" or "emerging." Hence, our treatment of neighborhood effects differs from Gray (2013), who argues that investors take governments' planned or actual participation in regional economic organizations (trade agreements) as indicative—on the basis of the other governments with which they choose to affiliate—of their willingness to repay debts (also see Gray and Hicks 2014). Given the diversity of the categorizations employed by investors, we assess a range of peer-group effects in our empirical analyses.

The placement of sovereign borrowers within categories is largely stable over time, although there are occasional changes in country categorization. Consider, for example, the case of MSCI, which generates widely utilized equity investment indices that we examine here. Each June, the firm conducts a review of its categorizations that takes into account a country's level of economic development, size, liquidity, and market accessibility. Annually, MSCI announces which countries are under consideration for inclusion or reclassification (that is, from frontier to emerging, or from emerging to developed), and it solicits feedback from investment professionals. While changes are relatively rare—from 1990 to 2011, six countries were moved from one category to another, while four were removed from the indices entirely—they generate great interest among affected nations. The government of South Korea, for instance, has remonstrated for several years about MSCI's decisions not to reclassify it from "emerging" to "developed." While changes in categorizations are not the subject of our analysis, we control for these direct effects of country classification, and any changes therein, as entry or exit from a club of nations could have marked implications for investors' risk assessments (Gray 2009). We also control, empirically, for the direct effect of a country's classification on its risk premium. Our expectation, however, is that it is market assessments of peers, rather than the peer category itself, which transmits risk among sovereign borrowers.

While our analyses establish the importance of categories to sovereign borrowing outcomes, we do not explore the reasons why investment professionals choose to use some categories (for example, frontier markets) rather than others (for example, resource-dependent economies); how new types of classifications emerge; nor how the perceived utility of some categories (for example, Eurozone nations) might change over time. Such an inquiry lies beyond the scope of our analysis. Rather, our theoretical reasoning expects to observe a systematic divergence, in many instances, between country-specific political and economic fundamentals and country risk premiums. And we expect that this divergence reflects the impact of country categories—which assume commonality rather than diversity among a group's members—on country borrowing costs. If divergence persists over the long term —if, for instance, Latin American nations increasingly differ in their political and economic outcomes—then we would expect investors eventually to develop or utilize new categories. Declining utility or accuracy of such categories, however, should not automatically or immediately lead to a reassessment of such heuristics. Given that our empirical analysis covers a fairly short time period, however, we leave the exploration of changes in the categories themselves (rather than in countries within a category) as an issue for future research.

Investors' adoption, development, and use of categories also remind us of the role of private actors in much global governance: Throughout the contemporary world economy, in areas ranging from accounting standards and environmental practices to labor standards and product safety, private actors now serve as creators or enforcers of rules (Vogel 2005). While private and joint private–public governance offers to better align rules with the incentives of private agents, it also has distributional consequences (Prakash and Potoski 2006; Büthe and Mattli 2011). When private sector actors make decisions about which behaviors to reward—for instance, what the limit on fiscal deficits should be, or which countries are deserving of investment-grade credit ratings (Mosley 2005; Sinclair 2005)—the power of these agents vis-à-vis governments and citizens increases.

In the next section, we provide a test of our argument using data that allow us to estimate whether commonalities among countries in market risk assessments are merely episodic responses to crisis or changes in global liquidity, or whether they represent persistent, long-term interdependencies in the relationship between global capital and groups of national governments. Because professional investors rely on a variety of categorization schemes, we estimate peer-group effects on the basis of geographic region; the level of economic and market development; and sovereign credit quality.

Data and Empirical Model

Dependent Variables

To gauge market responses to national government policies, we employ two measures of sovereign risk. The first is the sovereign spread, the difference between the yield on a given country's government debt and (what is considered to be) a risk-free government bond of an equivalent duration (*Spread*). Sovereign spreads capture both the expected losses from default and the risk associated with the possibility of unexpected losses (Remolona, Scatigna, and Wu 2007). Sovereign spreads are widely employed in analyses of sovereign credit risk to capture the market evaluation of the creditworthiness of a government (Obstfeld and Taylor 2003; Block and Vaaler 2004). Higher sovereign spreads also are correlated with lower sovereign risk ratings (Cantor and Packer 1996; Kaminsky and Schmukler 2002). We use measures of monthly stripped spreads from the principal index of emerging market debt prices, the JP Morgan EMBI Global Bond Index, for 14 countries from 2001 to 2010.[4]

Our second dependent variable is based on credit default swap (CDS) contracts on external sovereign debt. The CDS is an important type of credit derivative through which investors hedge the risk of default or of restructuring of fixed income investments. In a typical CDS contract, the purchaser of default protection pays a fee to the seller (the insurer) during the term of the CDS contract. If the issuer (here, the government) defaults or restructures its debt, the seller of the CDS compensates the buyer (Mengle 2007; Longstaff, Pan, Pedersen, and Singleton 2011). A CDS is essentially an insurance policy for sovereign (or corporate) debt; the price of insurance captures market perceptions of a borrower's creditworthiness. Compared to sovereign ratings agencies, moreover, CDS spreads respond more rapidly to market conditions, and they are generated without a direct contractual relationship between the issuing government and the ratings agency. CDS markets thus provide a more real-time mechanism for signaling and assessing sovereign risk (Intercontinental Exchange 2010; Longstaff et al. 2011). We examine a set of monthly CDS prices for 15 developed and developing countries from

[4] By definition, the EMBI indices include only emerging (not developed) markets with sufficiently liquid public debt issues. A bond's stripped spread adjusts the market price of the bond by subtracting (stripping) the present value of the collateralized cash flows from the price of the bond. The appendix provides a complete list of variable definitions and sources, and a robustness check using annual spreads.

October 2000 to January 2010. Summary figures for each of these dependent variables—sorted according to geographic region as well as broad credit-rating category—are presented in the Appendix S1. These figures indicate that perceived sovereign risk varies over time, as well as across types of countries. Our analyses go beyond the average levels of premiums to consider the correlates of country-level risk premiums.

Independent Variables

We regress our two measures of sovereign risk on an array of domestic and global variables, representing the established determinants of sovereign risk. At the domestic level, scholars have found that defaults are closely associated with the state of the domestic economy (Grossman and Van Huyck 1988). Domestic macroeconomic and government financing variables also are among the principal determinants of sovereign risk ratings (Cantor and Packer 1996; Archer et al. 2007). We therefore include the following domestic economic variables: government consumption, the ratio of sovereign debt to gross national income, the average maturity on new external debt commitments, the fiscal balance, current account balance, export profile, and inflation rate. We also include a measure of capital account openness; this may signal to investors the extent to which a government is willing to subject itself to "market discipline" (Bartolini and Drazen 1997). An open capital account also expands a government's access to funds, suggesting that more open countries will pay lower borrowing costs.

We also include an array of political variables that have been found to affect market risk assessments. These include the level of democracy, the partisanship of the executive and of the largest opposition party, the year in the electoral cycle (proximity to the next election), and whether the country's electoral institutions are presidential or parliamentary (Freeman, Hays and Stix 2000; Saiegh 2005; Bernhard and Leblang 2006; Biglaiser and DeRouen 2007; Santiso 2013).

Moreover, we account for global market factors, including the U.S. prime lending rate. As interest rates in the U.S. rise, global liquidity declines, so do the risk appetites of international market actors (Eichengreen and Mody 1998; Kaminsky and Schmukler 2002). This leads to higher borrowing costs, especially in emerging and frontier markets. We also control for the change in yields on U.S. Treasury bonds, which may indicate shifts in U.S. growth, and hence in the global business cycle, as well as flight-to-quality dynamics (Longstaff et al. 2011). And we include a measure of U.S. stock market returns, since bond spreads for developing nations have been shown to covary with U.S. stock market volatility (Pan and Singleton 2008).

Interdependence in Sovereign Risk

The country-specific and global factors discussed above have been shown to have long-term correspondence to sovereign risk premiums (Mosley 2003; Tomz 2007). These equilibrium relationships may be disturbed by common shocks such as regional crises, or global liquidity booms. Indeed, Longstaff et al. (2011:76) report that credit spreads reveal a high level of commonality over time. It is possible that co-movements in sovereign spreads are only temporary: A country's risk profile is disrupted and influenced by those of its peers, during exceptional market conditions, but then returns to its long-term equilibrium as the market settles. As such, the interdependencies would be exceptional and temporary, as well-known episodes of contagion suggest.

We hypothesize, however, that co-movements in sovereign risk are a regular and persistent (long-term) feature of capital markets. That is, evaluations of other countries with which a given nation is categorized, such as "emerging markets" or "AAA-rated sovereign borrowers," routinely shape investors' evaluations of that nation. As such, it is not only that governments may lose "room to move" because of financial openness generally (Mosley 2003:2–3), but also that they may lose autonomy specifically because of what happens elsewhere in their peer group. We therefore test whether, net of domestic fundamentals and global variables, the risk premiums attached to sovereign debt—and hence the price and possibility for fiscal autonomy—are interdependent across countries. We treat interdependencies in market evaluations of sovereign creditworthiness as a type of diffusion process, wherein outcomes in one country are affected systematically by the outcomes of commensurate processes in other countries. Increasingly, scholars have treated cross-national diffusion as a form of spatial autocorrelation, rather than merely a spatial error term (Franzese and Hays 2007). Such an approach seeks to model interdependencies in theoretically relevant ways rather than simply treating contemporaneous correlations as a nuisance.

This approach turns our attention to identifying the basis of commonalities in market actors' assessments of sovereign borrowers. We model the interdependence in market responses as the weighted average of the outcome variable—CDS prices and bond spreads—among "proximate" nations, where four theoretically relevant categories define proximity (Beck, Gleditsch, and Beardsley 2006). We follow the standard model for estimating the presence of diffusion in the term $\rho(\mathbf{Wy})_{i,t-1}$, wherein the W matrix specifies which countries' risk evaluations are expected to influence that of country i at time t. Crucial to this task is the creation of a matrix of weights that captures the influence that market responses to one category of "sending" countries will have on the receiving nation. The coefficient on the spatial lag, ρ, permits us to answer the question of how membership in different peer groups or categories affects the standing of a sovereign government in the eyes of international bond market actors, net of the array of features (country specific and global market specific) that may directly affect that market evaluation. We specify a series of spatial weights matrices, **W**, to operationalize three potentially relevant types of groups into which professional investors sort borrowing countries (Franzese and Hays 2007).

We expect that, because of the various ways that investment funds are structured and managed, each of these types of peer categories may serve as a channel for the diffusion of risk premiums. While some investment funds have a "global" (United States plus all other) or an "international" (non-United States) focus, many are oriented toward a specific geographic region. Managers of these funds have expertise about, and often are based in, a region, such as Asia or Latin America. Other investment funds are organized according to the level of market development, with an emphasis on developed, emerging, or frontier market nations. And, while certain funds explicitly structure themselves in relation to the level of sovereign creditworthiness, professional investors' attitudes and mandates regarding investment risk should

generally lead to a diffusion of interest rate premiums among countries with similar levels of creditworthiness. The role of categories as heuristic devices might suggest, moreover, that the effects of categories should be less pronounced for finer-grained categories: If a category is broken down into a dozen different sets of countries, the utility of the categorization as a cognitive shortcut disappears to a great extent.[5] With three or five gradations, on the other hand, categorizations can more readily facilitate decision-making shortcuts. From the point of view of our analyses, then, we might expect that diffusion via shared levels of sovereign ratings (narrowly defined so that there are many distinct levels) may be less likely than diffusion via geographic region or market development level.

Our first peer-group measure recognizes the tendency of investors to classify nations into geographic portfolios. *Region* groups nations into the following major geographically based categories defined by the World Bank: Asia, Western Europe, post-Communist Europe, Latin America, Non-Latin Caribbean, Middle East and North Africa, North America, South Asia, and Africa. This spatial lag, **Wy**, estimates the extent to which the average sovereign risk assessment of other countries in the region affects a government's own sovereign premium.

Our second peer category groups countries according to their level of economic and market development. To assess the interdependence of risk among economic peers, we employ one coarser (three tier) and one finer (five tier) measure. The fine measure, *FTSE*, groups countries as Frontier Markets; Secondary Emerging Markets; Emerging Markets; Advanced Emerging; or Developed. The FTSE, a subsidiary of the London Stock Exchange, bases these groups on "a range of criteria which was developed in conjunction with international investors" and which are reviewed annually.[6] The coarse measure of market development comes from MSCI. It categorizes countries as Frontier Markets; Emerging Markets; or Developed Markets, with input from the investment community.[7] In this sense, the categorizations represent both objective differences in levels of development and subjective assessments by market participants. Both the FTSE and the MSCI review the countries classified annually. Crucially, both the fine (FTSE) and the coarse (MSCI) market development categories crosscut the geographic peer-group measure. For instance, MSCI's "Emerging Markets" group includes Brazil, Chile, Colombia, Mexico, and Peru in the Americas, but also the Czech Republic, Egypt, Hungary, Morocco, Poland, Russia, South Africa, and Turkey, as well as China, India, Indonesia, Korea, Malaysia, Philippines, Taiwan, and Thailand.

Our third and final categorization depends on countries' sovereign credit ratings (Fitch *Risk Rating*). Sovereign ratings are qualitative measures of the probability of default, published by three major credit rating agencies (Standard and Poor's, Moody's, and Fitch) on the basis of a broad set of economic, social, and political factors (Sinclair 2005; Jaramillo and Tejada 2011). The ratings attempt to capture both the willingness and the ability of governments to repay their obligations. We expect that if, for instance, an AA-rated sovereign experiences a default or restructuring, investors may begin to re-evaluate the overall credit quality of AA borrowers. To test this expectation, we utilize the weighted average Fitch Sovereign Rating for each country and year, removing the ± designations (so that AA+, AA, and AA- country-years are treated as a single group) and transforming ratings into integers ranging from 1 to 12 (where higher scores represent higher risk). We also confirm that our results on this variable are robust to coding the Fitch sovereign ratings category in different ways (for example, with fewer or more gradations; see the Appendix S1).

We acknowledge that these peer classifications often overlap with one another: most countries in the Latin American region are in the "emerging markets" (rather than developed country or frontier markets) category of market development; and most European nations fall into the "developed" (and, until 2009, in the AAA-rated) peer group. Given the high correlation across types of categories, we include only one type of spatial lag in the models we estimate. Doing so may raise the possibility of omitted variable bias but diminishes inefficiency in the model. Table 1 provides summary statistics for all of the variables we employ, while variable descriptions and the correlations across the diffusion terms are included in the Appendix S1.

Empirical Model

Because we are interested in measuring whether interdependencies in sovereign risk assessment are merely episodic—such as a temporary crisis—or whether they represent long-term equilibrium relationships (or both), we employ an error correction model (ECM) to estimate these relationships. Because of the extremely short time horizons over which market decisions are made (Santiso 2003), including trades that may occur in fractions of a second, we use the term "long term" to refer to a period of at least a year. Indeed, our research suggests that most deviations from long-term trends are corrected within a year. In general, error correction models estimate the rate at which Y_t returns to equilibrium after a change in X_t. These models are known to be well suited for the analysis of cointegrated data; they are appropriate also for the analysis of stationary data series that are not cointegrated but for which we have theoretical reasons to explore both long- and short-term relationships (De Boef and Keele 2008). The single-equation ECM takes the following form:

$$\Delta Y_t = \alpha_0 - \alpha_1(Y_{t-1} - \beta_1 X_{t-1}) + \beta_0 \Delta X_t + \varepsilon_t$$

We estimate changes in Y (sovereign spreads and CDS prices) as a function of the vector of lagged X political and economic variables known to affect sovereign risk, and of the short-term changes that bring these variables out of their equilibrium. Among the independent variables, we include the spatial lags that capture the impact of different categories of nations on whose market evaluations a government's own risk premium may depend. In the equation above, the short-term effect of changes in X on Y is captured by β_0, and the long-term or equilibrium relationship between those variables is estimated in the coefficient β_1. The coefficient α measures the rate at which the correction or re-equilibrium is achieved—that is, the error correction (De Boef and Keele 2008). We can rewrite the equation above as follows and estimate it by OLS:

$$\Delta Y_{it} = \alpha + \Pi Y_{i,t-1} + \beta_k \Delta X_{i,t-1} + \beta_j X_{i,t-1} + \varepsilon_{it}$$

[5] At the other extreme—if there were only a single investment category—the category also would have little utility.

[6] http://www.ftse.com/Indices/Country_Classification/

[7] http://www.msci.com/products/indices/country_and_regional/em/

TABLE 1. Summary Statistics: Monthly Data

Variable	*N*	*Mean*	*SD*	*Min.*	*Max.*
CDS	2355	218.91	361.11	2.17	3857.61
Spread	2119	336.67	341.90	9.37	3569.37
US Market	2886	−0.07	4.91	−18.55	11.04
Treasury Yield	2886	−0.03	0.32	−0.87	0.92
Inv. Grade	2886	0.005	0.44	−3.09	2.89
High Yield	2886	0.001	0.61	−4.20	2.56
Equity Premium	2886	0.0002	0.00	−0.01	0.02
Volatility Premium	2886	0.11	4.54	−16.62	13.70
Term Premium	2886	−0.02	1.18	−3.19	4.69
Stock Flows	2886	4634	18,256	−72318	42965
Bond Flows	2886	6849	10,137	−32782	40174
FX Rate	2707	0.0003	0.04	−0.15	0.36
Debt	2016	39.45	18.93	8.34	114.07
Maturity	2016	14.38	5.32	2.83	28.95
Inflation	2801	6.61	7.57	−4.86	54.92
Budget	22.32	−1.32	4.12	−8.59	16.45
GDP/capita	2912	7093	9091.55	511.11	40707
Democracy	2912	6.31	5.21	−10	10
KA Openness	2912	0.51	1.39	−1.86	2.46
System	2912	1.55	0.65	1	3
Fitch	2685	4.15	1.03	2	7
US Prime Rate	2912	5.70	1.83	3.25	9.5
Left	2912	0.17	0.37	0	1
Right	2912	0.83	0.37	0	1

Our estimation strategy relies on a pooled cross-sectional time-series analysis. We employ a generalized least squares estimator and include country fixed effects and a linear time trend to control for country and temporal dynamics not explicitly modeled in the data. We also correct for first-order serial correlation and heteroskedasticity in the errors. The use of country dummies restricts our analysis to within-country effects, which, along with the panel-corrected standard errors, sets up a rather conservative test of our hypotheses, as there is typically more cross-sectional than intertemporal variation in sovereign risk. Yet, the use of fixed effects is particularly important for our purposes as we wish to set aside country-specific legacies that may affect sovereign ratings, such as the "original sin" of historic default, or the difficult-to-measure qualities that distinguish countries in the eyes of investors. Next, we undertake these analyses using monthly indicators of sovereign risk. As a test of robustness, we replicate the analysis in annual data using both CDS prices and bonds spreads and report those results in the Appendix S1. The annual analyses indicate that market corrections in sovereign risk spreads often occur in a time frame shorter than 1 year. This also fits with the structure of asset allocation and fund management evaluation in the investment management industry (for example, Mosley 2003). Given the short-term nature of most market movements, we focus below on the monthly data for sovereign risk spreads.

Results

Our model rests on the premise—which theoretical and empirical research supports—that there are significant long-run relationships between a government's sovereign credit risk and an array of political and economic variables. To the extent that domestic events, such as elections, or international shocks, such as changes in global liquidity or risk attitudes, disturb such relationships, we expect the equilibrium relationships to be restored with the passing of these phenomena. Over the longer term, and in periods of normal market operation, we expect that market participants' evaluations of other countries in the same peer categories affect market participants' assessments of a given country's sovereign creditworthiness.

Tables 2 and 3 present the results from our analyses of monthly risk data. Country fixed effects are included in all specifications, but are not reported for the sake of brevity. The coefficients on the lagged independent variables ($X_{i,t-1}$) indicate the longer-term equilibrium relationship between those variables and the sovereign bond spreads. The magnitude of the relationship depends not only on those coefficients, however, but also on the coefficient on the lagged dependent variable ($Spread_{t-1}$), which captures the rate at which changes in Y return to equilibrium. Specifically, the parameter capturing the long-term multiplier is defined as $\Upsilon = \beta_j/\text{-}\Pi$ (Kaufman and Segura-Ubiergo 2001:587; De Boef and Keele 2008:191). The first differences of the X variables, in turn, estimate whether short-term changes in X—here, measured monthly—bring about changes in Y. The ECM permits us to estimate both the size of those changes and the rate at which such departures from the equilibrium persist—that is, the time it takes for the long-term relationship to be restored.

Table 2 examines month-end CDS spreads from October 2000 to January 2010, while Table 3 reports results for models in which monthly EMBI *Spreads* is the dependent variable.[8] Tables A1 and A2 of the Appendix S1 list the countries included in the analysis of the monthly data. Because most political variables do not change on a monthly basis, we regress the CDS spreads on the

[8] The countries included in each specification vary according to the existence of developed CDS and government bond markets, as well as due to the availability of the independent variables, as noted in both tables.

Table 2. Explaining Monthly Changes in Credit Default Swap Prices

	(1) Region		(2) Fitch (Risk Rating)		(3) FTSE		(4) MSCI	
DV: Monthly ΔCDS	*Coef.*	*SE*	*Coef.*	*SE*	*Coef.*	*SE*	*Coef.*	*SE*
CDS								
t−1	−0.109***	0.018	−0.117***	0.016	−0.074***	0.016	−0.086***	0.020
Peer diffusion								
Peer CDS								
t−1	0.007	0.021	0.009	0.018	−0.031	0.021	−0.013	0.025
Δ	0.349***	0.051	0.071***	0.018	0.035	0.033	0.163***	0.048
Categories' direct effect								
Category								
t−1	–	–	5.587	7.104	59.609	37.271	115.797	95.155
Δ	–	–	9.090	9.274	–	–	−136.715	169.291
Domestic politics and economy								
Debt								
t−1	0.697**	0.313	0.762***	0.285	1.357***	0.538	1.186*	0.670
Budget balance								
t−1	−0.413	1.283	−0.177	1.181	1.290	1.272	0.127	1.647
Current account balance								
t−1	0.679	0.653	0.393	0.579	0.716	0.629	0.906	0.881
Inflation								
t−1	0.775	1.017	0.395	0.914	0.878	1.129	1.288	1.390
GDP per capita								
t−1	0.018	0.016	0.014	0.017	−0.001	0.014	0.006	0.019
KA Open								
t−1	−3.960	5.046	−5.548	4.382	−5.190	4.923	−7.823	7.319
FX rate								
t−1	448.631***	121.959	388.912***	96.702	431.006***	95.943	449.537***	122.503
Δ	290.856***	79.730	275.860***	63.834	372.739***	64.186	366.030***	81.059
Democracy								
t−1	−0.563	1.018	−0.688	0.897	0.288	0.717	0.465	1.233
Months to election								
t−1	0.006	0.108	0.032	0.099	−0.030	0.093	−0.020	0.129
Common shocks								
US prime rate								
t−1	−1.095	1.505	−1.348	1.394	−1.076	1.578	−0.537	2.031
Δ	−16.209	11.160	−23.259**	10.036	−26.065***	9.854	−27.524**	13.263
US stock market								
t−1	−3.020***	0.859	−4.005***	0.753	−3.218***	0.737	−3.048***	1.043
Δ	−2.794***	0.488	−3.685***	0.417	−3.301***	0.397	−2.901***	0.600
Invest. grade yield								
t−1	−5.950	6.426	−1.861	5.786	−3.183	5.380	−2.217	7.415
High yield								
t−1	−10.277**	4.913	−5.668	4.464	−11.700***	4.220	−6.701	5.687
Treasury yield								
t−1	−7.627	10.280	−4.851	9.097	−10.173	8.338	−8.504	11.548
Volatility premium								
t−1	−0.006	0.391	0.424	0.344	0.658**	0.315	0.596	0.441
Equity premium								
t−1	245.374	717.482	225.214	636.530	975.401	609.325	133.458	782.645
Term premium								
t−1	1.365	2.406	2.026	2.105	2.660	1.943	2.959	2.684
Stock flows								
t−1	−51.067	34.865	−67.352**	31.417	−96.175***	32.530	−114.839***	42.740
Δ	−53.423**	22.117	−61.372***	19.986	−79.659***	20.553	−94.636***	26.757
Bond flows								
t−1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Δ	−0.000	0.000	−0.000	0.000	−0.000	0.000	−0.000	0.000
Energy index								
t−1	−0.081	0.083	−0.077	0.073	−0.069	0.069	−0.124	0.094
Time	−0.106	0.217	−0.103	0.198	0.318	0.234	0.195	0.325
Constant	−8.252	28.879	−37.600	58.569	−182.264	125.689	−134.346	116.496
N	927		1021		825		885	
Wald χ^2	447.63		495.26		510.43		368.36	
Prob > χ^2	0		0		0		0	

(Notes:. FGLS error correction model of monthly changes in CDS prices.
Estimates of country fixed effects not shown in table for ease of presentation; available upon request.
Countries included in the analysis are listed in the Appendix S1.
***$p < .01$; **$p < .05$; *$p < .1$).

TABLE 3. Explaining Monthly Changes in Sovereign Bond Spreads

	(5) Region		*(6) Fitch (Risk Rating)*		*(7) FTSE*		*(8) MSCI*	
DV: Monthly ΔSpread	*Coef.*	*SE*	*Coef.*	*SE*	*Coef.*	*SE*	*Coef.*	*SE*
Spread								
t−1	−0.122***	0.017	−0.129***	0.015	−0.108***	0.014	−0.101***	0.016
Peer diffusion								
Peer Spread								
t−1	0.056***	0.019	0.052***	0.018	0.008	0.021	0.016	0.022
Δ	0.492***	0.045	0.118***	0.022	0.330***	0.068	0.343***	0.048
Categories' direct effect								
Category								
t−1	–	–	8.495	6.075	0.459	2.604	−69.661*	38.010
Δ	–	–	7.022	9.664	−16.145***	4.727	−293.124***	112.390
Domestic politics and economy								
Debt								
t−1	0.288	0.238	0.505**	0.231	0.147	0.395	0.300	0.423
Budget balance								
t−1	−0.738	1.017	−0.677	0.963	−0.877	0.934	−1.107	1.029
Current account balance								
t−1	−0.096	0.597	−0.424	0.572	−0.192	0.630	−0.936	0.694
Inflation								
t−1	1.100	0.861	0.537	0.822	0.010	0.871	0.147	0.944
GDP per capita								
t−1	0.026**	0.013	0.019	0.015	0.028**	0.011	0.021	0.013
KA open								
t−1	−3.834	4.170	−5.902	3.907	−4.891	4.524	−8.141	5.131
FX rate								
t−1	423.703***	92.772	405.327***	80.043	396.472***	75.466	391.487***	84.073
Δ	7.831	63.174	52.077	56.076	65.519	53.593	40.872	58.096
Democracy								
t−1	4.745*	2.680	1.881	2.475	1.825	1.743	6.596***	1.975
Months to Election								
t−1	−0.016	0.092	0.067	0.085	0.085	0.079	0.055	0.091
Common shocks								
US Prime Rate								
t−1	0.001	1.237	−1.247	1.167	−2.719**	1.242	−1.414	1.397
Δ	−8.785	9.612	−14.021	9.080	−18.168*	9.654	−15.345	10.361
US stock market								
t−1	−1.844***	0.703	−3.742***	0.663	−2.300***	0.770	−1.933**	0.789
Δ	0.585	0.375	0.696*	0.369	0.464	0.369	0.451	0.397
Invest. grade yield								
t−1	10.286*	5.937	13.454**	5.717	12.279**	6.014	15.440**	6.008
High yield								
t−1	5.700	4.498	12.633***	4.352	12.254***	4.604	14.447***	4.533
Treasury yield								
t−1	−3.146	8.900	−3.058	8.727	−6.348	8.456	−6.166	9.133
Volatility Premium								
t−1	−0.021	0.352	−0.548	0.339	−0.161	0.349	−0.143	0.355
Equity premium								
t−1	−2001.165***	684.621	−3003.013***	637.776	−2409.243***	602.452	−2165.226***	661.678
Term premium								
t−1	−0.446	1.954	−1.548	1.941	−0.473	1.940	−0.370	2.050
Stock flows								
t−1	−75.523**	31.015	−105.992***	29.503	−88.432***	30.169	−99.549***	33.008
Δ	−9.290	20.898	−16.548	20.101	9.496	20.475	3.988	21.805
Bond flows								
t−1	−0.000	0.000	−0.000**	0.000	−0.000	0.000	−0.000*	0.000
Δ	−0.000	0.000	−0.000	0.000	−0.000	0.000	−0.000	0.000
Energy index								
t−1	−0.185**	0.077	−0.222***	0.070	−0.207***	0.072	−0.217***	0.076
Time	−0.150	0.168	0.052	0.158	−0.132	0.210	0.067	0.198
Constant	2.636	22.365	−92.540	48.837	−35.713	44.449	−3.795	59.086
N	940		1022		911		959	
Wald χ^2	771.753		754.730		877.219		777.530	
Prob > χ^2	0		0		0		0	

(Notes:. FGLS error correction model of monthly changes in sovereign bond spreads.
Estimates of country fixed effects not shown in table for ease of presentation; available upon request.
Countries included in the analysis are listed in the Appendix S1.
***$p < .01$; **$p < .05$; *$p < .1$).

lagged annual levels, rather than changes, for the political and other variables for which we do not have monthly data.

As discussed above, higher CDS contract prices indicate a greater perceived risk of default. The monthly prices on 5-years sovereign credit default swaps, also referred to as a spread, are measured in basis points (Longstaff et al. 2011). The analysis of these monthly data provides support for our hypothesis of interdependence among sovereign risk premiums for three of the four country categorizations we examine. The first thing we observe in Table 2 is that the error correction process in CDS markets operates on a different temporality than does that of the secondary market for sovereign debt. Looking at Model 2, where *Fitch Risk Ratings* categorize countries, we find that monthly changes in the CDS prices of countries of a common risk rating, be it AAA, BB, or C, bring significant short-term changes in the same direction for the reference country. Short-term shifts in the CDS spread for credit-rating peers bring an immediate 0.07-basis-point increase in CDS spreads. The coefficient on the lagged dependent variable indicates, moreover, that the impact of short-term changes in CDS prices among peers is quite persistent: After 1 month, only 13% of that increase has been corrected, and 5 months later, fully half of the increase remains. Indeed, it takes a full year for 96% of the error correction—the impact of the short-term change in the CDS prices of other countries in the same sovereign risk category—to occur. Peer effects thus are felt quite immediately in derivatives markets where investors purchase insurance against sovereign default, but they also dissipate relatively quickly among countries of a similar risk rating. What remains to assess in future research, and perhaps using interviews with professional investors as well as analysis of daily data for specific countries—is whether such co-movements are distributed equally across sovereign risk groups. For instance, are AAA countries subject to the same interdependence as BB or CCC countries might be?

The analysis in Table 2 also reveals that, for monthly CDS spreads, other peer categories do not significantly affect the equilibrium (long-term) CDS price relationships. Rather, CDS market prices for countries of the same region and the same MSCI category are subject to short-term contagion (models 1 and 4). These prices also do not move together in equilibrium, suggesting a rather myopic nature of derivatives markets where the price of insurance to hedge default risk in one country is affected only in the short term by corresponding fears of default in other peer countries.

The CDS contract represents a unique, albeit important, species of sovereign risk indicator; while it captures market actors' assessment of default risk, it does not directly tell us about peer effects on governments' cost of borrowing. To assess the robustness of these findings using an alternative indicator of sovereign risk, we next examine monthly sovereign debt spreads for emerging market debt. In Table 3, we use monthly stripped bond spreads from the EMBI Global data set (*Spreads*) as our dependent variable. In this case, the results of the ECM analysis of monthly spreads reveal important *long-term* relationships, as well as short-term contagion among the sovereign bond spreads of countries of a common credit rating (model 6). We also find long-term and short-term ties among the spreads for countries within the same geographic region (model 5). Moreover, among the FTSE and MSCI categories (models 7 and 8), there is evidence only of short-term contagion in the spreads for countries within these market development categorizations.

Model 5 in Table 3 includes geographic peer groupings *(Region)* as a measure of risk interdependence. The analysis again supports our expectation of interdependence: There is a significant long-term correlation among the sovereign risk spreads for countries of the same geographic region. For every basis point increase in the average of regional peer spreads, a government's spread increases by 0.46 basis points ($\beta_j/\text{-}\phi$). And where there is a one-off monthly rise in the average regional peer spread, an attendant increase of 0.49 basis points occurs. The impact of such short-run changes is again quite salient: Only 12 percent of that departure from the equilibrium, or "error," is corrected by the next month. After 3 months, 68% of the interdependent movement in the country's spread remains. After 5 months, more than half of the impact has dissipated. After 12 months, all but 22 percent of the long-term trend has been restored.

Turning to the second specification reported in Table 3 (model 6), we again find significant long- and short-term effects of credit-rating peers (Fitch Risk Rating). Again, there is a positive equilibrium relationship in which each one point increase in the average risk peer spread is associated with a 0.40-basis-point increase in the reference government's spread. As with geographic peer diffusion, short-term changes also bring significant and rather persistent movements in the equilibrium relationship; a one point rise in the average spread of countries in the same risk category brings a 0.12 increase in the government spreads, 87% of which is still present in the country's own spread a month later, and 19% of which remains after a year.

Given the dynamic nature of ECMs, we follow the advice in Williams and Whitten (2012) and plot the dynamic effects of the peer-group diffusion variables. We simulate the effect on a given country's risk premium of a 50-basis-point (0.5-percentage-point) increase in the CDS prices or bond spreads of its peers. We plot the effect of this hypothetical shock over the course of a 6-month period. The predicted value of the dependent variable at each month is used as the value of the lagged dependent variable for the next month. The results of the simulations are shown in Figures 1 and 2.

To account for the possibility that the results on our categorical variables might directly affect CDS prices and bond spreads—for instance, that countries in the "frontier market" group have a higher cost of market access, over and above their economic fundamentals—the models estimated in Tables 2 and 3 also include a direct measure of the categorical variable.[9] None of the models of CDS prices suggest a systematic effect of changes in categories on changes in CDS costs. When we model sovereign spreads, we find short-term effects of changes in categorizations, using the FTSE and MSCI measures; these effects do not, however, eliminate the peer effects that are the main subject of our analyses.

We also find some support for the expectation that more financially open countries (higher *KA Open*), which are at risk of market discipline via capital flight, pay lower

[9] Given that we use ECM analysis, this measure accounts for changes in categorizations, e.g. when a country moves from one sovereign risk category to another. Because the geographic categorization variable does not change over time, we cannot include this categorical measure in our analyses.

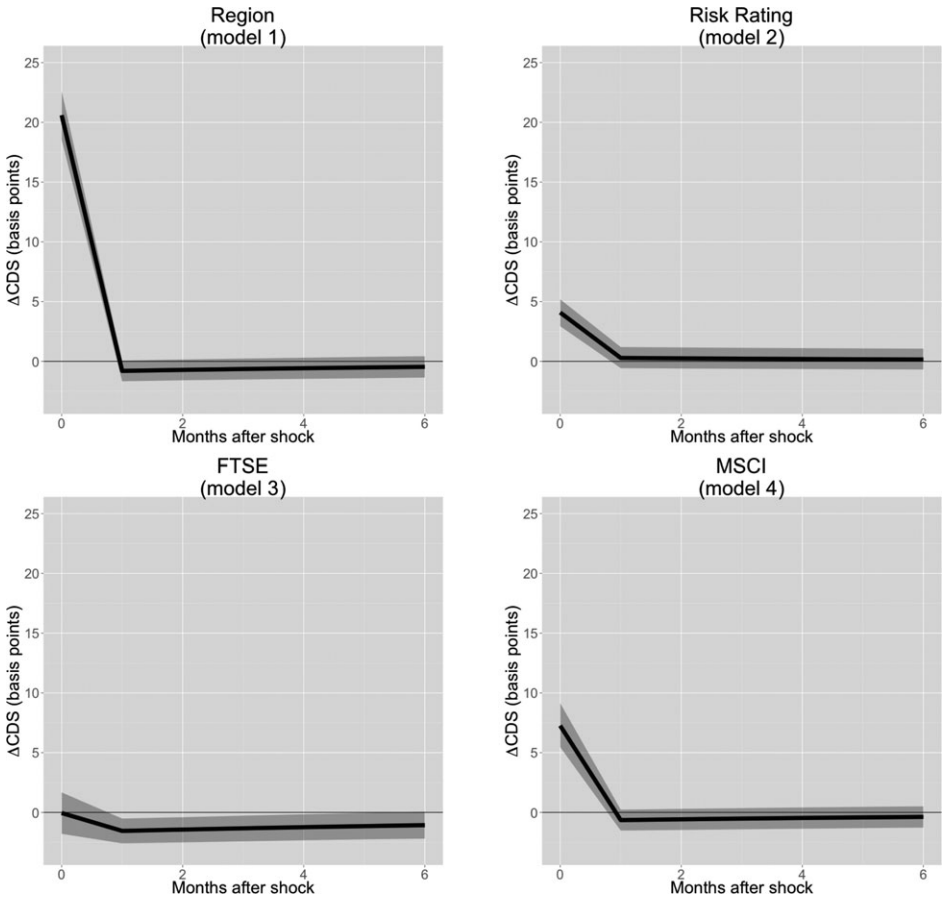

Fig. 1. Dynamic Simulations of Peer-group Diffusion Effects on CDS Prices (Based on Results Reported in Table 2). (*Note:* Predicted values and confidence intervals were obtained using the simulation method proposed by King et al. (2000).)

interest rates (Bartolini and Drazen 1997), in both the short and long term. This effect is significant in the equilibrium, lagged variable, for three of the four specifications. The monthly analysis does not include short-term changes in many of the political and some of the macroeconomic variables (available only in annual time series), and thus, the analysis cannot control for short-term changes in political variables. We examine such annual changes in political variables in our annual analyses of these data, reported in the Appendix S1. Where long-term equilibrium trends in our political variables are concerned, we find that more democratic countries have higher bond spreads. This result suggests that, far from being rewarded by international investors, democracy may introduce higher levels of uncertainty and pressures for potentially risky public spending that increase the cost of sovereign borrowing. Specifically, we see in the first and fourth specifications that a unit increase in the *Polity* score is associated with a 4.7- and 5.9-basis-point higher risk spread, respectively (also see Saiegh 2005). We only observe partisan effects in specification 2, where left governments are associated with a more than 100-basis-point higher spread than center governments, all else being equal. This result is consistent with prior research that has found that market actors may respond less favorably to left-leaning governments (for example, Bernhard and Leblang 2002; Vaaler et al. 2006).

The empirical analyses thus have tested our main hypothesis that there is significant interdependence in the ways that markets assess the riskiness of sovereign borrowers. We find evidence of significant short- and long-term ties among the bond spreads (EMBI) for sovereign borrowers in the same region and risk categories, as well as short-term correlations among CDS spreads for various peer groups. In addition, the analysis reveals significant short-term ties among the bond prices for sovereign borrowers in the same market development categories, all else being equal. We have estimated the magnitude and persistence of short-term changes that alter these equilibrium relationships, which vary significantly across types of peer groupings, net of common global trends and domestic political economies. Overall, we see that even as contagion within derivatives markets is constrained to primarily short-term effects, the price of sovereign government borrowing, as indicated in secondary market spreads, is altered powerfully by interdependence and thus is not entirely "sovereign" even in the long term.

Conclusion

"Spain is not Greece" might appear an all-too-obvious statement for the Spanish Finance Minister to make. But in the midst of the Eurozone crisis of 2010, it was not just Spain's Finance Minister, but also officials from Portugal, Ireland, Italy, and Greece who took pains to distinguish themselves from the other crisis-ridden, peripheral European "PIIGS" countries. And for good reason, Although

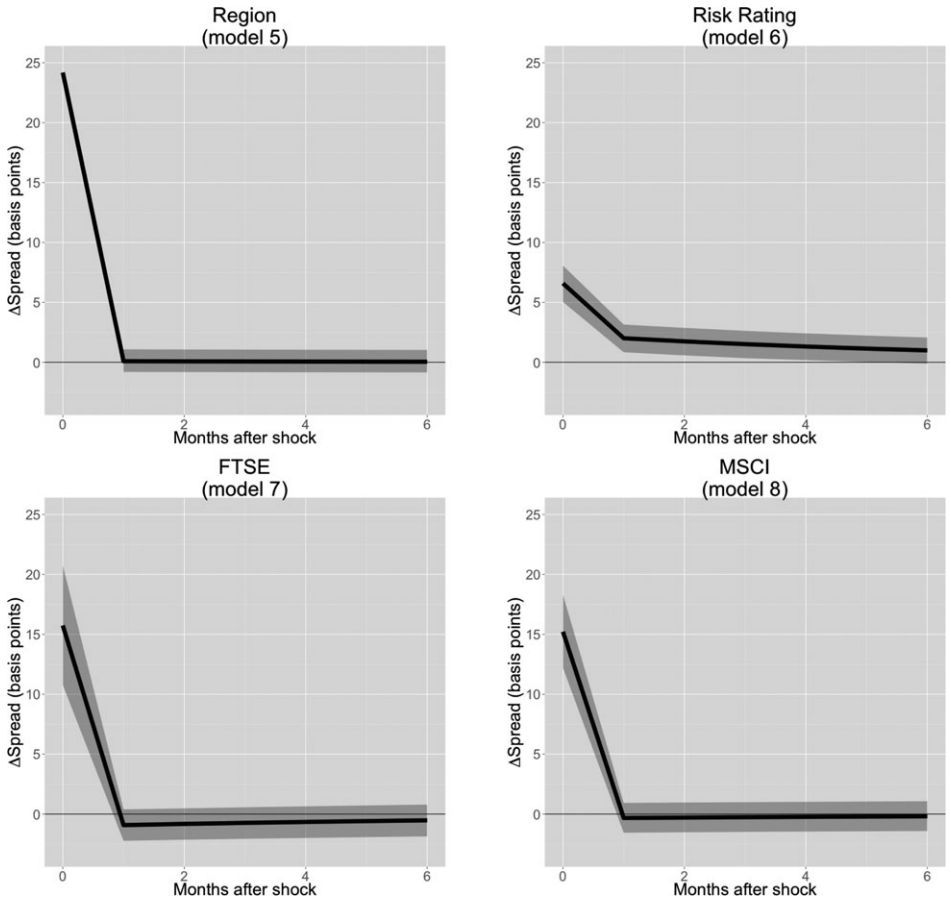

Fig. 2. Dynamic Simulations of Peer-group Diffusion Effects on Sovereign Spreads (Based on Results Reported in Table 3). (*Note:* Predicted values and confidence intervals were obtained using the simulation method proposed by King et al. (2000).)

many of the PIIGS country crises were quite different in their causes and character, investors had placed them into the same heuristic group. This placement facilitated the contagion of market sell-offs of sovereign debt from Greece to the remainder of the European periphery. Governments thus sought to convince investors that, in fact, their categorization was an inaccurate means to assess sovereign creditworthiness.

We have argued that, to understand professional investors' assessments of sovereign risks in situations such as the Eurozone crisis—and also in more normal periods of market operation—we must account for the tendency of market actors to rely on heuristic devices such as country categorizations. These categories provide a shortcut to ease the task of information processing, but they also generate allocative inefficiencies and contagion beyond the level that may be predicted by economic fundamentals.

Our study adds to a body of scholarship that has typically examined the government–financial market relationship for any given country in relative isolation from corresponding relationships abroad. When other nations are considered, it is in the context of common global shocks, such as when global liquidity declines, or when a financial crisis in one nation or region prompts capital flight in other nations or regions. What is missing from these analyses is attention to how market conditions might be transmitted—for better or worse—across sovereign borrowers, via the evaluation of other countries to which the reference government is compared, and how this transmission can serve to further undermine (in the case of the transmission of higher premiums) or enhance (with transmission of lower interest rates) governments' room for maneuver, in crisis as well as non-crisis periods.

Our analyses illustrate that a theoretically and empirically significant element of interdependence among nations has thus far been overlooked. Controlling for the effects of global shocks and domestic fundamentals, market assessments of sovereign risk in "similar" countries alter risk assessments both in moments of crisis and over the longer run. Sovereign credit risk is therefore not entirely sovereign. Instead, it depends on the credit risk of—and, ultimately, the policies of—countries with which a sovereign borrower is categorized. Future research in this vein might consider the effect of investors' peer categorizations on different types of capital flows, such as foreign direct investment, as well as probe the individual-level behaviors—using a survey experiment design, for instance (for example, Gray and Hicks 2014)—which underlie the macro-level significance of country categorizations. Another task for future research is to understand more clearly both the origin and implications of these cognitive shortcuts—the country categorization rubrics employed by investors. Doing so will offer important lessons for the study not only of international capital markets, but also for understanding the evolving nature of private governance and the role of ideas in international political economy.

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Supporting Information

Additional Supporting Information may be found in the online version of this article:

Appendix S1. Data Appendix.