

A COMPLEX POLITICAL ECONOMY OF THE GLOBAL BANKING SYSTEM

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ABSTRACT

WILLIAM KINDRED WINECOFF: A Complex Political Economy of the Global Banking System.

(Under the direction of Thomas Oatley)

The global financial crisis which began in 2007 is the most severe economic event since the 1930s. The profound political and economic consequences of the crisis have clarified the need to better understand the financial system at both micro and macro levels. This dissertation advances research on both fronts. First, it utilizes network prominence measures to look at the pre- and post-crisis organization of the global banking system, finding that American prestige has increased as a result of the crisis. Second, it employs complex network theory and inferential statistical models to explain why the global banking system is organized as it is, finding that endogenous processes interact with monadic and dyadic political economy variables to produce a global structure. Third, it examines bank behaviors at the firm level, demonstrates that representative agent models are insufficient for explaining the patterns observed, proposes an alternative approach drawing from ecological finance theory, tests the model using Bayesian regression, and finds support for the new approach. In sum, this dissertation demonstrates the need for further quantitative political economy work at both the micro and macro levels of the global financial system and provides several possible pathways forward.

For Ruth.

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1 FINANCIAL POWER AND THE GLOBAL CRISIS

1.1 Introduction

The global financial crisis which began in 2007 was widely expected to weaken U.S. hegemony. Nearly every possible configuration of the future of world politics has been proposed as likely to emerge from the crisis: apolarity, region-based multipolarity, a hegemonic shift to China, institutional multilateralism, a fragmentation of multilateral institutions, the end of the nation-state as the relevant unit of analysis, the end of capitalism, the end of democracy, the creation of Bretton Woods III, a reversion to Bretton Woods I, and more. These conversations convey the sense that there should be *some* significant change resulting from the largest financial crisis since the previous period of hegemonic transition. These accounts shared a premise if not a conclusion: the Anglo-American model of finance capitalism has been discredited. The crisis has been compared to the end of the Cold War (Cohen 2009*b*) and has been called a “transformative moment” (Reinhart and Rogoff 2009, 208); there was a palpable sense that an epochal shift was underway. How could it not be?

Despite such speculation there has been surprisingly little empirical analysis of the ways in which the global financial system has changed since the crisis. This is of vital importance to post-crisis conversation on the distribution of power in the global economy, but to this point most analyses have focused on the effects of the crisis on attributes of individual countries (e.g. inequality or debt in the United States, growth in China), regional integration efforts (e.g. strains within the European Union), institutional reform (voting shares in the IMF, shift in economic governance from the G7 to the G20), or regulatory reforms at the national and international levels. Each of these political economy processes has been powerfully impacted by the spread of the crisis through global markets in ways which are

conditioned by linkages in the global economy; none of them is fully understandable without reference to the complex interdependencies in the world economy from which power is constructed. The fact that post-crisis speculation has out-paced empirical analysis indicates that the pre-crisis observation of Cohen (2000) may be accurate:

Theory calls for a reasonably parsimonious and well specified set of propositions about behavior - statements that are both logically true and, at least in principle, empirically falsifiable. In that sense no true theory of monetary power may be said, as yet, to exist.

The same is true of financial power more generally. The geopolitical importance of financial power is well-demonstrated. Financial power is inextricably linked with hegemonic projects (Sobel 2012), restricts the ability of states to wage war in some instances (Kirschner 2007), and in others provides opportunities for war-making without resolving domestic political disagreements over how to pay for them (Oatley 2013). Yet financial power is more often recognized than measured. Contrary to previous conceptualizations of financial power imported from bargaining theory (Drezner 2007), I argue that financial power arises from prominence within market structures which perform in non-monotonic ways. Unlike earlier intuitive conceptualizations of structural power (Strange 1987), I provide measures of prominence which are employed to show that the global banking system was affected by the crisis in several ways. First, overall cross-national connectivity initially declined as the crisis began and spread. In this way, comparisons to the 1930s crisis and global depression were apt. Unlike the 1930s, however, this deterioration in connectivity was temporary rather than persistent: since 2009 the system has been reinforced rather than fragmenting further. Second, unlike the 1930s, the position of the most prominent country – the United Kingdom then, the United States now – at the core of this system has *increased* as a result of the crisis by some measures, and remained constant by others. The United Kingdom has remained secondarily prominent since 2009, while continental Europe has

generally declined and the so-called BRICS – Brazil, Russia, India, China, South Africa – have remained quite peripheral. No other countries have increased in prominence as a result of the crisis. Some others, including tax havens, have fallen in importance.

This outcome was generally not anticipated either before the crisis or after it. But quite early on, it was possible to notice that in some key ways this time *was* different. As a recent review of the literature noted:

In most emerging-market countries over the previous two decades, the bursting of domestic financial bubbles was accompanied by capital flight, which only exacerbated these countries financial crises by generating exchange rate depreciation and higher interest rates. But foreign funding of the United States – both public and private – continued during the crisis, even as the United States lowered interest rates dramatically. Indeed, the dollar even strengthened as the crisis became more severe after mid-2008. ... IPE scholars have not yet produced detailed explanations for the foreign support provided during the crisis. ... But it seems very likely that one of the most important explanations was the structural position of the United States in global financial markets. Despite the enormity of the U.S. financial troubles at the time, the U.S. Treasury bill remained the investment of choice for financial institutions and investors scrambling for liquidity and security in the midst of the panic (Helleiner 2011, 81).

It is not just emerging economies which faced capital flight during this crisis. A number of OECD countries did as well, among them Iceland, Ireland, Greece, and Spain. Germany and France were net exporters of banking finance before the crisis, and the United Kingdom switched from being a net recipient to a net sender. But despite suffering the worst internal financial crisis since the 1930s, flight from the United States was moderate and temporary. Moreover the phenomenon was not limited to Treasury bills. Thus, faced with a similar

situation – a domestic banking crisis – some countries experienced capital outflows while others experienced capital inflows. As Helleiner notes, an approach which focuses on the internal attributes of states has difficulty explaining this outcome. Nevertheless, it has major implications for the future performance of the global banking system, and in particular the ways in which power is distributed within it. Prior theory in international political economy, which has primarily focused on the internal attributes of states as being the primary determinants of capital flows, have difficulty accounting for these divergent outcomes (Cohen 2009*b*; Oatley 2011).

This realization is reflected in the policymaking community. The shift in focus among regulators from “too big to fail” (TBTF) financial institutions to “systemically important financial institutions” (SIFI) is revealing: TBTF considers internal characteristics, while SIFI places the emphasis on positions within structures. While the two may correlate they are conceptually distinct. This change in thinking took hold quite suddenly during and after the crisis. The report to the G7 of the Financial Stability Forum on April 7, 2008 contained no mention of “systemically important” institutions, and indicated that risk in the global financial system was concentrated in the largest firms that operated cross-nationally (Financial Stability Forum 2008).¹ Seven months later, following the collapse of Lehman Brothers, the first meeting of the Group of 20 (2008) tasked their finance ministers with “defining the scope of systemically important institutions and determining their appropriate regulation and oversight”.² Since then, the Basel Committee on Banking Supervision and national regulators have worked to define SIFI by firms’ positions within the structure of the global financial system in addition to traditional criteria such as size (Bank for International Settlements 2011; Price and Walter 2011).

¹The section of interest in the Financial Stability Forum report is VI.10, p. 52.

²Point 10.

SIFI are more important than other firms, even other large firms, because their prominent position within financial markets gives them influence which is both broad and deep. There is an increasing awareness among policymakers that these positions confer political power. Shortly after leaving her post as Director of Policy Planning for the U.S. State Department, Anne-Marie Slaughter made explicit the argument that the U.S.'s role in the world is determined by its position within a network structure:

For the next decade, the United States should pursue of a grand strategy of network centrality. The most important shift for America is not the rise of China and the realignment of power in the international system, but rather the ubiquity and density of global networks. Existing grand strategies – such as primacy, containment, offshore balancing, isolationism, selective engagement and order building – assume a world of states acting essentially as unitary actors with defined military, economic, and diplomatic strategies. ... However, even if [states] are the principal actors in the international system, they now act side by side with many types of social actors who are able to come together and act independently on the world stage. The resulting [network] system is messy, complex, and frustrating. Yet wishing for a simpler world will not make it so. (Slaughter 2012, 45)

Among these “types of social actors” are financial institutions. Slaughter is arguing that the U.S. should exploit as strategy the position of the U.S. at the core of the global economy, as this confers distinct geopolitical advantages beyond the U.S.'s internal material capabilities. A corollary is that each country's position within this structure conditions outcomes and opportunities for that country. As the recent crisis demonstrated, the organization of the entire system is a meaningful variable which powerfully impacts interactions and interdependencies among countries.

This mode of thinking is not entirely new to studies of power within the global economy. Applications of network theory in international relations go back at least to Hart (1974). Knoke and Burt (1983) and Knoke (1990) defined power in terms of prominence within networks, although the networks they analyzed were not complex. The complex interdependence tradition often used network logics if not network empirics, and following Susan Strange the British school of IPE frequently considered power to be at least partially determined by structural position (Strange 1982, 1987, 1998). But conceptualizations of power which employ network theory and quantitative methodologies are far from the norm in contemporary international political economy.

Nor has the awareness of the importance of structure percolated far into contemporary theories of interdependence, which are often presented in terms of diffusion which operate at the dyad-level. Diffusion is only one dynamic process of interdependence, and it does not involve the overall structure of relationships as being a meaningful condition. Similarly, very little work has considered structural dynamics as something that can be theorized systematically and measured empirically (Cohen 2000). This is of particular concern in the study of power in global banking (Cohen 2009b; Keohane 2009). A conceptualization of structural power that is operationalized in terms of complex networks offers avenues for the development of such a theory and the tools for an empirical examination of it.

I focus on two general types of structural power – prestige and centrality – which are in some ways analogous to “sensitivity” and “vulnerability” in theories of complex interdependence (Keohane and Nye Jr. 1973). I offer several measures of each which contain distinct properties. While I apply this framework to the global banking system, I suggest that it may be useful in analyses of power in systems of security, production and exchange, and information and knowledge. I use the recent global financial crisis to consider how a complex network approach can help us understand developments within this system which were not expected *ex ante* in a theoretically coherent and empirically sound manner. These

results suggest that the hegemonic position of the United States has not disappeared as a result of the crisis, at least in banking, contrary to the expectations of many, because of processes which have previously been identified by network scientists but have not yet been appreciated by political economists.

So a complex network conceptualization of power is not merely orthogonal with prior conceptualizations of the global system. There are several advantages which come with the network approach. Among them are a wide range of statistical measures with known properties in complex systems. Another is a scientific expectation of future performance of the system which draws from a large literature studying social processes in other disciplines. That is, a complex network conceptualization of the global banking system not only allows us to measure key features of the power distribution in that system empirically, but to infer the likely patterns of future relationships from the distribution of prior relationships. Thus, complex network theory and methods offer important additions to existing explanations of power dynamics, which are generally constructed *post hoc*.

This paper presents a theory of power as stemming from prominence within interdependent markets; defines particular forms of this power with substantive value for scholars and policymakers; develops a taxonomy by which states may be considered as core or peripheral, bridges or prestigious, insiders or outsiders; and provides measures of each. It applies this conceptualization to the global banking system pre- and post-crisis, and shows how the crisis affected the global banking system, emphasizing the ways in which change (or no change) could have been anticipated by this approach but not prior approaches. As such, I show how a power-based approach which emphasizes prominence within networks fulfills the theoretical demands of Cohen (2000) in a way which lends itself to quantitative analysis.

1.2 Global Banking as a Complex Network

The global banking system is comprised of a set of contractual relationships which exists across national boundaries. Taken together, these relationships can be conceptualized as a network in which individual units (i.e. nodes) are connected via financial obligations (i.e. ties) to other units. The units, in turn, can be conceptualized as individual investors or firms, or as aggregated units such as national banking sectors. The connection of the system of nodes and the relationships between them constitute a single entity whose outcomes are considered at the level of the network rather than the node or dyad. Thus, in a network context, the unit of analysis is the system itself rather than any particular component which exists within it such as a national economy or firm.³

Networks are often described in terms of the distribution of ties linking nodes.⁴ These distributions can take many different organizational forms, which are referred to as topologies. Generally, there are two ideal types of networks: those in which the topology is trivial – ties between nodes are formed according to a random process whereby new ties are formed with equal probability – and those in which network topology is non-trivial – ties between nodes are formed partially in response to the endogenous characteristics of the network itself. The former are random, the latter are “complex”. Complex networks are often characterized by a heavy tail in the distribution of link between nodes, assortative mixing between nodes, the formation of communities within the network, and (often) a clearly hierarchical structure. Almost all real-world networks are complex. As we will see, so is the global banking system.

The topology of the network matters. Networks behave differently under different probability distributions of tie-formation: if the topology is trivial, nodes will attract links with

³In this context “system” is not meant to bring to mind billiard balls and functionally undifferentiated bargaining units concerned with relative and/or absolute gains. It is meant to connote a structure of interdependence which encompasses the global economy: a complex adaptive system with a non-trivial topology (Oatley, Winecoff, Danzman, and Pennock 2013).

⁴“Ties” may also be referred to as “links” or, depending on the context, as “edges” or “arcs”.

equiprobability; if the topology is non-trivial, some nodes will attract links with a higher probability than others. This probability may be related to some inherent trait possessed by some nodes, or it may relate to properties of the network structure. In finance, consider two decision rules for portfolio allocation. In the first, investors determine which firms to invest with by following the advice of economist Burton Malkiel in his famous book *A Random Walk Down Wall Street*: with efficient markets, the performance of all firms will be the same in expectation. Given that, a portfolio allocation rule which collects some monkeys, blindfolds them, has them throw darts at a board listing financial institutions, and allocates money according to where the darts land is as good as any other *ex ante* (and possibly better than most) (Malkiel 1973). As many monkeys throw many darts many times, the distribution of financial ties will converge to the Gaussian normal distribution: few firms will have very large or very small numbers of clients, and the mean and median number of ties will be equivalent.

Under a different portfolio allocation decision rule, firms are treated as units whose expected investment return is partially a function of internal fitness and partially a function of the connections that firm has to other actors (Barabási and Albert 1999; Bianconi and Barabási 2001). The attractiveness of Goldman Sachs as a counterparty may have something to do with its particular skill at investing, but it also involves the fact that Goldman Sachs has strong relationships with many other actors in the financial, business, and government sectors: it is prominent in the financial system. So Goldman Sachs attracts new business because it previously attracted business, and as this dynamic reinforces itself over time the distribution of ties between nodes in the financial system will be skewed and have a heavy tail: some (like Goldman Sachs) will attract a large number of ties while most attract very few; the mean will be much larger than the median (Newman 2005). As new ties are formed the network will not only become more densely connected but will also cluster around a small number nodes.

Whether the distribution of ties is distributed in a way which more closely resembles a normal or skewed probability distribution is important on its own, but it also has implications for the development, evolution, and stability of the network. In random networks information, viruses, financial crises, or other “shocks” will impact every node with roughly equal probability as they diffuse through the system. In a complex network this is not the case: the probability of contagion – or any other process involving interdependence – varies by whether a node is in the core or periphery.⁵ As such, an understanding of the empirical reality of the global banking system is a prerequisite for building theory, locating puzzles, and understanding the system.

1.3 Power As Prominence: Centrality and Prestige

Networks are generally described in terms of the amount and distribution of connectivity. These two criteria allow us to consider structural features of the total network as well as the relative importance of particular nodes within that structure. Each of these features has substantive importance for the behavior of the network. In this section I describe the network of global banking relationships from before and after the crisis, focusing first on the network at an aggregate level before shifting to an analysis of the distribution of ties between nodes. The underlying data come from the Bank for International Settlements’ consolidated banking statistics on an immediate borrower basis.⁶ The network is “egocentric”, meaning that full information is available for only a subset of nodes. In this case, the

⁵For more discussion on this point see Oatley et al. (2013).

⁶In an online appendix I also report the results for the same banking statistics on an ultimate risk basis, which distinguishes between the host country of a financial institution and its home country. The difference between the two is most noticeable when considering the role of off-shore financial havens: in the immediate borrower statistics, cross-national holdings of an American bank in a subsidiary in the Cayman Islands would be classified as a tie from the United States to the Cayman Islands; in the ultimate risk basis it would not be, as the terminal liability remains in the United States. As a result, the immediate borrower data tend to overstate the importance of tax havens and understate the importance of “true” financial centers. The overall distribution of the network is similar in both data sets, but for the sake of conservatism I employ the immediate borrower data in the text and report the ultimate risk data in the appendix. Additionally, the appendix reports a full time series of all measures for both data types, from 1999-2012 using the data on an immediate borrower basis and from 2005-2012 on an ultimate risk basis.

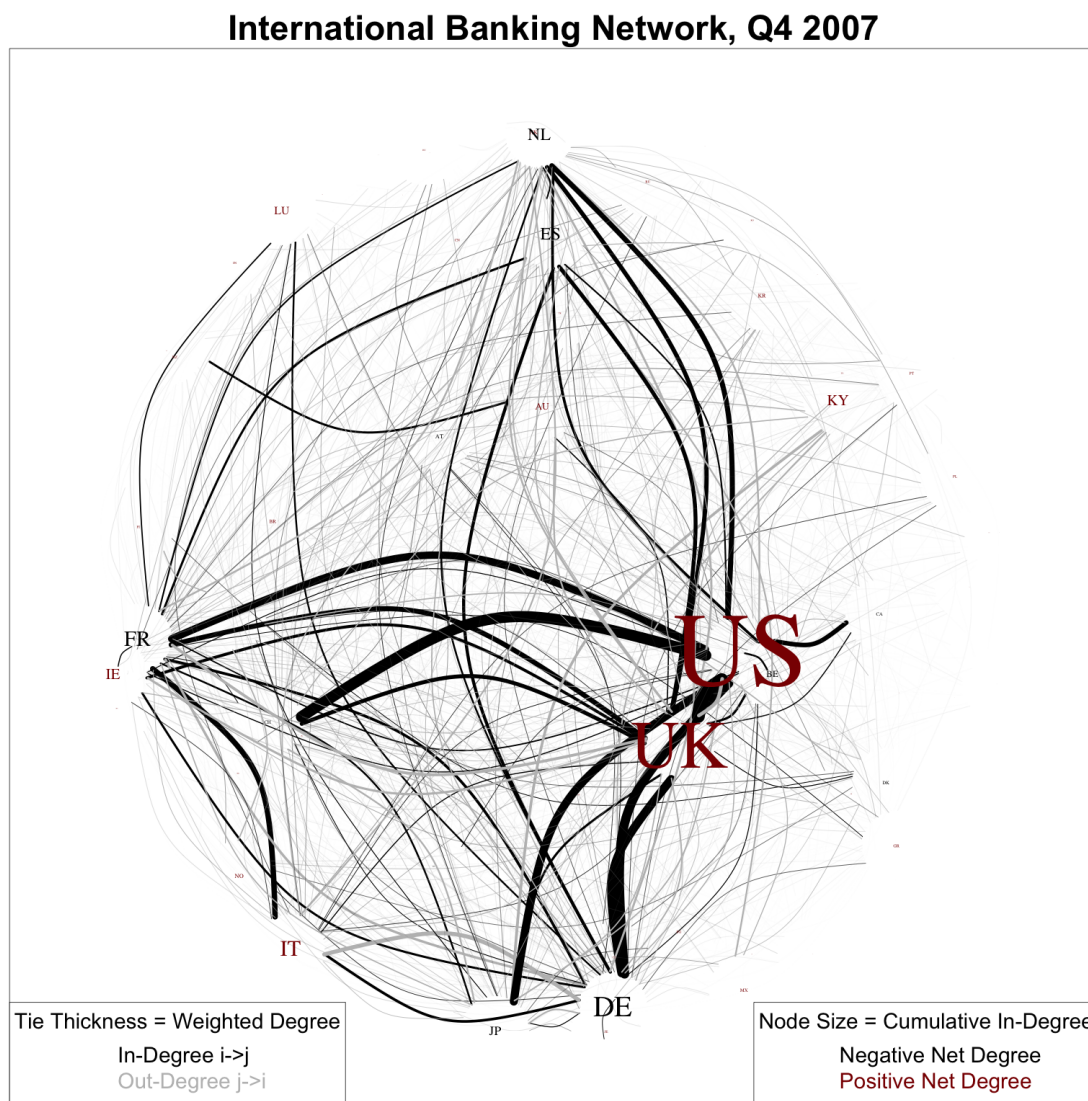


Figure 1.1: A depiction of the global banking network in the fourth quarter of 2007, before the global financial crisis. The spherical layout exists in three dimensions, with nodes spaced equidistantly around the surface of the sphere.

International Banking Network, Q3 2012

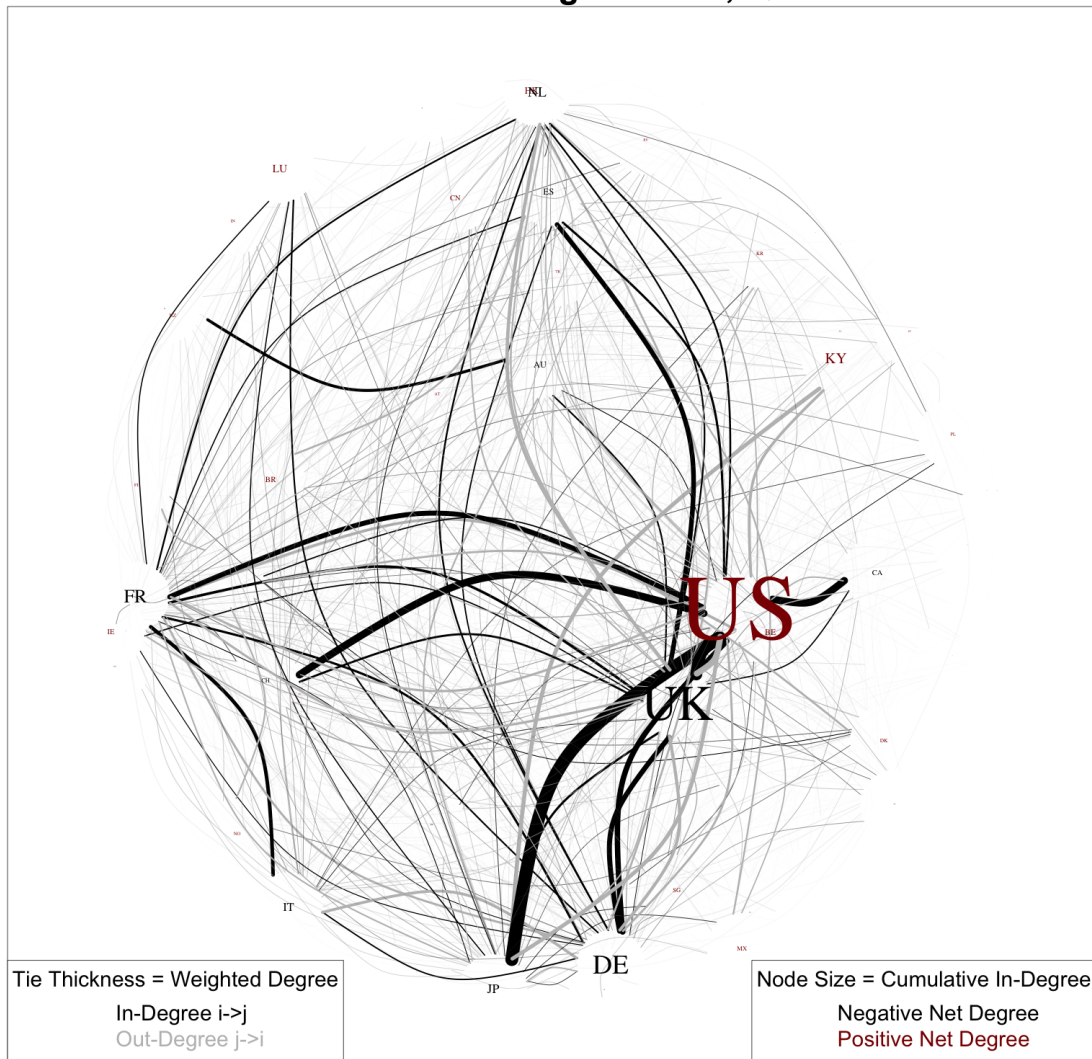


Figure 1.2: A depiction of the global banking network in the third quarter of 2012. The spherical layout exists in three dimensions, with nodes spaced equidistantly around the surface of the sphere. The most significant changes from the crisis include the weakening of European prominence, and the switch of the U.K. from net receiver to net sender of bank assets.

data-collecting process involved surveying “egos” (roughly two dozen leading economies) regarding their connections to “alters” (every other economy in the world), but the reciprocal information was not collected. There are methods for correcting the potential bias which could result from this, but for now it is simply worth pointing out that any problems with the egocentric nature of these data will tend to under-emphasize the importance of financial centers, especially those which attract many in-links from diverse sources.

Figure 1.1 presents a snapshot of the global banking network before the global financial crisis, while Figure 1.2 reports the same network in the most recent period for which data are available. The nodes are national financial systems, which form ties when banks in one jurisdiction have claims on banks in another jurisdiction.⁷ The ties are directed – assets owned by country i that are held in country j generates one weighted tie while links from country j to country i generates a separate weighted tie – while the width of each tie is proportional to the amount (in U.S. dollars) of the ties connecting the two nodes. The nodes are arranged uniformly (in alphabetical order) on the surface of a sphere; thus, this layout portrays the network in three dimensions.⁸ The size of nodes are the summation of all of the ties connecting to that node. The color of node indicates whether the node has more in-links than out-links (red) or the opposite (black). The size of the edges indicate the strength of the relationship between two nodes.

From a glance at this visualization we can see the importance of the United States (and, to a lesser extent, the United Kingdom) in the global banking system was not much diminished by the crisis. Those two countries have far more cross-national banking ties

⁷This network therefore depicts stocks of assets, not flows.

⁸Force-directed layout algorithms, such as that proposed by Fruchterman and Reingold, are often not visually appealing for directed networks with weighted edges and a large number of nodes. A circle layout, in which nodes are arranged equidistantly in a two-dimensional space, also makes visualizations of networks with a large number of nodes difficult, as nodes tend to be “stacked” on top of each other. The sphere layout used here helps correct both problems by allowing us to see “through” the network. For the same reason, however, it may be difficult to spot nodes and connections that are not at the front of the sphere. In the online appendix I present several alternate layouts, including a two-dimensional circle as well as force-directed visualizations in which the network has been dichotomized according to various thresholds.

than any others, and this is not proportional to simple differences in size of the national economy. Most countries are so peripheral that they are not even visible. Moreover, the United States has been a net host for foreign bank holdings during the entire period under observation; all of the other important nodes are net senders.⁹ In short, the United States is the world's banker: a tremendous proportion of overall network activity can be described as the rest of the network being organized around depositing assets into U.S. banks.¹⁰ In some ways, as described below, the status of the U.S. as the global banker has been enhanced by the crisis.

Although these are merely snapshots, they already reveal the extent to which the crisis presented less of a transformation than many expected: there was little fundamental reorganization of the network. From this, we might conclude as Oatley et al. (2013) did that the U.S. is likely to remain in possession of the bulk of structural power in global banking. But we can go much further by calculating statistics which describe key features of the network, and linking them to conceptions of power within systems. In particular, we can isolate different forms of power which arise from structural positions within the network. These, in turn, follow from the distribution of ties within the network.

Often, we are concerned with the distribution of ties in a network because they constitute outcomes in many static analyses, but also because they function as inputs guiding future tie formation in dynamic networks. The distribution of ties across nodes determines nodes' prominence. A node is prominent if it is conspicuous relative to other nodes. Specifically, I consider the two types of node prominence proposed by Knoke and Burt (1983):

⁹Note that "under observation" here means 1999-2012. The U.K. was a net receiver until the third quarter of 2008, when it became a net sender in response to the global financial crisis. Italy was the most important node (other than the U.S.) that was a net receiver of bank assets until the height of eurozone crisis in the third quarter of 2010. Ireland and the Cayman Islands (abbreviated 'KY' in the graph) were the next most significant recipients prior to the crisis, but both receded after it. In the ultimate risk data the importance of both Ireland and the Cayman Islands is reduced.

¹⁰Prior to the crisis Gourinchas and Rey (2007) characterized the U.S. as the world's venture capitalist, as it borrowed short, lent long, and generated excess returns on its foreign investments.

		In-Links	
		<i>Low</i>	<i>High</i>
Out-Links	<i>High</i>	Central Sender	Core
	<i>Low</i>	Peripheral	Prestigious Receiver

Table 1.1: *A taxonomy of country type, delineated by the distribution of ties in the global banking system.*

centrality and *prestige*.¹¹ In brief, central nodes send many ties while prestigious nodes attract many ties. In this way the direction and intensity of ties connecting nodes is important for theory and inference. If we distinguish between ties a node sends and ties a node receives, we may find large asymmetries. The level of prestige increases as the number of ties a node receives increases. In this way, all prestigious nodes have high prominence on at least one dimension but not all nodes with high prominence are prestigious. The same is true for centrality. We can distinguish between types of nodes according to their position within the structure of the network, as in Table 1.1: those which attract many in-links and send many out-links constitute the core of the network. Those which attract many in-links but send few out-links are prestigious receivers; their mirrored image are central senders. Those who receive few in-links and send few out-links are peripheral nodes.

¹¹This framework was explicitly extended to political networks in Knoke (1990), which indicated that node prominence is related to, and is in fact one conceptualization of, power in the international political economy and other political systems. See pp. 10ff.

Note that different uses of terminology exist in the literature.¹² Some refer to in-links as “prominence” (or “prestige”) and out-links as “influence” (Hanneman and Riddle 2005). In many social systems such a separation may make sense. But in financial systems, different forms of influence come from an ability to attract a large number of in-links and from extending a large number of out-links. Because banks act as intermediaries between savers and borrowers, they must first receive finance before they can lend it out. Thus, a bank’s out-link influence is dependent upon its capacity at persuading savers to entrust their funds to the bank: its in-link influence. This persuasion capacity will vary with the bank’s prior performance in successfully transforming in-links into out-links, from *saver* – *>* *bank* – *>* *borrower* and, eventually, back again. Therefore, I distinguish between types of prominence: the broad influence of prestigious nodes and the narrow influence of central nodes.

Both prestigious and central nodes are prominent in networks. Prominent nodes have the quality of being “in the thick of things” (Freeman 1978, 219). That is, most activity within the network involves them in some way. Prominent positions give the nodes that occupy them power over the broader network such as a capacity to initiate (or curtail) certain types of activities. In informational networks, prominent nodes disproportionately influence the spread of information from one part of the network to other parts. In viral networks, prominent nodes are capable of communicating disease to more victims than peripheral nodes. Destroying the prominent nodes in terrorist networks can fragment the

¹²“Centrality” is a general term, often applied to high rankings on various measures of prominence as in the quote from Anne-Marie Slaughter reproduced above. Most of these were developed in analyses of undirected networks, where a tie connecting i and j is represented by $i - j$ rather than $i - > j$ or $i - < j$. In undirected networks centrality and prominence refer to the same concept. Thus, the literature often does not distinguish between prominence and centrality, and the latter term is more common in these cases. A Google Scholar search for “network centrality” (including quotes) returned 8,870 results on March 2, 2013. Omitting the quotations increased that number to 153,000 results. I use a narrower definition here both for reasons of precision – the global banking system is comprised of directed ties – and also to emphasize that central nodes are less critical than prestigious nodes for some functions in the global banking system.

entire organization, causing it to cease functioning. The collapse of a “systemically important financial institution” (SIFI), and only the collapse of a SIFI, can threaten the collapse of the entire financial system.¹³

The concept of prominence is relatively easily to understand. It simply implies that some nodes are more important than others according to some criterion, and that the importance of these nodes is defined in some manner by its connections with the rest of the network. Because of the importance of prominence, its properties have been extensively studied. In real-world networks, prominent nodes are those which exist at the core of the network structure, such as the hub of a wheel. Most nodes are connected to it and to relatively few other nodes. Scholars in international relations have recently defined power in terms of network prominence (Nexon 2009; Carpenter 2011), sometimes using alternative language to describe the same intuition.¹⁴

But while the general intuition of prominence is easy to grasp, precise operationalizations of the concept beg the question: what trait should “prominence”, as a concept, prioritize? Prominence may be measured by *degree*, which counts up the number of other nodes to which one node is tied. It may operationalized as *strength*, the weight on each of those ties. Since not all ties are equivalent, perhaps we should consider what types of connections nodes have in addition to the amount of connections, thus conceptualizing prominence in terms of *Eigenvector scores*: ties to other high-tie nodes are weighted more heavily than ties to low-tie nodes. Prominence could also refer to the number of paths – linear or geodesic – in which a node is situated *between* two other nodes, which has implications for transmission through networks that the former measures lack, since nodes with high betweenness prominence will serve as bridges connecting various clusters in the

¹³A summary discussion of types of prominence can be found in (Borgatti 2005), although he focuses on unweighted and undirected networks and thus uses the term “centrality” rather than “prominence”.

¹⁴For example, Strange (1987) refers to the “structural power” that states attain by being at the center of the global system, but never explicitly uses network terminology. Oatley et al. (2013) describe prestige in the global banking system but refer to it as “centrality”, following previous literature.

network.

1.4 Degree-Based Measures of Prominence

In network studies, “degree” refers to the number of ties connecting one node to other nodes. A node with high degree prominence is thus in contact with many other nodes. As a result, high-degree nodes have the ability to influence the entire network in some way. There are a variety of degree-based prominence measures. In its simplest form, a node’s degree is the number of other nodes to which it is connected. In a weighted network where ties can take on values other than zero or one, the cumulative weight of all of a node’s connections – its cumulative degree – is known as its “strength”. In a directed network in-links may be distinguished from out-links, and the total in-strength may function as a measure of prestige while total out-strength measures centrality. Moreover, the distribution of degree centrality tends to be durable: nodes which are prominent at time t tend to remain prominent at time $t+1$ (Burt, Marsden, and Rossi 1985). This tendency becomes increasingly important when the size of the network changes over time. As new connections are formed between nodes, the probability that they will involve high-centrality nodes is higher than the probability that they will involve low-centrality nodes.¹⁵

The size of the global banking network is largely invariant across time in one sense: the number of national banking systems (nodes) generally does not change from one period to the next. As a result, we should expect degree prominence to remain relatively fixed. But new relationships are frequently formed (or dissolved) between banks in different jurisdictions, so the density of the network may vary significantly from one period to another. This is especially true when the network is “shocked” by a crisis. As a result, the relative prominence of nodes as measured by strength may change quite a lot over time. If we expect nodes with an initial strength advantage to increase in relative importance as the network

¹⁵There are various mechanisms by which this might occur, including preferential attachment, triadic closure, reciprocity, reinforcement, and more. For reasons of space parsing which mechanisms are operating in the global banking system is beyond the scope of this analysis, but can be done using inferential statistical models in the exponential random graph and stochastic actor-oriented network model families.

develops, we should also understand that this dynamic may not be a monotonic function of a linear process: some relatively high-strength nodes may lose ties when shocked, while others gain.

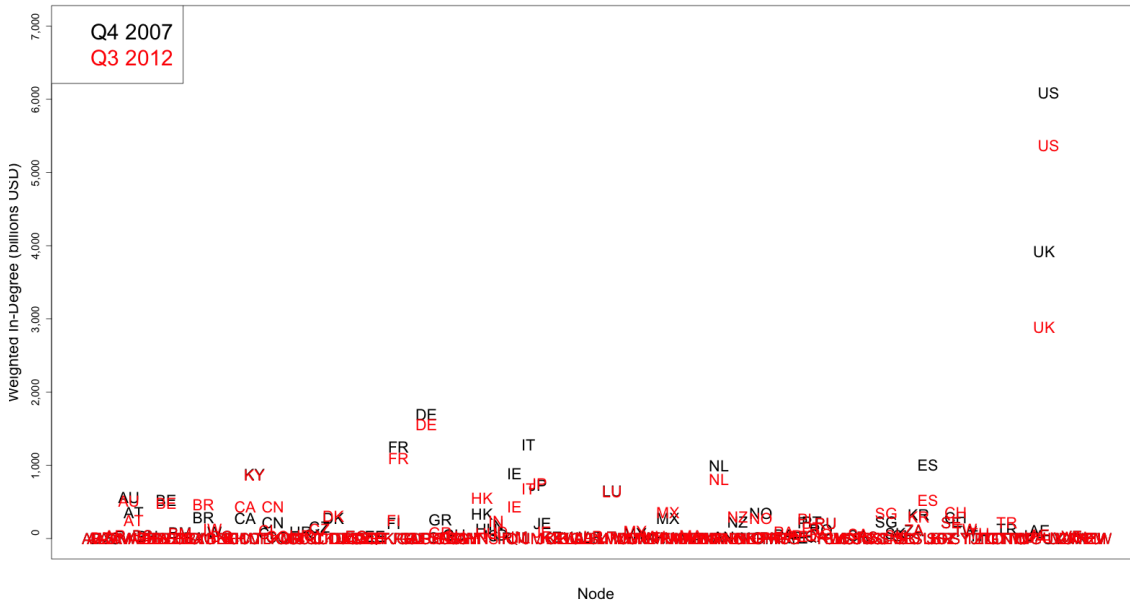


Figure 1.3: *The weighted in-degree (in-strength) distribution before (black) and after (red) the financial crisis. Overall network connectivity suffered, but the United States, and to a lesser extent the United Kingdom, remain the most prestigious nodes.*

Figure 1.3 shows one measure of prominence in the global banking network, where countries are arranged in alphabetical order and plotted according to their in-strength.¹⁶ Pre-crisis observations are depicted in black, while post-crisis observations are in red. This snapshot shows a clear delineation between prestigious nodes, particularly the United States, and all others. Most countries have very low in-strength: their banking systems do not attract much foreign bank capital. A handful – including major European economies and Japan – attract a significant number of strong ties, but far fewer than the U.S. The crisis brought the U.S. back to the pack somewhat, and the U.K. somewhat more, but the gap is

¹⁶ A time series animation is included in the online appendix. It shows that the prestige of the U.S. increased over time before the crisis, after which it declined for several quarters before beginning to regain lost ground. If recent trends continue, in other words, the U.S. will continue to separate from the rest of the nodes in the system.

still enormous.¹⁷ The gains by the BRICS – “BR”, “CN”/“HK”, “IN”, “RU”, “SA” – are slight or non-existent. Keep in mind that many of the out-links of countries which might “fly to safety” in the United States as the crisis spread to other locales are not reported in these data; therefore, the gap between the U.S. and the rest is likely understated to a significant extent.

How does this confer power? Cohen (2000) refers to “internal power” which comes from prominence in the international financial system. If the United States is able to attract foreign bank finance even during the worst crisis period since the Great Depression rather than experiencing capital flight, then it possesses what Cohen refer to as the power of “autonomy”. It is not constrained by foreign finance to the same extent as any other country. It enjoys policy flexibility that others do not. And, indeed, we have observed this flexibility. The U.S. has been able to engage in the most significant monetary expansion in modern history without suffering a decline in the dollar’s value. It has been able to run trillion-plus dollar deficits annually as it recovers from the crisis without a spike in the interest rate it pays on its bonds. It has therefore been able to avoid the sort of harsh austerity which have been imposed on other polities during crisis periods. And, perhaps more importantly for this analysis, it has allowed its domestic banking sector to recover quickly from the crisis, and become more active in the global banking system in other ways.¹⁸ Other major economies – even the U.K., Germany, and France – have not had this flexibility despite the fact that the crisis did not originate in those jurisdictions, nor were its effects most pronounced there. This analysis shows one source of this internal power-as-autonomy: the high level of American prestige in global banking.

The converse is also true. The spread of the U.S. crisis throughout the system had

¹⁷This could provide evidence either of capital flight or of wealth being destroyed by the crisis, thus shrinking the value of the claims foreigners had on U.S. banks. Given other observable features of the global financial system the most plausible explanation is the latter, but the former cannot be ruled out by these measures.

¹⁸I expound on this below.

devastating effects on many others. Thus, using the language of complex interdependence, the high in-degree and in-strength of the United States implies a high level of sensitivity and vulnerability of other countries in the face of a crisis in the U.S.¹⁹ In this context, sensitivity would refer to the set of specific relationships between the U.S. and other countries, while vulnerability would refer to the cumulative effect of all relationships.²⁰

The crisis clearly eroded some of the absolute advantage the U.S. had over other states, at least by this measure. But it did not erode the position of the U.S. at the core of the system. Contrary to expectations, no country moved into a position from which it could challenge American banking supremacy as a result of the crisis. As the network has begun re-building itself it has done so by reinforcing American prominence.²¹ Thus, the hierarchical structure of the global banking system was not altered as a result of the crisis. In fact, the most likely pre-crisis challenger to Anglo-American dominance – the European Union – suffered (and at this writing continues to suffer) greatly from the crisis. The net result appears to be a more unequal distribution of internal power – prestige – in the global banking system than before the crisis.

But a simple plotting of in-strength does not tell us whether nodes attract a tremendous amount of strength from one or two nodes, or whether it attracts quite a lot of bank finance from many nodes. In the case of the United States' position, this is important. If the U.S. receives most of its finance from one country – perhaps Japan, due to developments in the balance of payments – then it will have far greater influence over Japan than it has over all

¹⁹In Keohane and Nye's framework, sensitivity refers to the ability of a state to avoid repercussions emanating from outside. Vulnerability refers to the inability of states to reverse patterns of outside influence except at extremely high cost. In this case, the cost would likely be segregation from the network.

²⁰Cohen (2000) thus refers to sensitivity as a relational concept and vulnerability as a structural concept. While perhaps useful in some cases, this assumes that the sensitivity of i to j is independent of those countries' relationships with k . This is now always, or perhaps even often, the case. I elaborate below.

²¹I again refer readers to the separate appendix which contains the full time series, in which this dynamic is even more noticeable.

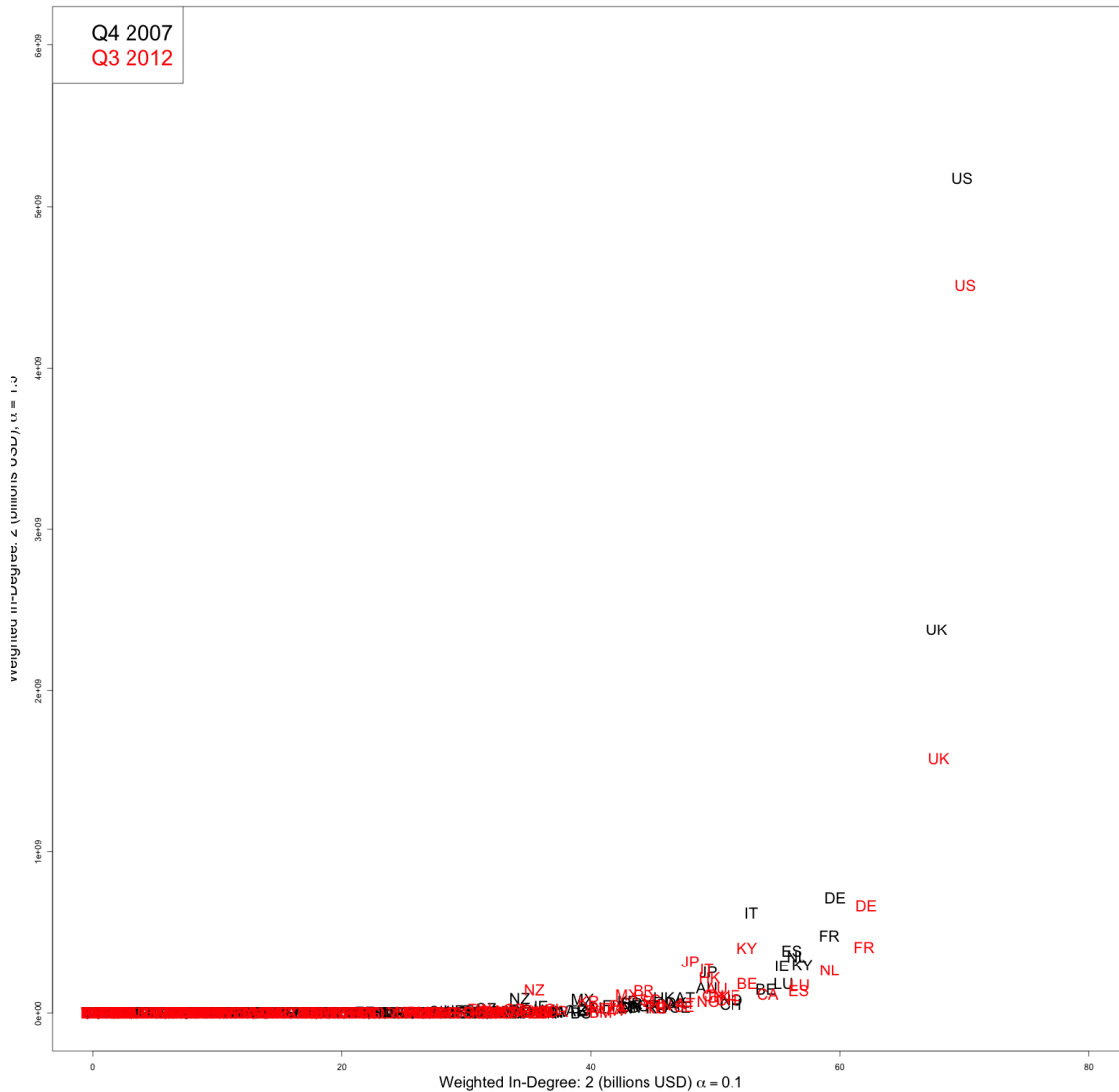


Figure 1.4: The weighted in-degree (in-strength) distribution before (black) and after (red) the financial crisis, at different α . The distribution appears to be exponential: an increase in in-degree does not correspond to a large increase in in-strength, except at the height of the distribution.

other nodes.²² Conversely, if the U.S. receives a lot of strong in-links from many nodes, it has broad influence over much of the system. In other words, the question is whether there is a positive relationship between in-degree and in-strength: does the former rise with the

²²China would perhaps be a better analogue than Japan, but China's out-links are not reported in the BIS data set. This is a reminder that the prestige of the U.S. (and probably some other countries) in the global banking system is understated in all of these measures, probably to a significant extent.

latter? If not, then prestige may be deep but narrow.

One way of parsing this is to plot both in-degree and in-strength on a two-dimensional plane as in Figure 1.4.²³ Here, we adjust the value of ties by a tuning parameter α as proposed by Opsahl, Agneessens, and Skvoretz (2010), which allows us to adjust the level of importance given to node strength relative to node degree. In other words, α allows us to distinguish between two nodes, one of which attracts ties from 10 different nodes each with a weight of 1, and another which attracts a tie from 1 node with a weight of 10. When $\alpha = 0$, the measure is equivalent to the number of binary ties, which is a node's degree. When $\alpha = 1$, the measure equals the sum of weighted ties irrespective of the number of unique ties, which is a node's strength. When $0 > \alpha > 1$, nodes are rewarded for being connected to many other nodes; when $1 > \alpha > 2$, nodes are rewarded for being strongly connected to other nodes. In Figure 1.4, the horizontal axis arranges national banking sectors when $\alpha = 0.1$ while the vertical axis places the same banking sectors when $\alpha = 1.5$. As we can see, there is a correlation between the two: the same nodes tend to be prestigious regardless of which α is used, and an increase in one measure generally coincides with an increase in the other. But the relationship appears to be exponential. The U.S. is slightly more prominent than Germany and France when strength is heavily discounted, but much more prestigious when it is rewarded.²⁴ This provides some preliminary evidence that ties may be formed by some sort of a preferential attachment mechanism, "rich get richer" effect, and/or triadic closure. Structural processes may guide tie formation in addition to national characteristics.

In-strength is not the only measure of prominence which is important. The out-link

²³Again, see the separate appendix for a time series of these statistics.

²⁴When $\alpha < 1$, this statistic is very likely to be heavily biased against the United States, as in-degree is restricted by the data collection process. The U.S. has a global presence in financial markets, while countries like Germany and France have a predominately regional presence. This is demonstrated in the analysis of a broader set of financial relationships examined by Oatley et al. (2013), which shows that the U.S. attracts significant in-links from roughly 70% of the countries in the system; no other country attracts more than 35% (the U.K.) and the distribution has an exponential decay.

centrality of nodes provides them with another form of influence within the network. As traditionally defined, senders of cross-national bank finance are powerful because they control the international supply of credit. Figure 1.5 shows that the centrality of the U.S., U.K., and Japan actually increased as a result of the crisis, while that of most European countries fell significantly.²⁵ Pre-crisis, the U.S. had a much higher prestige than centrality: it attracted many more in-links than it sent out-links. Other countries, particularly European countries, were larger net senders of bank finance. Post-crisis, many of those countries have declined in out-link centrality, while the U.S. has risen markedly in addition to remaining the most prestigious.

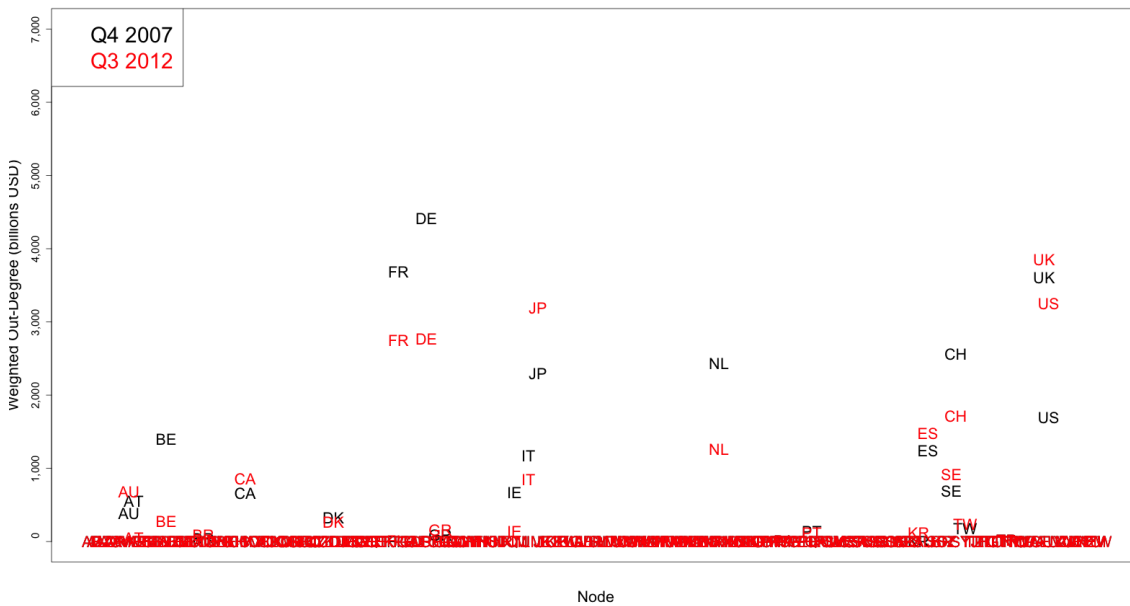


Figure 1.5: *The weighted out-degree (out-strength) distribution before (black) and after (red) the financial crisis. Overall network connectivity suffered, but the United States increased in centrality. European prominence mostly declined.*

The rapid post-crisis increase in the United States' out-link centrality could be interpreted in several ways. First is as a fulfillment of responsibility to provide countercyclical lending to the rest of the system when a crisis hits (Kindleberger 1973). This can be

²⁵Note that out-link data is only collected for twenty-six countries in the BIS data set.

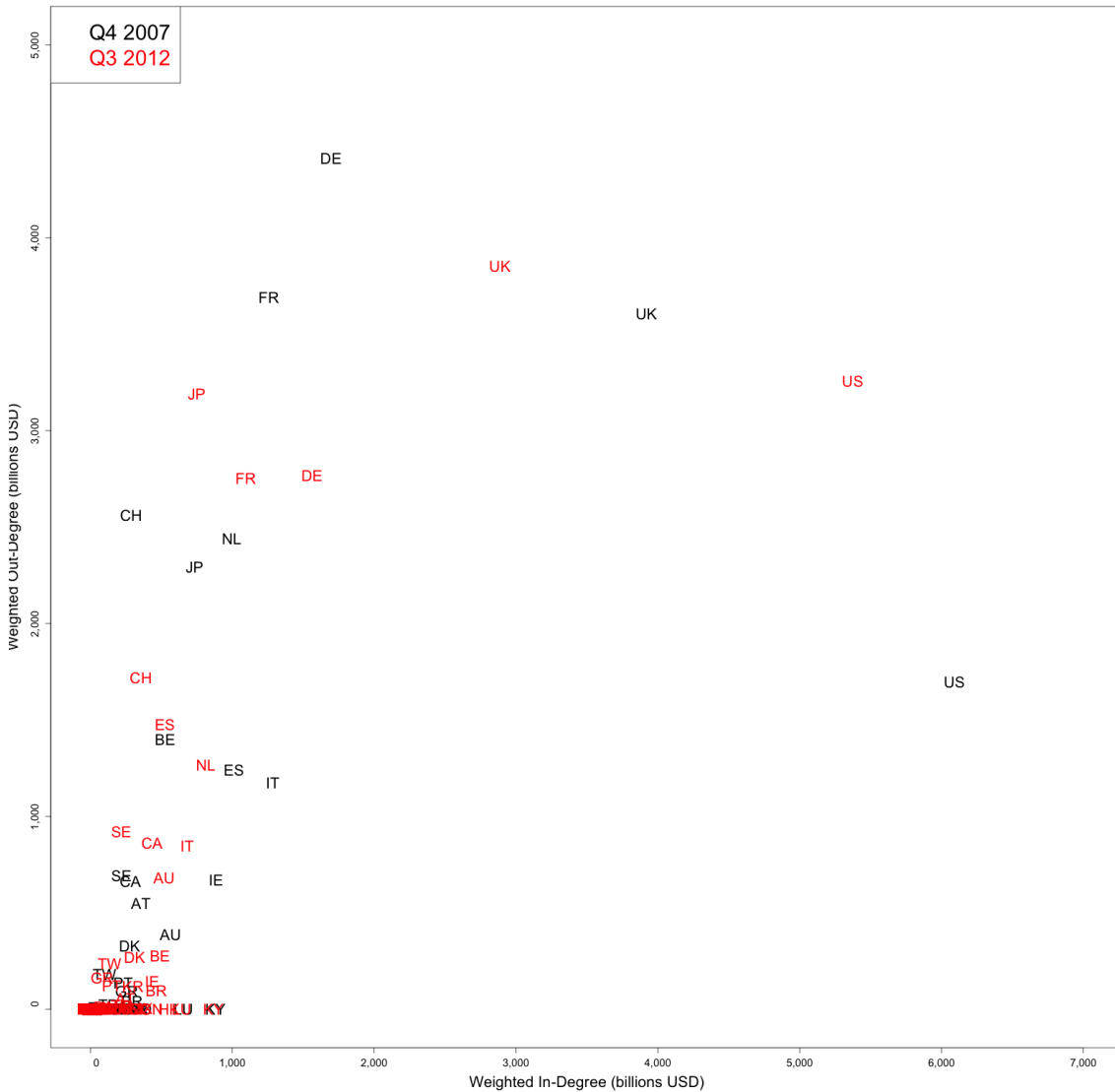
translated into private self-interest with the same result: as the crisis spread from the U.S. outward, and cross-national banking ties deteriorated (particularly in Europe), U.S. banks were able to invest internationally because they recovered from the crisis first – due to the substantial interventions made by American policymakers at the Treasury and Federal Reserve, and the lack of capital flight – and were willing to do so because such opportunities were attractive. Indeed, it appears that most countries which could increase foreign lending post-crisis did so: the U.K., Japan, South Korea, and Australia all increased their foreign exposure. But none so much as the U.S., which nearly doubled the amount of claims on foreign banks after the crisis.

This confers a distinct type of power from internal autonomy, what Cohen (2000) refers to as “external power”, which involves mechanisms of control. In response to the crisis the U.S. moved into position as a preeminent source of cross-national bank finance. Its ability to extend (or not extend) this finance provides it with opportunities for control throughout the system. It suggests that outcomes in other jurisdictions are dependent upon outcomes in the United States to a significant extent. This not only gives the U.S. leverage in international negotiations over global banking regulations (Oatley and Winecoff 2012), but increases the dependence of the rest of the system on American finance, both as a safe haven destination and as a source of finance capital.

The overall portrait of a degree-based measure of power is visible in figure 1.6. The global banking network shows a sharp delineation between nodes with high prestige, those which are prominently central but are not prestigious, and those which are not prominent in any sense. Figure 1.6 plots countries’ out-strength (y-axis) against its in-strength, with $\alpha = 1$ for both.²⁶ We again see that only one country is truly prestigious both before and

²⁶Several things immediately stand out from the time series reported in the separate appendix. First, the size of the network – the total number of cross-border financial relationships – has increased markedly in a relatively short period of time. Second, the distribution of these links has not been equal across all nodes, nor has the allocation of ties followed a strictly linear process. Third, all countries with high prestige possess high centrality as well, although the converse is not true. Several countries display some elements of prominence, but only one or two are prestigious.

after the crisis: the United States. Thus, referring to the taxonomy in table 1.1, the U.S. is the only definitively core country, while the U.K. is a borderline case. Germany and France were central senders before the crisis and remain so post-crisis, but their prominence has diminished. Japan's centrality has risen, while its prestige remains unchanged.



The fact that in-strength prominence is distributed so much more unequally than out-strength prominence is both striking and important. It suggests that even if the system becomes more interconnected in coming years – meaning that more countries have more cross-national banking relationships – a disproportionate amount of that activity will involve the United States. Such an outcome would not be expected by extant political economy theories based on balancing, portfolio diversification, or hegemonic decline, but would be expected by a complex network approach which anticipates hierarchical networks to contain positive feedback mechanisms – such as preferential attachment – that exacerbate inequalities over time.²⁷ Thus, the rest of the world will be more sensitive to outcomes in the United States than the United States will be to outcomes elsewhere. If positive feedback mechanisms do operate in this system, and a full analysis of that question will have to be the subject of another paper, reversing these dynamics would come at a very high cost: the dissolution of the network. The only historical referent we have of this happening during an era of globalized capitalism is the 1930s, the nadir of modern civilization. Thus, those who wish to move away from a financial system organized around American prestige do so at great risk, since the rest of the world is vulnerable to American prominence.²⁸

While the results which are observed (summarized in Table 1.2) may not be especially surprising, the results which we do *not* observe might be. None of the high-growth emerging markets which have been speculated as possible additions to (or replacements of) the U.S. and E.U. at the core of the global economy made in-roads in prestige, despite the largest crisis to hit the industrialized core since the 1930s. None of the BRICS gained noticeably in network importance on any degree-based measure during the period. This provides some descriptive evidence, at least, that the architecture of the global financial system is not undergoing a major reorganization. This is significant. It calls into question

²⁷There is a large literature on this, but see as examples Barabási and Albert (1999) and Oatley et al. (2013).

²⁸There are few examples from history, maybe none, in which the transition from one financial core to another was gradual and stable. It is easy to bring to mind transitions which were rapid and chaotic.

		In-Links	
		<i>Low</i>	<i>High</i>
Out-Links	<i>High</i>	DE, JP FR, CH	US, UK
	<i>Low</i>	All Others	None

Table 1.2: *Placement of national banking systems according to the taxonomy in Table 1, from various degree-based network statistics reported above. The U.S., and arguably the U.K., are the only core nodes. All others are peripheral, excepting Japan and several European countries which are central but not prestigious.*

speculation that the center of gravity in the global financial system is shifting from West to East or from North to South. To the extent that there has been a reorganization at all, it has been to reduce the rise of continental European powers and reinforce the prominence of the U.S. and U.K.²⁹

At this point a note of caution is in order. Because of the ego-centric quality of the data collection, some countries may have increased in centrality (but likely not prestige) without being appropriately measured. China, for example, may have become more important as a source of cross-national bank finance even if it remains peripheral as a destination for

²⁹Even before the crisis the role of off-shore or lax-regulation financial havens as hosts of banking assets was noticeable but relatively muted. Following the financial crisis, the importance of some of them – particularly Ireland and Iceland – reduced further. This indicates that the global financial system is not dominated by a “race to the bottom” at least in banking. Financial assets are based in banking systems based primarily on criteria other than regulatory strictness or disclosure requirements, although tax avoidance does appear to drive some banking sector behavior at the margin.

it.³⁰ Indeed, in absolute terms there is little doubt that it has; in relative terms it may not have. These data cannot tell us, despite being the best available. But the identical fact also understates the prominence nodes which are present, and in particular downplays the prestige of the United States: for China to be a large sender, others must be large receivers. Many emerging markets – especially those with high national savings, from China and other newly-industrialized exporters to countries which recycle petrodollars through New York and London – hold large amounts of claims on the United States and United Kingdom. These are not reported in the BIS data. Given the endogenous growth mechanisms which likely exist in the global banking network, the absolute gap between the U.S. and the rest has likely grown since the crisis.

In summary, descriptions of the global banking network based on the number or strength of ties connecting nodes show that the U.S. is the most prestigious national financial sector – it attracts the most ties – and is one of the most central. Some of this surely reflects the U.S.’s status as a “safe haven” for international investment, and its deep internal market, which did not significantly change despite the subprime financial crisis. We might suspect that endogenous processes played a significant role in this development, since the internal attributes of the U.S. – such as financial health, macroeconomic growth prospects, and political stability – were incontrovertibly weakened by the crisis. Other major economies – particularly Germany, Japan, and the United Kingdom – are highly central, but are less prestigious. The spread of the subprime crisis throughout the global financial system had a major impact on the network but not necessarily in obvious ways. Some previous trends of prominence growth were halted or went into reverse. Continental European centrality decreased, while that of Japan, the U.K., and the U.S. increased. No nodes moved into a more prestigious position as a result of the crisis.

³⁰This argument cannot be applied to emerging markets more generally: Brazil, Chile, India, Mexico, Panama, South Korea, Taiwan, and Turkey are all egos in at least one of the two BIS surveys. None are prominent nodes under any measure in either.

1.5 Eigenvector and Betweenness Prominence

Node prominence can be measured in ways other than simple summation of degree and strength. Other types of network performance are important besides adding up ties connecting nodes to each other. Two of these are betweenness and Eigenvector prominence.³¹ Degree-based measures of prominence treat all ties as if they were of the same importance. Proposed by Bonacich (1972, 1987), Eigenvector prominence complicates this approach and distinguishes between ties with others according to *their* prominence. Ties which connect to a core node are thus weighted more heavily than ties which connect to a peripheral node. Because it takes the connectivity of other nodes into account, Eigenvector prominence is a weighted sum of direct and indirect connections, and provides a measure of a node's prominence within the entire structure of connections comprising the network: nodes with high Eigenvector prominence are not just the most connected nodes in the network, they are the most *well*-connected nodes in the network. The Eigenvector score combines in-links and out-links, providing an overall measure of a node's influence.

Betweenness prominence is a measure of the paths which indirectly connect nodes via a third party, taken as a function of the total number of paths in the network. For example, if i and k are connected to each other only by mutual connection to j , then j provides a "bridge" for the other two. Nodes with high betweenness prominence are critical conveyers of "information" throughout a network by connecting disparate clusters to each other. In financial systems, high-betweenness nodes may be conduits of crisis by providing the pathway for instability to spread from one country to others. As such, the overall connectivity of the network is enhanced by nodes with high betweenness scores, but the same feature also entails vulnerability.

³¹Most network literature does not distinguish between centrality and prestige for these measures, because they consider both in-links and out-links. I use prominence for purposes of analytical consistency, but both measures incorporate elements of prestige and centrality.

		Eigenvector	
		<i>Low</i>	<i>High</i>
Betweenness	<i>High</i>	Bridge	Core
	<i>Low</i>	Outsider	Insider

Table 1.3: *A taxonomy of node importance according to their betweenness and Eigenvector prominence.*

Thus, these measures capture different structural relationships than degree-based measures. The scores of nodes do not just depend on their direct connections to others, but on indirect connections as well. As such, they complicate conceptions of sensitivity and vulnerability. When bridges connect clusters in the global banking network, nodes in one cluster may become sensitive to nodes in other clusters even if they are not directly connected. Through these connections, many or most states may be vulnerable to those with high Eigenvector prominence even if they are not directly tied to them.

Looking at the two in conjunction can provide information regarding the importance of nodes within a network along multiple dimensions as Table 1.3 portrays (Conway 2012). Nodes with high Eigenvector but low betweenness prominence are network “insiders”: they occupy a core position in the network but have few (direct) connections outside their immediate cluster. Nodes with high betweenness prominence but low Eigenvector prominence function as significant bridges linking together major components of the network, but may not themselves exist at the core of the structure. Nodes with low scores on both

measures are outsiders: they exist in the periphery and do not create pathways connecting clusters. Nodes with high betweenness *and* Eigenvector prominence constitute the core of the network and provide bridges to most other clusters.

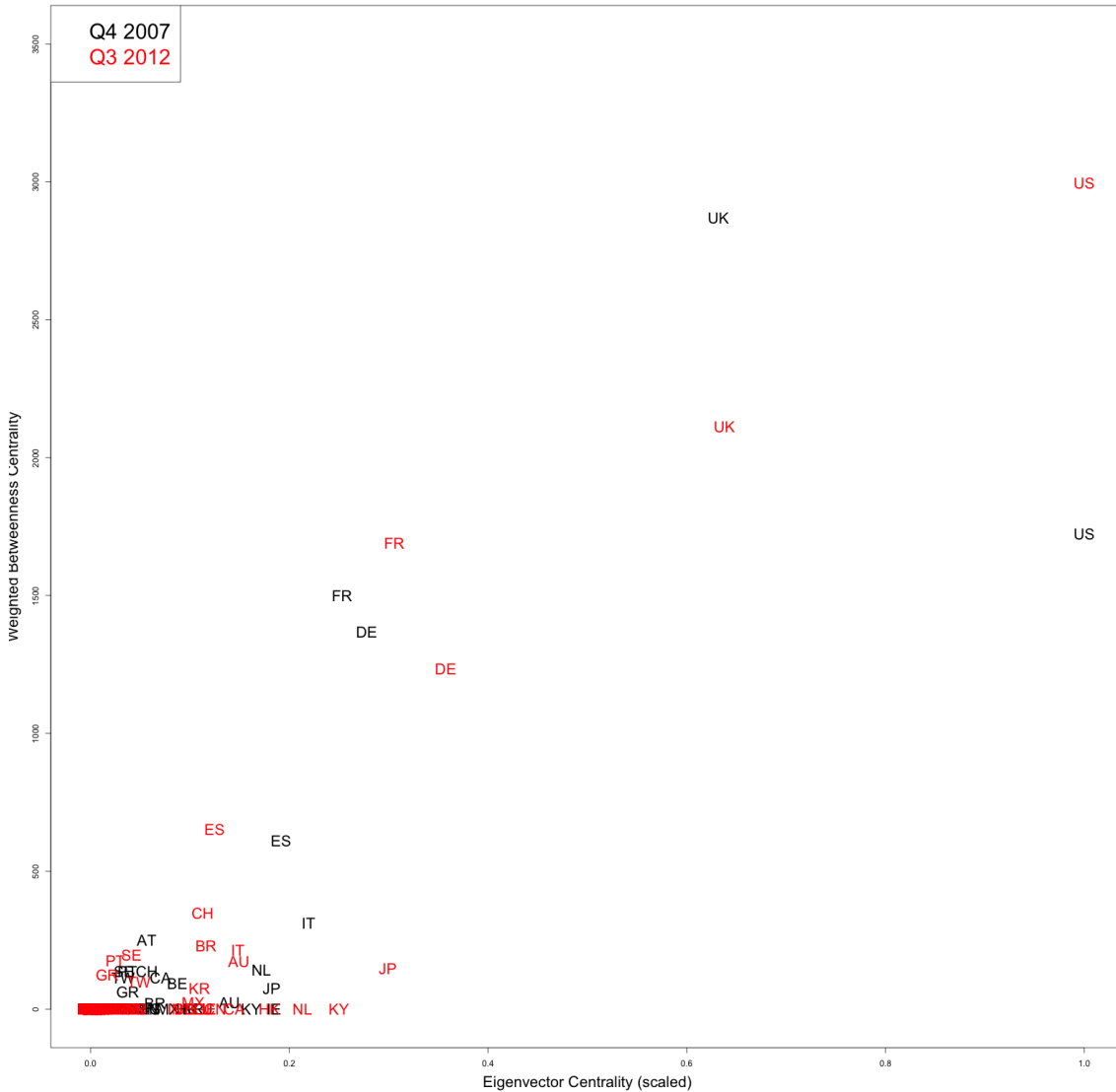


Figure 1.7: *Betweenness prominence (vertical axis) plotted against Eigenvector prominence (horizontal axis) both before (black) and after (red) the global financial crisis. The United States is the only definitive core node. The United Kingdom may be considered as a core node or an insider. Several European countries function as bridges, but most countries are outsiders.*

Figure 1.7 plots countries according to their Eigenvector (horizontal axis) and betweenness (vertical axis) prominence before and after the financial crisis.³² The U.S. stays in the most prominent position according to Eigenvector scores; in fact, there are no important countries to which the U.S. is *not* connected. No other national banking system comes close to the U.S.'s importance on this dimension, and the financial crisis did not erode it. This indicates that not only is the U.S. the most connected node, it is also the most well-connected node, and suggests that there are no major national banking sector which is not influenced, in some way, by the United States. The converse is not true of any other country.³³

Before the crisis, some European nodes were important pathways for other nodes to connect to the broader system – and thus are prominent by the betweenness measure – but are not themselves at the core of the system, as is made clear by low Eigenvector scores. In most cases the crisis led to an erosion in the betweenness prominence of Europe. This follows intuition. The European economic integration project has revolved around several large economies within the eurozone, particularly Germany and France, which connect financial centers outside of the eurozone with smaller economies inside the eurozone. Through these connections the rest of Europe is linked to the rest of the world. Thus, prominent European countries have great regional importance, but their global importance is less significant. The spread of the crisis to the eurozone led to a reversal of capital flows from the Eurocore to the Europeriphery, thus disconnecting parts of the network. As a result the regional importance of Germany and Italy declined as a result of the spread of the subprime crisis to the eurozone. Perhaps surprisingly France and Spain actually increased slightly. Japan is connected to well-connected countries – increasingly so post-crisis – but

³²As before, a full time series is available in the appendix. Again, the increasing importance of some nodes over the period under observation is remarkable: the prominence of several nodes increases to a large extent from 1999-2007, then the system reorganizes as a response to the global financial crisis.

³³A few others (Japan, Germany, and France) slightly increased in Eigenvector importance following the crisis. This may be due to increasing their connections to the U.S. and U.K., and decreasing connections to the European and Asian periphery.

does not serve as an important bridge. This perhaps reflects the fact that Asian regional integration has lagged behind European regionalism, particularly in finance.

The most significant development in terms of magnitude was the increase in the importance of the U.S. as a bridge and the drop in importance of the U.K. Prior to the crisis the U.S. was the second most important bridge, and the difference between it and Franco-Germany was small. After the crisis the U.S. was by far the most important bridge in addition to being the most well-connected node. Indeed, the rising importance of the U.S. by these measures shows the extent to which the U.S. held the entire structure together in the face of the shock: had the U.S. failed as a bridge, the entire network may have fragmented into isolated clusters with few connections between them. Such was the experience in the 1930s, and many expected a similar outcome during this crisis. Instead, the U.S. was able to stay connected to all the most important countries while building bridges between them.³⁴ According to this measure the prominence of the United States increased significantly as a result of the crisis.

This is reflected in table 1.4, which summarizes the graphical depiction in figure 1.7. Most nodes are unimportant by either measure, but a handful are important betweenness nodes (bridges) and two are globally important on both accounts (core nodes): the United States and United Kingdom (and in particular the former). Both also became more important by both measures over the time series, despite the fact that the financial crisis emanated from their national financial systems. This reinforces the result from degree prominence, but in a more nuanced way. Moreover, as a result of the crisis the U.S. became the most important bridge maintaining connections between disparate parts of the network. Without the U.S. occupying this position, the recent financial crisis may have led to the disappearance of a truly global banking network, as the network fragmented into regional or local

³⁴This may have been an intentional policy goal. The U.S. Federal Reserve extended liquidity to foreign firms and governments during the crisis, thus taking Kindleberger's advice to the hegemon to extend countercyclical finance to others in the system during crises. For one study of this phenomenon see Broz (2012). For a journalistic account see Irwin (2013).

		Eigenvector	
		<i>Low</i>	<i>High</i>
Betweenness	<i>High</i>	DR FR	US, UK
	<i>Low</i>	All Others	JP?

Table 1.4: *Placement of national financial systems according to the taxonomy in Table 3, from the betweenness and Eigenvector centrality score above. The U.S., and arguably the U.K., are the only core nodes. Several European countries act as bridges. All others are outsiders, with the possible exception of Japan.*

clusters in an analogous way to the 1930s.

All of these results tell a similar story in slightly different ways: the U.S. remains the most important banking system, and there are no strong contenders for displacing it. In fact, the relative gap between the U.S. and the rest has grown since the subprime crisis, and as the global financial system has begun to recover it has re-organized itself with the U.S. occupying a reinforced position at the core. This cannot be easily explained by reference to the internal attributes of the United States which were not favorable during this period. Instead, we should consider how the structural properties of the banking network may have facilitated patterns of endogenous growth.

1.6 Conclusion

Theories of international politics have often conceived of power as arising from the structure of relationships in the global system, but measures of power have been limited to monadic or dyadic characteristics of states. This paper argues that the structure can

be operationalized in terms of statistics describing prominence in complex networks, and provides an application to the global banking system. Besides offering precision, such an operationalization offers novel conclusions regarding the performance of the system in the wake of the most severe financial crisis since the 1930s: despite being the epicenter of the crisis, the United States has increased in prestige according to some measures and remained at the core in others. European financial centers have declined by most measures, while the rest of the countries have remained peripheral. Notably, this includes emerging markets like the BRICS – Brazil, Russia, India, China, South Africa – which have not increased in prominence in global banking according to these metrics.

The complex network conceptualization of power can be applied to substantive areas other than banking. Strange (1987) conceived of structural power as existing in four areas: finance, production and exchange, security, and knowledge generation. Future analyses may be able to demonstrate whether American preeminence in banking has extended to other areas of the global financial system as well as these other areas. Such an approach might provide a different picture than metrics now in common usage such as the Composite Index of National Capabilities (CINC) scores, which counter-intuitively suggests that the Soviet Union was more powerful than the United States during the 1980s and that Chinese power eclipsed American power in the late-1990s.

Moreover, a complex network approach provides expectations regarding future performance of the system. While such dynamics have barely been mentioned here, inferential models of networks allow researchers to formally test whether mechanisms such as preferential attachment, triadic closure, or other structural processes exist in networks. Such models are increasingly common in political science, but have yet to be utilized to analyze the distribution of power in the system. These models allow for the inclusion of country-level and dyad-level covariates which also impact development and change within the global system, thus allowing researchers to test the relative impact of different kinds of

processes in network formation. For this reason, applications of complex network science – especially in its dynamic form – may complement and enrich other conceptualizations of power, and may unify disparate strands of the literature.

This analysis has barely scratched the surface. Many other measures of network prominence exist and can be applied to studies of the global political economy and security system. Among others, such possibilities include analyzing when crises are likely to arise and spread, the conditions under which states move from the periphery to the core, the manifestations of structural power in bargaining over global governance structures and security situations, and many other topics. By providing an empirically precise and theoretically rich environment in which to study the global political system as a system, a complex network approach can improve our understanding of many phenomena of interest.

2 GLOBAL BANKING AS A COMPLEX POLITICAL ECONOMY

2.1 Introduction

To this point international political economy (IPE) discussion of “the most virulent global financial crisis ever” (Greenspan 2010, 3) has contained almost no analysis of global finance, instead focusing on the pre-crisis innovations of micro-level units and the post-crisis response behaviors of governments. What IPE conversation has occurred has mostly been speculative (Helleiner 2010; Drezner and McNamara 2013; Oatley et al. 2013) or sociological (Cohen 2009*b*; Keohane 2009; Helleiner 2011; Oatley 2011). The only well-established theoretical framework in the empirical literature which seeks to explain dynamics at the global level is a “race to the bottom” driven by global competition, which is often presumed rather than empirically demonstrated. This despite the fact that “race to the bottom” theories have been called into serious question or in other ways complicated in many other issue-areas of the global political economy.¹ Nevertheless, such theories remain predominant in the literature (Meseguer and Gilardi 2009).

Such a post-crisis lack of interest in the politics of global finance is at odds with prior theory, which maintains that predominance in world financial markets is advantageous because it confers a broad base of power (Strange 1998; Cohen 2000, 2006) which may be employed to provide advantage for domestic firms through the coercion or neglect of their foreign rivals (Oatley and Nabors 1998; Simmons 2001). Conceptualizations of power

¹Also in finance. More than a decade ago (Simmons 2001, 590) noted that “[t]heories of ‘races to the bottom’ are of little help” in explaining patterns in global capital markets. The recent crisis, which was centered around AAA-rated financial instruments and supposedly low-risk debt of OECD sovereigns, provides support for the Simmons thesis as it indicates that many financial actors believed they were acting safely rather racing to the bottom.

in financial systems have been imported either from neo-Marxist structuralism (Strange 1982) or from bargaining models of international relations (Drezner 2007). Both agree that a state's ability to attract interest from foreign financial firms is a indicator of power, but the former places primary importance on the qualitative nature of the global structure of financial relationships while the latter emphasizes quantitative attributes such as the importance of the size of internal markets in bargaining conducted between major powers. Thus, in existing literature there is a tension between the complex and the parsimonious, the accurate and the precise.² Perhaps it is this tension which has led to the relative lack of post-crisis attention from IPE scholars.

This paper provides a bridge which may connect the two while providing extensions to both. I argue that power in global banking can be conceptualized as emerging from a complex adaptive system comprised of national units and the linkages between them, theorized in terms of the linkages as well as the units, and quantitatively analyzed using recent inferential network methodologies. This approach creates opportunities for theoretical arguments which situate national political economies within a global context in unique ways, and for empirical analyses which uncover patterns in the global banking system that would be obscured using common methodologies. As such, this paper seeks to unify various strands of the IPE of finance literature while providing extensions to them. Rather than treating the global financial system as an “abstract force ‘out there’” (Helleiner 2011, 78), it problematizes the system by situating national political economies within a global market (Cohen 2009*b*; Palan 2009) which is modeled statistically. The central argument is that global banking is a complex system which emerges through the interaction of processes which occur at multiple strata.³

²These divisions roughly correspond with the divisions between the “American” and “British” schools of international political economy (Cohen 2008, 2009*b*; Helleiner 2011).

³In this context, “strata” does not correspond with the traditional levels of analysis proposed by Waltz (1959), but by the intensity of interconnectedness.

I focus on global banking. Following Oatley et al. (2013), I conceptualize the global banking system as a weighted and directed dynamic network. I do this because observed bank relationships comprise an interdependent market which more closely resembles a network than a series of independent and identically distributed monads or dyads, so a network specification is most appropriate for analysis of this kind of system. I employ inferential network methodologies to uncover the determinants of the global banking system, which is the outcome variable.⁴ Determinants of this system include country-level political institutions, macroeconomic fundamentals, national policies, dyadic relationships, and endogenous structural processes. The relative effect of these variables is analyzed using recently-developed extensions of exponential random graph models (ERGM), which I compare to linear regression models in order to highlight the utility of my approach. The findings suggest that the ability to attract cross-national financial relationships, which confers power in the world economy, is not a pure function of monadic or dyadic attributes of states. I show that in some ways the importance of internal market size, key elements of political systems, and shared characteristics (such as regional proximity, similar levels of development, or common political systems) have been overstated by previous studies. The importance of dynamic structural processes such as preferential attachment and triadic closure has been understated or only vaguely identified.

2.2 A complex political economy theory of financial power

Power in the global financial system arises from supply and demand forces in financial markets. The attractiveness of a national financial system impacts the extent to which these forces interact. If country j wishes to have access to country i 's markets then i has demand power over j ; if i wishes to attract capital from j then j has supply power over i . This understanding of financial power underpins the literature on bargaining over global regulation (Simmons 2001; Drezner 2007) as well as the accumulation of wealth in the global

⁴That is, I move beyond previous descriptive analyses of the global financial system, or analyses which employ inferential models but do not include country-level political or economic variables.

economy (Strange 1987) perhaps by the collection of rents from foreign financiers (Oatley and Nabors 1998). It creates an “exorbitant privilege” which comes from controlling global liquidity (Eichengreen 2011), and impacts the interest rate sovereigns pay on debt (Schultz and Weingast 2003; Saiegh 2005). Financial power bestows influence over international financial institutions (Woods 2003) which can be used to further geopolitical interests abroad (Thacker 1999; Oatley and Yackee 2004; Stone 2004, 2008; Kirschner 2007; Pop-Eleches 2008). Indeed, financial power has been inextricably linked with every hegemonic project in the capitalist era (Helleiner 1994; Sobel 2012; Oatley 2013).

Cohen (2006) usefully collects these aspects of financial power into two general types: the existence of *autonomy* from foreign pressures and the ability to *influence* others in the world economy. In one sense these are two sides of the same coin (so to speak) – autonomy is the ability to avoid being influenced in undesirable ways by others – but they have distinct properties as well. Crises often bring these aspects into sharp focus. The power of the United States to influence states in need of finance is evidenced by the conditionalities attached to International Monetary Fund loans (Oatley and Yackee 2004; Pop-Eleches 2008; Stone 2008). Following the Asian crises in the 1990s, the desire for autonomy led many states to stockpile a “war chest” of U.S. dollar liquidity so as to not come under the sway of the IMF again (Bernanke 2005). These reserves may have granted some degree of autonomy but evidence that it has bestowed influence, particularly over the U.S., is scant (Drezner 2009). Indeed, increasing dollar-denominated assets made these countries even more dependent on American financial health (Eichengreen 2006; Oatley et al. 2013).

Articulating the precise ways by which control over global finance confers advantage is difficult. Cohen (2000) noted of the international monetary system that no general theory of the sources and uses of power exists.⁵ In the intervening years several attempts were

⁵Cohen uses the term “monetary power” to refer to “finance or currencies” generally. As I am presently concerned with bank finance rather than currencies, I refer to financial power even as I adopt some of Cohen’s language.

made to define, and occasionally measure, financial power. One method is to consider the ways in which states are dependent upon others or independent of them in the global banking system.⁶ There are three possible locii of power in the global banking system: the internal characteristics of national political economies (monadic), the interaction between characteristics of two political economies (dyadic), and the organizational structure of global finance (systemic). All of these may operate simultaneously and each of them impacts autonomy and influence in ways which produce observable outcomes at different strata of the global banking system.

Monadic sources of power are a linear function: as some internal characteristic of a state increases, its power increases proportionately. Dyadic power is multiplicative, as it involves the interaction between domestic attributes which are shared (or not shared) with other countries. Systemic power is exponential and arises from the entire structure of global bank relationships. Monadic and dyadic sources of power may be exogenous to the global banking system, meaning that they influence the creation of cross-national bank relationships, and they may be endogenous to it. Systemic sources of power are endogenous to the system. They are not a function of unit attributes, but of dynamic processes which are beyond the control of any actor but nevertheless condition the behavior of actors.

Each of these are useful at particular strata of the global financial system. Because its effect is linear, monadic sources of power will typically have the greatest amount of influence at the lowest stratum: the presence or absence of banking relationships involving a locality. Dyadic sources power operate at a higher stratum through multiplicity, and may extend to sets of dyads – such as regional partnerships – with common goals or attributes. Systemic sources of power are not limited to regional clusters but extend through the entire global banking market, and is therefore the highest stratum of power in global banking. The

⁶Banking is only one component of the global financial system, but it may be the most important. Bank assets recently topped \$100 trillion, or 150% of global GDP, nearly half of all global financial market activity (The International Monetary Fund 2012). In any case, the framework I develop here is intended to have broader application.

Source	Intensity	Influence	Autonomy	Stratum
Monadic	Linear	Compellence	Deterrence	Low
Dyadic	Multiplicative	Gravity	Assortativity	Medium
Systemic	Exponential	Shared Partners	Preferential Attachment	High

Table 2.1: *Locus, type, manifestation, and level of power in the global banking system.*

sources, intensities, particularities, and strata of power in this system are summarized in table 2.1.⁷ Each of them has important theoretical implications which should be observable empirically. I expound on each in turn.

2.3 Monadic sources of power in global banking

In global banking, the internal characteristics of states may confer instrumental power in ways similar to other types of relational power (Dahl 1957). In particular, the ability to restrict outsiders' access to a large internal market may compel the foreign state to accede to some demand, such as adherence to a common regulatory standard like the Basel capital accords (Oatley and Nabors 1998). These capabilities may also shield them from the innovations of others (Simmons 2001). In either case, a consideration of internal characteristics will cause us to focus on the great powers, as determined by criteria such as the size of the domestic financial and economic markets (Drezner 2007). This sort of power will be most visible during explicit negotiations with other states (influence) or, perhaps, by the absence of such discussions (autonomy).

States which control access to significant markets thus possess capacity to compel others toward some behavior which it prefers and deter others from compelling them, but this power is most useful at lower strata. To the extent that it isn't binary, control over an attractive market is an additive function: the stronger the fundamentals – size, growth

⁷While each of these elements may contain subelements it is not possible to encompass all possibilities in a single analysis. As such, I focus on the broad categories contained in table 2.1 in the rest of this section, reserving further complications for future work.

rate, political system – the more attractive a market is, and the more power a state has. Drezner (2007) refers to this as a linear process which determines control over the content and adherence to global financial standards.⁸ What matters is the relative gap between two countries compared to the cost of adjustment relative to the *status quo ante*: if the difference in market size between i and j is large enough, and the costs of adjustment small enough, then j will conform to i 's preferred regulatory standard. In this case, i has influence over j . If that condition is not met, then j has autonomy.

It is not difficult to find examples of the pursuit and exertion of this sort of power in global finance. Recent bargaining over control of international institutions is a manifestation of influence. In particular, the increase of internal attributes of emerging markets, such as size of the domestic market, would be expected to lead to an increase in monadic power. Accordingly, there has recently been a shift in global financial governance from the G7 to the G20, a realignment of voting shares in the IMF, and a more inclusive membership in the Basel Committee for Banking Supervision which negotiates international capital standards. Each of these provides evidence that the monadic power of major emerging markets has increased.

But the effect of this shift has been less pronounced than we might expect from a sole focus on internal attributes. The relocation of international *ad hoc* governance from the G7 to the G20 has been less meaningful than many predicted (Drezner 2012). Despite controlling a larger internal market, China has roughly half the voting shares of Japan in the IMF, and only the U.S. and E.U. retain effective veto power in that institution. Bargaining over the recent revisions to the Basel capital accords were dominated by the U.S. and major European powers just as previous negotiations had been (Oatley and Winecoff 2012). In short, because it arises from a monadic source, the increase in emerging market power

⁸Page 55, footnote 90. While Drezner mentions that “gravity” factors such as regional proximity might also play a role, he suggests that in his analysis it does not affect the results. In any case, I discuss spatial models below.

has primarily functioned at low strata: gaining a seat at the table is significant and may grant some measure of autonomy, but it does not automatically confer agenda-setting or other types of revisionist power. Perhaps because of their inability to exert significant influence in global finance, emerging markets have focused on increasing their deterrence capabilities. These efforts have proceeded along two tracks: first, the accumulation of financial assets which insulate these economies from foreign influence (Bernanke 2005; Drezner 2009); second, the establishment of alternative financial institutions over which they will have predominant influence. The former has proceeded further than the latter, as these countries' deterrence capabilities have out-paced their compellence capabilities.

2.4 Dyadic sources of power in global banking

As the above discussion suggests, there may be sources of power in the global banking system which are impossible to uncover by reference to linear processes stemming from monadic attributes. This would not be surprising. Spatial models of diffusion, contagion, and spillover effects are increasingly common in studies of the global political economy.⁹ While early applications of spatial models – such as gravity models of trade – focused on internal characteristics such as size, recent advances in spatial modeling incorporate many types of dyadic interdependence (Neumayer and Plümper 2010). In such models, the unit of analysis is the joint relationship between i and j . To this point such accounts have included spatial processes primarily as control variables: a relationship between i and j is conditioned by the presence or absence of a shared attribute. These effects are thus interactive and multiplicative: an internal attribute of i and/or j combines with a common characteristic to determine the nature of a relationship. Such variables may include location, level of development, or type of political system.

These sorts of interactive effects can also be characterized in terms of influence and autonomy. The most common application is a gravity model, wherein the probability (or

⁹Although they are uncommon in studies of global banking.

extent) of a relationship between two countries is a function of the mass of each economy mediated by the “distance” between them. Distance may refer not only to geographical proximity but also to other similarities.¹⁰ Thus, the effect of an internal attribute (market size) on an outcome of interest (existence or strength of a relationship) is conditional upon the presence of a mitigating factor (membership in an institution). Large economies which belong to international institutions will be very attractive to many other countries, which gives them power in international negotiations. For example, Neumayer and Plümper (2010) show that the attractiveness of bilateral investment treaties (BITs) is in part a function of the number of BITs which a potential partner has with a country’s competitors. A country with many BITs has influence in negotiations over the terms of a new BIT. A spatial perspective would expect these types of relationships to extend beyond the case of BITs.

Autonomy in dyadic interdependence models can arise through an assortative mixing process, whereby firms or governments prefer to establish relationships with those like them on some dimension. These might include equivalent levels of economic or financial development, regional proximity, similar political institutions, or some other shared attribute. A country with many similar partners along these dimensions is less dependent on any one of them, which provides autonomy. Assortative mixing is important for overcoming adverse selection problems in a host of relations including finance (Ghatak 1999). While prior studies of the politics of global banking have not emphasized shared characteristics, such variables seem to have a profound effect on global politics in other areas. The effect of joint-democracy, for example, is presumed to have a major impact on military peace (Maoz and Russett 1993), trade (Mansfield, Milner, and Rosendorff 2000), and foreign direct investment (Guerin and Manzoocchi 2006). Cross-national production and

¹⁰For a recent review of gravity models in economics, see Anderson (2011). The use of these models in international political economy is extensive; for one discussion of their strengths and weaknesses see Ward, Ahlquist, and Rozenas (2013).

exchange are also associated with similar levels of economic development (Grossman and Rossi-Hansberg 2012), which are in turn associated with peace (Gartzke 2007).

In these ways, the effect of internal characteristics are multiplied through relationships with other states in a non-linear fashion. The attractiveness of a domestic banking system is enhanced by its ability to develop a set of dyadic relationships. This, in turn, bestows power on governments of these markets over and above their internal attributes: relatively small economies, such as Switzerland or Luxembourg, may be able to “punch above their weight” in international financial negotiations by virtue of their attractiveness to their peers. This power functions at an intermediate stratum: it is “higher” than a monadic attribute, as it exists at the level of the dyad, but does not describe a systemic phenomenon. It describes the relationship between subsets – pairs – of national economies, rather than the entire world economy. Nevertheless, these relationships are quite important in world politics as the expansive literature on diffusion, contagion, and spillovers emphatically demonstrates.

While political economy studies which include dyadic interdependence have made impressive gains over prior research, there are several limitations to spatial models that have recently been discussed in the literature. These are related but distinct: two are primarily methodological but have theoretical implications, while the other is primarily theoretical but has methodological implications. The primary methodological concern is that, like other regression-based approaches, spatial models assume that dyadic relationships are observed independently from each other and are identically distributed (Ward, Ahlquist, and Rozenas 2013). This has two implications. First, it assumes that dyad $i - j$ is unrelated to dyads $i - k$ and $j - k$ and that these, in turn, are not affected by any other dyads. In the present analysis, this would involve an assumption that a banking relationship between the United States and Ireland is not conditioned by banking relationships between the United States and the United Kingdom and the United Kingdom and Ireland or any of the other

banking relationships in the world economy.¹¹ Not only is this methodological assumption quite strong, it is in opposition to most general theories of international political economy.¹² Therefore, many dyadic analyses either contort theory to fit the assumptions of the model and/or data structure – e.g., by positing a simple dyadic relationship rather than something more complex – or they involve statistical analyses which contradict theory in potentially meaningful ways.

A secondary methodological implication is that the data are multiplied in dyadic analyses (Cranmer, Desmarais, and Menninga 2012). For example, in the statistical analysis conducted below there are 217 banking jurisdictions. A dyadic specification of cross-national banking relationships could contain up to 47,089 undirected observations or 94,178 directed observations per time period, each of which are treated as independent from the others.¹³ Because I examine eleven time periods, the number of observations could be as high as 1,035,958. This inflation of observations can artificially reduce standard errors, thus creating problems of inference and in particular increase the likelihood of committing type I error. The severity of this problem in any particular case is unknowable and untestable, but it is likely to be non-trivial in many cases (Oatley 2011; Cranmer, Desmarais, and Menninga 2012). Spatial analyses have unquestionably improved upon prior studies which assumed no dependence within dyads, but challenges remain.

¹¹Noting this problem, Neumayer and Plümper (2010) attempt to overcome it by specifying a variety of spatial dependencies in increasingly-complex weighted matrices. Nevertheless, the unit of analysis remains the dyad and the only dependencies which can be modeled in this context are intra-dyad, so the problem is at best lessened rather than eliminated.

¹²“General theory” is not meant to imply “grand theory”, although it is inclusive of it, but also mid-range theory which posits a system of competition (or other complex interdependency) in the world economy such as a “race to the bottom”. I know of no general theory in IPE which does not involve such a claim.

¹³In the Neumayer and Plümper (2010) study of bilateral investment treaties, the creation of 555 BITs is analyzed using 38,395 observations of 2,411 dyads.

2.5 Systemic sources of power in global banking

The last limitation of spatial analyses is theoretical. Neumayer and Plümper (2010) note that spatial analyses cannot account for endogeneity. In some studies this may be concerning simply for methodological reasons, and various statistical “fixes” may be proposed, but in theories of banking this is a matter of theoretical importance. Many endogenous processes are considered to be important in financial markets. Among them are confidence, herding, reputation, information processing, “animal spirits”, and other cognitive-behavioral factors which may operate at the level of the individual or firm to condition the broader competitive environment. The competitive environment may also involve endogenous processes. Consider a prominent financial institution, a fictional First National Bank of the United States, which generates significant business despite not offering higher interest on deposits or lower interest on loans. How does it do it? Because of its brand: it has previously attracted a lot of business, which makes it more likely to attract business in the future. Its *ex ante* prominence gives it a competitive advantage quite separate from its attributes. The fact that the First National Bank was able to gain customers initially may have been related to its internal characteristics, but absent extreme mismanagement positive feedback mechanisms can guarantee that it gets more business over time.¹⁴

At the stratum of the system, endogenous structural processes may grant power to some national banking systems over others. This power arises from the set of relationships in a system, which can be theorized and analyzed as a network: a social structure which is defined by the entire set of entities and the relationships contained between them, rather than a collection of dyadic subsets treated independently from each other. Thus, “systemic” refers to the entire ecology of banking relationships which exist globally. It does not mean “international” in the sense that traditional levels-of-analysis studies following Waltz (1959)

¹⁴This is known as “fitness with preferential attachment” (FPA) and is discussed thoroughly in Oatley et al. (2013). FPA suggests that *ex ante* quality can provide an initial advantage which is exacerbated over time through preferential attachment mechanisms such as those described below.

often use the term, nor is it merely “transnational” in the sense that Keohane and Nye Jr. (1977) describe.¹⁵ As such, in this context a network is closer to the conceptualization of systems commonly used in neo-Marxist critical theories (Wallerstein 1974; Strange 1982), but draws primarily from contemporary network science (Barabási 2012).

Conceptualizations of power within networks are not new to political science. Hart (1974) extended the relational depiction of power from Dahl (1957) into a graph theoretical construct.¹⁶ Knoke and Burt (1983) defined prominence within network structures as being meaningful for influencing the network, while Knoke (1990) explicitly operationalized power in networks as resulting from prominence. More recently, Hafner-Burton, Kahler, and Montgomery (2009) and Carpenter (2011) have looked at various kinds of simple networks in international politics, noting that position within a structure might confer particular types of influence in particular situations. Cohen (2009a) recommended network analysis as a way of locating power in monetary systems.

Earlier applications of network science to international politics have generally not emphasized the complexity that exists in most real-world networks (Barabási and Albert 1999; Clauset, Shalizi, and Newman 2009), including political and economic networks (Cranmer and Desmarais 2011b; Cranmer, Desmarais, and Kirkland 2012; Cranmer, Desmarais, and Menninga 2012; Oatley et al. 2013; Ward, Ahlquist, and Rozenas 2013). Complex networks are defined by non-trivial topologies, meaning that they contain structural processes which are endogenous to the network and are causally important drivers of future network developments. These processes powerfully impact the performance of the network but do not derive from characteristics of any of the individual units or dyads within it. Nevertheless, they are features of the system and they affect units within the system in heterogeneous ways. Some units will be beneficiaries of these processes while others suffer. Two types of

¹⁵Although the entire set of complex interdependencies described by Keohane and Nye comes much closer to the idea.

¹⁶A graph is a particular type of representation of a network.

structural processes are most significant for the present analysis, as they correspond to our concern with influence and autonomy in global banking: one type describes the hierarchical ranking of countries' prominence within the system, while the other concerns relationships beyond pairs of countries.¹⁷

Many complex networks exhibit preferential attachment, which is a stochastic process by which new relationships in a network are distributed as an increasing function of the existing distribution of relationships. That is, under a preferential attachment rule, banking systems which attract much finance from foreign banks will tend to attract more at an exponential rate. In its purest form the distribution of relationships will conform to a power-law distribution (Barabási and Albert 1999).¹⁸ The banking system which attracts all of these links is advantaged relative to its peers. It receives finance beyond what its internal or shared attributes would suggest. And because this banking system attracts a disproportionate amount of the world's capital, it possesses autonomy: it is not dependent on any particular part of the network because it draws from the whole. The converse is not true. Most of the other parts of the network are dependent upon the prominent banking system, increasingly so over time (Oatley et al. 2013).

Banking sectors which are not the most prominent as measured by an ability to attract the most (or the strongest) relationships may still be influential by linking together other parts of the network. For example, a country j which provides a path connecting otherwise-isolated i and k gains power by functioning as a bridge. To the extent that the global economy becomes increasingly regionalized these bridges become increasingly important as the sinew which holds together the overall structure. In networks, bridges which

¹⁷Systemic assortativity can exist in networks as dyadic assortativity exists does in spatial analyses, but other effects are unique to networks and cannot be uncovered in a regression where the unit of analysis is the monad or dyad.

¹⁸Clauset, Shalizi, and Newman (2009) note that true power laws are somewhat-rarer than is often claimed, but conclude that whether distributions conform to a power law is generally less important for network performance than that the distribution is heavily skewed.

connect clusters are sometimes more influential even than the most strongly-connected units (Granovetter 1973). They provide outlets and access to information which would otherwise be unavailable to the mass of the network. Moreover, once i and k are indirectly linked by joint association with j , they are more likely to become directly linked to each other through a process known as “triadic closure”: friends of friends are more likely to become friends than a randomly-selected pair.

These triadic relationships may be especially important in the development of the global banking system. Consider the relationship between the United States, the United Kingdom, and Hong Kong. The latter two developed strong financial relationships during the course of the 20th century as the result of British imperialism, but the significance of this relationship went beyond the direct tie. Because the U.K. maintained a simultaneous relationship with the U.S., Hong Kong had indirect access to New York, and New York had indirect access to China. Over time Hong Kong and the U.S. established a direct relationship, but had the U.K. not provided an initial path between the two that likely would not have happened as rapidly, or perhaps not at all. More generally, the fact that j is conducting business with k sends a signal regarding k 's quality which i might not otherwise be able to ascertain. If i trusts j , which is likely if they maintain a relationship, then i will be more likely to initiate a relationship with k than it otherwise would. In practice, we frequently observe such dynamics in financial markets: if a sufficiently prominent j develops a new relationship with k , then i senses an opportunity. And not just i . h and l may also become attracted to k if they are first connected to j (or i). Each of these reflects a triad being closed.

Of course, bridges may also be well-connected generally. In the above example the U.K.'s power in global banking does not exclusively obtain from its provision of a path between the U.S. and Hong Kong; the U.K. has many other ties as well. Particularly in global banking, it may be the case that some countries are prominent both in terms of the amount of strong direct connections they attract and the number of indirect connections

they provide for other countries to be linked together. In a hegemonic system, such as that intuitively described by Strange (1987), one country may provide the most pathways and attract the strongest links. Such a country would have a great deal of autonomy and influence; actions taken by that country would have far-reaching implications, and it would be protected from exposure to idiosyncratic events elsewhere because of its broad base of strong connections. Oatley et al. (2013) suggests that the United States serves in that capacity today.

From the perspective of financial stability, these structural processes are highly salient. When preferential attachment is occurring rapidly, or when many triads are being closed over a short period of time, the systemic outcome may resemble “hot money” flows, “capital bonanzas”, and other developments in financial markets which have frequently been observed. Previously these behaviors have been explained, or explained away, by references to psychology which suggest that they are in some way irrational. Keynes (1936) famously called them “animal spirits”. Alan Greenspan referred to one such process as “irrational exuberance”. The aggregation of individual actions lead to speculative bubbles (“manias”, to Kindleberger and Aliber (2005)) which eventually culminate in crisis (Minsky 1986). A reference to endogenous structural processes provides a framework within which these psychological accounts may be embedded. Rather than being irrational, rapid changes in the organization of the global financial system can be modeled as endogenous processes: investors place assets where other investors are placing assets because the attractiveness of these locations are partially determined by their ability to attract assets.

As these processes operate over a sustained period of time, risk in global banking becomes increasingly concentrated. As risk becomes concentrated, so does power: the ability to affect the *entire* system, rather than just a partner (or potential partner) in a dyad. Because prominent countries (or firms) are strongly connected, the performance of the entire system depends on them. This confers significant advantages over competitors. It is easier for

prominent nodes in networks to attract new relationships and strengthen existing ones, thus granting autonomy from the influence of any particular nodes. At the same time, bridges which connect other nodes to each other have influence over the nodes being connected. These types of structural processes, which are known as “dyadic dependence” in the networks literature, cannot be analyzed empirically when the unit of analysis is monadic or dyadic.

2.6 Hypotheses

The preceding discussion suggests that monadic, dyadic, and systemic factors should influence the formation of ties in global banking. The question of which factors are important at each strata remains. Monadic factors include internal attributes of states, such as macroeconomic fundamentals and political institutions. Dyadic factors involve shared characteristics between two national banking systems. Systemic factors involve dynamic processes which shape the evolution of the network over time. Specific expectations are summarized in table 2.2.

Prior theory as well as the theoretical discussion above would expect the size of a country’s national economy and banking system to positively impact its ability to attract foreign bank finance. Indeed, in some prior analyses these have been the predominant source of financial power (Simmons 2001; Drezner 2007). Foreign banks wish to have access to large markets, liquid markets, and growing economies. Large banking sectors will be better able to supply funds internationally as well. Economic variables may not have a strictly monotonic effect however, for reasons related to network structure. If an economy receives a large amount of foreign funds into its banking sector because of its size, then its financial markets will become deeper and more liquid. This, in turn, may attract additional investment. As a national economy becomes a hub for global banking, its ability to continue to develop new relationships will grow as a partial function of its previous relationships.

Thus, the initial positive impact of GDP and growth on tie formation may become decoupled, with the rate of new financial relationships increasing faster than economic growth. Such a country may continue to successfully form new connections even if growth slows or stops, while another country may develop a similarly-sized economy but receive many fewer assets from foreign banks, as it has fewer existing links from which to draw. Thus, the effect of the size – or growth rate – of a national economy on its ability to generate interest from outside banks may be conditioned by its body of connections to others. In general, we might expect a country's macroeconomy to have a greater impact on tie formation at low levels (i.e. when links are new, and thus relatively weak) than at higher levels (i.e. when ties are quite strong), at least if structural processes influence network performance.

Other macroeconomic factors could matter. A country's national accounts are related to the foreign financial relationships it maintains. If capital is flowing into a country, it must also import more than it exports. But countries with large current account deficits may also be less attractive investment partners for banks. Competition will be stronger and default risk will be higher, so opportunities for a high risk-adjusted return may be limited. If a country experiences a financial crisis it should experience capital flight, which is a weakening of the cross-national linkages, although whether this is less likely when ties are strong or weak is not clear. Strong ties may be able to withstand a crisis, even a major one such as the subprime crisis after which the U.S. experienced capital inflows as a result of "flight to safety", while weak ones do not, as evidenced by capital flight from East Asian countries in the late-1990s. On the other hand, crisis prevalence is more likely if a contagion effect exists. If this is the case then we may observe a positive relationship between crisis and the existence of ties as crises spread across the tie distribution.

Political variables may also have an impact on network development. Much political economy literature is concerned with the properties of regime type as it pertains to international economic relationships. While any sort of comprehensive survey is beyond the

scope of this paper, democracy has not only been given credit for international peace – at least among some sets of dyads – but trade openness (Milner and Kubota 2005),¹⁹ foreign direct investment (Jensen 2008), and a host of other outcomes which are generally considered to be normatively desirable. While the precise mechanisms are not always clear, there is a overall sense that democratic regimes are inclusive, and inclusive politics reduces the political risk of expropriation while providing a stable environment for investment (North and Weingast 1989; Acemoglu and Robinson 2012). As such, a baseline political economy model would expect democracy to be associated with the existence of cross-national banking relationships as it is with other international economic outcomes.

In a complex network conceptualization, however, we may be skeptical. Prominence in the global banking system has remained with the U.S. and U.K. for decades if not longer (Oatley et al. 2013). These countries are democratic, it is true, but so are many others. Successive waves of democratization have not eroded the prominence of the U.S. and U.K., not can regime type explain why the U.S. and U.K. are so much more prominent in global banking than consolidated democracies like Australia or Spain, much less non-OECD democracies. It may be the case that an inclusive political system is a prerequisite for the establishment of many and strong international banking linkages, but it cannot be a guarantee of it. Thus, a complex network theory would de-emphasize the importance of regime type as a determinant of patterns in global banking, particularly at higher strata in the network.

The same may be true of policies related to regulation. Regulation at both the national and global levels is given quite a lot of attention in the international and comparative political economy literature on banking. As noted above, the general conclusion is that lax regulation should facilitate a “race to the bottom” in lending standards, so international

¹⁹Though see Oatley (2011).

banking should flock to those jurisdictions.²⁰ There are at least three reasons to be skeptical of these claims. First, “race to the bottom” behavior is sporadic or at least inconsistent in other parts of the global economy, as noted above. Second, if the literature on financial power previously mentioned is correct, that power is as often used to *strengthen* regulations rather than weaken them as stronger regulations create barriers to entry which protect incumbents (Oatley and Nabors 1998). Finally, the distribution of financial power is remarkably durable across countries and time; particularities in regulatory structures are not. When we observe change in an independent variable but no change in a dependent variable, we should suspect there is not a strong relationship between the two.

I include two regulatory variables to be sure. While not comprehensive, they get at two key elements which might condition the attractiveness of a domestic banking sector to foreign firms.²¹ First, I consider how open a country is to foreign finance. Previous literature on the capital account has noted it that it may be used as a tool for financial protectionism, designed to induce prudence from domestic financial institutions (Rosenbluth and Schaap 2003). A network theory would suggest that capital account liberalization is a necessary condition for integration into the global banking network. A country cannot attract in-links without an open capital account. A contemporary example of this is China, which has integrated into global production and trade networks markedly over the past two decades, but is unimportant in the global banking system. The other variable I consider is the location of regulatory authority. Other literature has suggested that banks benefit from preferential monetary policies when regulated by central banks (Winecoff 2014). If this is the case, then domestic firms may be privileged when central banks regulate, thus entrance

²⁰Often tax havens are also categorized this way, although the two should be distinct: moving business to a low-tax jurisdiction (e.g. the Cayman Islands) is qualitatively different from moving to a low-regulation jurisdiction (e.g. East Asia, at least in the 1980-90s (Kapstein 1989; Oatley and Nabors 1998; Walter 2008b)), even if in practice the two may correlate.

²¹Comprehensive international data on regulatory policies do not exist, but another chapter of this dissertation suggests that their effect on firm behavior is somewhat idiosyncratic.

by foreign firms may be dissuaded.

Assortative mixing may also impact bank relationships which extend across dyads. Regional economies such as the European Union, NAFTA, ASEAN, and others will incentivize the development of financial relationships which facilitate trade and investment, so we should expect homophily according to geographical proximity. Most connections will take place between countries in relative high income groups as well. Once controlling for these factors, however, homophily will not necessarily extend to common political systems. It is a long running theme in political economy that global capital is concerned with return. So long as investments are not at risk of expropriation, regime type affinity should be, at most, a secondary concern.

Structural processes should also play a large role in the banking network. There are two basic types of structural processes in which we are interested: those which pertain to direct and indirect links between national banking sectors. The collection of direct links in the network forms a degree distribution. Those countries which are tied to many other countries have a higher degree – are more prominent – than those which are not tied to many others. Future tie formation will be a function, in part, of past tie formation: countries which have many cross-national banking ties will tend to attract new ones. This is known as preferential attachment. Indirect links involve connections through shared partners: if both the U.S. and U.K. are tied to Germany, then the U.S. and U.K. are linked indirectly through Germany whether or not they are linked directly. When countries have a shared partner they will be more likely to become directly tied to each other.

2.7 Data and Models

The dependent variable is constructed from the Bank for International Settlements (BIS) consolidated banking statistics on an immediate borrower basis, which are available from 1999-2012.²² These data are egocentric: the BIS collects information on the

²²For more information about these data see http://www.bis.org/publ/qtrpdf/r_qt0509f.pdf. While BIS data is available through 2012, most of the country-level covariate data are not. Therefore, I restrict the analysis

Variable	Direction	Stratum
GDP	+	Low
GDP growth	+	Low
Current Account	-	Low
Banking Crisis	-	Low
Banking Sector Size	+	Low
Regulatory Central Bank	-	Low
Capital Account Openness	+	Low
Joint Democracy	+	Medium
Shared Region	+	Medium
Same Income Level	+	Medium
Preferential Attachment	+	High
Shared Partners	+	High

Table 2.2: *Hypotheses concerning the relationship between monadic, dyadic, and systemic variables on the formation of the global banking network.*

amount of cross-national claims that a subset of countries have on all countries, but the reciprocal information is collected for only a subset of countries. As an example, the BIS data includes the dollar amount of claims that all American banks have on all South African banks, but not the amount that South African banks have on American banks. This raises the question of whether all the data should be analyzed, or whether we should restrict the analysis to include only ties which are (or could be) reciprocal. In such situations Gile and Handcock (2006) recommend using all the data, and I follow their advice.

Country-level macroeconomic and locational data – income class, regional classification, nominal GDP, GDP growth, current account balance (% GDP) – comes from the World Bank World Development Indicators database, while financial data come from the Bureau van Dijk BankScope database. The BankScope database contains detailed information at the firm level of thousands of financial institutions around the world. To create the variable for size of the banking sector, I summed the amount of assets controlled by commercial banks and bank holding corporations for each country-year in the sample.

to the years 1999-2009.

I also include the Polity2 measure of regime type from the POLITY IV dataset, the capital account openness variable described by Aizenman, Chinn, and Ito (2008), the banking crisis measure compiled by Laeven and Valencia (2008, 2010, 2012), and a dichotomous measure of whether a national banking system is regulated by a central bank or another institution. This variable was constructed from the Bank Supervision surveys conducted in 1999-2000, 2003, 2005-2006, and 2011 by the World Bank (Barth, Caprio Jr., and Levine 2013). Where there was no change in the location of regulatory authority from one survey to the next, I expanded the data to cover all years. When there was, I supplemented the data with information from national authorities to uncover the timing of the institutional shift.

The theoretical framework developed above anticipates power in global banking to be located at the monad, dyad, and system and to occur at multiple strata. Therefore, an empirical model seeking to analyze the plausibility of the theory must be able to incorporate monadic, dyadic, and systemic effects. Until recently no inferential statistical models were capable of doing so. Perhaps for this reason, most prior analyses of the political economy of global banking have been historical, interpretivist, or otherwise qualitative (Helleiner 1994; Kapstein 1994; Germain 1997; Oatley and Nabors 1998; Simmons 2001; Drezner 2007; Helleiner 2011). There have been few quantitative inferential analyses of the political economy of global banking; those which do exist have used regression models which assume independence of observations and thus exclude structural processes (Broz 2012). Previous network analyses have been descriptive (Oatley et al. 2013).

Since their development by Wasserman and Pattison (1996), exponential random graph models (ERGMs, also called p^* models) have provided a way of evaluating the importance of structural processes alongside monadic and dyadic characteristics by evaluating the effect of a set of covariates and network tendencies on the probability that ties will form between nodes. ERGMs treat networks as a single observation, rather than a collection

of many independent dyadic observations.²³ Because the assumptions underlying ERGMs match the theoretical arguments made above, I use them to explore the determinants of global banking relationships. To illustrate the usefulness of ERGMs in this context, I compare their results to a standard linear regression as described below.

Cranmer and Desmarais (2011b) provide a full derivation and discussion of ERGMs. Briefly, ERGMs evaluate the likelihood of observing a network of ties $Y = [Y(i, j)]$ between all nodes i and j in the network, given an observation of ties y and node attributes X . More formally, ERGMs are denoted by:

$$Pr_{\theta}(Y = y|X) = \frac{\exp(\theta^T g(y, X))}{\kappa(\theta)} \quad (2.1)$$

where Y is a random network connecting n nodes, θ is a vector of maximum likelihood parameters, $g(y, X)$ is a vector of network statistics on y , and $\kappa(\theta)$ is a normalizing function which ensures that the above equation is a legitimate probability distribution:

$$\kappa(\theta) = \sum_{\text{all possible } y} \exp\{\theta^T g(y, X)\} \quad (2.2)$$

In other words, ERGMs attempt to find the probability, given our model, that we *would* observe the network that we *have* observed over the possible networks we *could* have observed. In many ways ERGMs are similar to logistic regressions, with the difference that ERGMs allow for the inclusion of structural terms that are disallowed in logits by the assumption of independence of observations. ERGM coefficients are interpreted as affecting the likelihood of tie formation relative to a null model: a positive parameter indicates that higher values of a variable are associated with a higher likelihood of tie formation, controlling for the effect of the other variables in the model as well as network dependencies.

²³This is not trivial. Because the network is the unit of analysis, there is no need to assume that components of the network – nodes and ties – are independent and identically-distributed observations of the outcome of interest. Such an assumption is required in a regression framework. It also reduces inferential problems associated with inflated sample sizes in many dyadic analyses as discussed above.

In this way, the interpretation of coefficients estimated by ERGMs is similar to the interpretation of logistic regressions, but with dependence built into the functional form of the model.

Many of the components of these equations have analogues in commonly-used regressions. Y is the outcome we are interested in explaining. X is group of covariates with Y , similar to regressors. θ is parameter relating X to Y , estimated by maximum likelihood. If dyads (i, j) are independent from each other, the model reduces to a logit model of the probability of a relationship forming between i and j :

$$\text{logit}(Y_{ij} = 1) = \theta^T \delta[g(y, X)]_{ij} \quad (2.3)$$

where δ_{ij} is the change in probability if y_{ij} changes from 0 to 1 (or vice versa). This would happen if the dependence terms in a network model have no impact on outcomes, which is the assumption underlying regression-based methods. However, if this assumption is not valid the difference between a logistic regression and an ERGM may be quite stark (Oatley 2011; Cranmer and Desmarais 2011b; Ward, Ahlquist, and Rozenas 2013).

There are several problems which commonly occur in ERGMs. First is the problem of degeneracy: the specification of a model so poor-fitting, so unlikely to have generated the network under observation, that the ERGM cannot be estimated. The probability of degeneracy increases when variables are included which do not improve the fit of the model, and when complex higher-order structural processes are present. In other words, degeneracy is a punishment for “kitchen-sink” modeling strategies and for the specification of atheoretical models,²⁴ but is also related to the complexity of the network itself: a more complex network will be more difficult to model. Each additional parameter added to an

²⁴A corollary is that including many different “control” variables, which have no explanatory power, are even less useful in ERGMs than they are in linear regressions (Achen 2005; Schrodtt 2010).

ERGM increases the chance that the model will be degenerate, so the estimation procedures of ERGMs force the modeler towards a specification which is a reasonable fit to the data. This is often more of an inductive process than model specification in a regression context.²⁵

A second problem is computational. ERGMs can be estimated in two ways, each of which involves complications: via maximum pseudolikelihood (MPLE) or by Markov chain Monte Carlo simulations of the maximum likelihood (MCMC-MLE).²⁶ MPLE parameter estimates are unbiased, but comparative studies have shown a tendency toward a suppression of variance and inconsistent estimation of confidence intervals (van Duijn, Gile, and Handcock 2009). Therefore, from the perspective of inference, MPLE estimation will tend to overstate the statistical significance of estimated parameters, although this tendency diminishes with larger samples (Liu, Yu, and Edwards 2010). MCMC-MLE estimations are much more computationally complex (especially for large networks) and may not converge on the target distribution even after a large number of simulations.

The global banking network is large and quite complex. MCMC-MLE estimation of cross-sectional ERGMs did not converge after running on 96 gigabytes of RAM for a week even when the model contained few terms. Moreover, there may be intertemporal dependence, such as serial correlation, which drive network formation. Estimation of these models would be even more difficult using MCMC-MLE simulations. Therefore, I employ the temporal ERGM (TERGM) developed by Desmarais and Cranmer (2012), which estimates via MPLE and then corrects inconsistency in the standard errors through a bootstrapping resampling algorithm. I compare the TERGM results to a logit model with fixed effects

²⁵As model degeneracy informs us when we have specified a sufficiently ill-fitting model, it is a lesser problem from the perspective of inference than omitted variable bias, for which there is no warning. I return to this point later.

²⁶The MCMC-MLE approach simulates the joint likelihood of the ties, while MPLE replaces the joint likelihood with the product of the conditional probability of the ties given the other ties. See the detailed discussion of these two approaches in Cranmer and Desmarais (2011*b*), pp. 74ff.

for time period to highlight the inferential benefit from using a network model motivated by theory.²⁷ Using this approach, the TERGM coefficient estimates remain unbiased, and problems of inference which sometimes appear in MPLE calculations are mitigated.

There is another potential problem associated with ERGMs. First, ERGMs are incapable of estimating weighted networks, in which relationships can take on values other than zero or one.²⁸ Obviously, in the global banking system the strength of a relationship may be as important as its presence or absence. Moreover, in the theoretical framework presented here the stratum at which a relationship exists is quite important: the U.S. and U.K. have a relationship that is not qualitatively similar to the relationship between the U.S. and Estonia. These problems can be overcome, or at least moderated, by “thresholding” the network: considering whether a relationship exists at different strengths, and then coding a network at that level.

The process of threshold selection is fundamentally arbitrary, meaning that there is no statistical rule for choosing thresholds, but can also lead to substantively interesting data analysis. The theoretical section discusses effects which occur at different strata, and thresholding can isolate these strata. The global banking system is highly concentrated: most countries have few connections, while a few have many. In all years the modal tie weight is zero even after restricting the out-degree of nodes which cannot send ties by data construction, and the median is a very small fraction of the mean. In some years the median and mode are both zero. For this reason, the presence or absence of a tie of connecting national banking systems of any strength is a good operationalization of the lowest stratum. As the median is so close to the presence/absence dichotomy, the 75th percentile is better as an intermediate stratum. In all years the mean is much higher than the 75th percentile,

²⁷All models were estimated using the statistical software R. I thank Skyler Cranmer and Zhengqi Pan for sharing TERGM code. Other models use the `ergm` and `arm` packages.

²⁸That is, they have been mathematically derived but are not yet implemented in software.

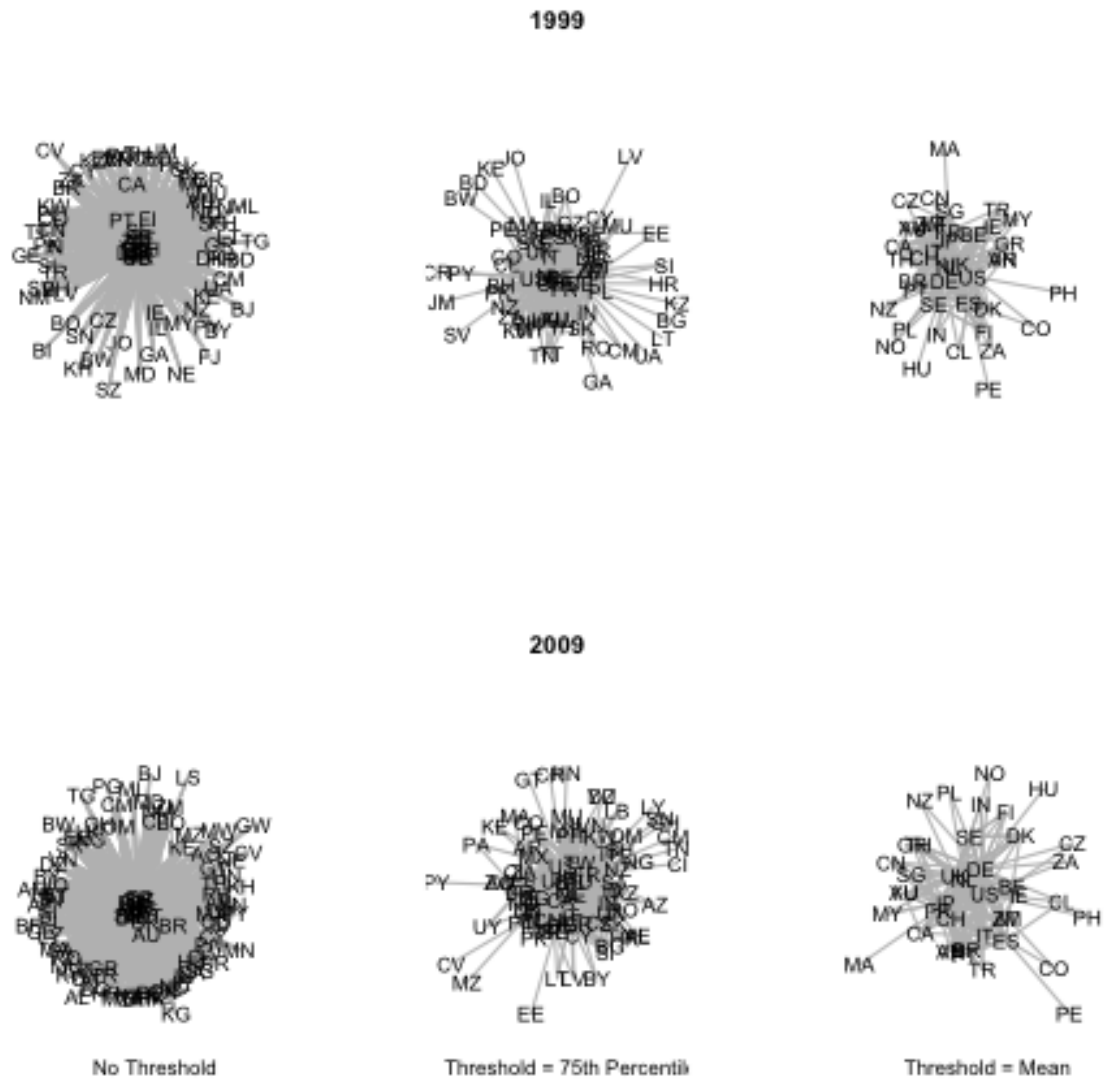


Figure 2.1: Snapshots of the global banking system in 1999 and 2009, at the three thresholds modeled below: any connection between countries, connections at the 75th percentile of in-degree strength or higher, and connections at the mean in-degree strength or higher.

indicating that the degree distribution is quite hierarchical.²⁹ As such, I use the mean as the highest stratum. The network thins noticeably at each threshold but there remains a substantial amount of activity in each, as shown in figure 2.1. When the threshold is simply the presence or absence of a relationship there is a clear core-periphery structure. This basic structure remains as the network is thinned, but becomes less pronounced.

Thresholding is a limitation but it also provides opportunities for examining which variables are important in driving which kinds of relationships. In particular, we are interested in which variables affect prominence at which strata. As monadic effects are additive, we expect them to operate most intensely at the lowest stratum, where the network is considered as the presence or absence of a banking relationship. Dyadic effects are multiplicative, and should occur at the intermediate stratum. Systemic higher-order effects are exponential, and should be the driving force in network formation at the highest stratum. In this way, the statistical necessity of thresholding may be used as a tool for exploring the plausibility of the theory. Without thresholding we would typically estimate average effects across the entire network; such averaging could lead us to miss where in the network which variables are important. With thresholding we can isolate the impact of effects at distinct strata.

2.8 Results

Table 2.3 shows the results from logistic regression and temporal exponential random graph models at three thresholds: presence or absence of any tie between national banking systems, the existence of a relationship at the 75th percentile of tie strength or above, and existence of a relationship at the mean tie strength or above. The comparison between the logit and TERGM models indicates the importance of an approach which can accommodate monadic, dyadic, and systemic variables simultaneously, as statistically significant effects exist at all intensities for the structural processes which are included in the model. Looking at relationships between exogenous covariates and endogenous processes at different strata

²⁹This is explored in greater depth in Oatley et al. (2013).

	No Threshold		Threshold = 75th Percentile		Threshold = Mean	
	Logit	TERGM	Logit	TERGM	Logit	TERGM
Edges	-110.89*** (8.63)	-2.29*** (0.20)	-67.95*** (9.84)	-1.30*** (0.10)	-149.67*** (15.00)	-1.52*** (0.16)
GDP	0.00*** (0.00)	0.00*** (0.00)	0.00*** (0.00)	0.00*** (0.00)	0.00*** (0.00)	0.00*** (0.00)
GDP Growth	-0.01** (0.00)	-0.02*** (0.00)	-0.02*** (0.00)	-0.03*** (0.00)	-0.01 (0.01)	0.00 (0.01)
Current Account (% GDP)	0.02*** (0.00)	0.02*** (0.00)	0.04*** (0.00)	0.02*** (0.00)	0.03*** (0.00)	0.02*** (0.00)
Banking Crisis	0.23*** (0.06)	0.42*** (0.07)	0.24*** (0.06)	0.04 (0.06)	0.14* (0.08)	0.13 (0.09)
Banking Sector Size	0.00*** (0.00)	0.00 (0.00)	0.00*** (0.00)	0.00 (0.00)	0.00*** (0.00)	0.00 (0.00)
Regime Type	0.04*** (0.01)	0.00 (0.00)	0.08*** (0.01)	0.01 (0.01)	0.15*** (0.01)	0.02 (0.01)
Regulatory Central Bank	-0.03 (0.03)	-0.13*** (0.03)	0.02 (0.03)	-0.09*** (0.03)	-0.06 (0.05)	0.09 (0.06)
Capital Account Openness	0.67*** (0.04)	0.51*** (0.04)	0.64*** (0.05)	0.22*** (0.05)	0.58*** (0.09)	0.20** (0.10)
Joint Democracy	-0.43*** (0.08)	0.05 (0.06)	-0.69*** (0.10)	-0.01 (0.10)	-1.45*** (0.18)	0.04 (0.20)
Shared Region	0.80*** (0.03)	1.16*** (0.04)	0.77*** (0.03)	0.87*** (0.04)	0.86*** (0.05)	0.71*** (0.06)
Same Income Level	0.01 (0.04)	0.03 (0.04)	0.66*** (0.04)	0.32*** (0.04)	1.37*** (0.06)	0.16** (0.08)
GW In-Degree		-7.41*** (0.24)		-6.69*** (0.15)		-4.95*** (0.16)
GW Out-Degree		-75.74*** (5.67)		-27.72*** (1.02)		-10.94*** (0.41)
GW DSP		0.44*** (0.02)		0.25*** (0.01)		0.12*** (0.01)
GW ESP		2.10*** (0.18)		0.98*** (0.07)		0.67*** (0.06)

Standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 2.3: A statistical comparison of logistic regression and temporal exponential random graph models. The former do not allow the inclusion of parameters capturing structural processes. All models contain fixed effects for year. TERGM standard errors are based on 1,000 bootstrapped iterations

is also vital, as different variables have effects which are statistically distinguishable from zero at different thresholds. The key result is that power in global banking, which arises from the ability to attract and supply bank finance internationally, is a function of internal characteristics of national political economies, dyadic similarities, and structural processes.

Previous political economy literature has argued that the size of a country's economy and domestic financial sector is the most significant factor in conferring financial power (Simmons 2001; Drezner 2007). These models provide partial support for these expectations. The logit models suggest that both GDP and the size of the domestic banking sector are significant predictors of tie formation at all thresholds. The TERGM complicate this inference: the size of a country's GDP is related to the attractiveness of a national economy to foreign banks at all thresholds, but the size of the domestic banking sector is no longer significantly related to tie formation once structural factors are included in the model. The network model thus leads to a different understanding of the ways in which key macroeconomic variables matter for forming cross-national banking relationships. Once structural processes are included, the existence of a deep and liquid banking market does not have an effect on tie formation that is statistically distinguishable from zero at any threshold. The size of the overall economy, however, is positively correlated with connections in all models.

There are two ways to interpret this. The first is to conclude that compellence and deterrence capabilities are not related to internal banking sector size as previous literature has suggested, but that a large overall economy does provide these mechanisms of influence and autonomy. This conclusion would be at odds with substantial amounts of prior theory and qualitative evidence. The second interpretation is that banking sector size is collinear with structural processes. The positive and significant coefficient on the logit models suggests that there is a linear correlation between banking sector size and banking interdependence. That the statistical significance of this effect goes away when the structural parameters are

included in the model thus indicates that the second interpretation is more likely correct: banking sector size may be endogenous to structural properties. An implication of this finding is that a model which does not include structural processes – that is, which assumes that country-year observations are independent – is prone to omitted variable bias. To the extent that banking sector size is related to power in global politics, it is as a consequence rather than cause.

Two other macroeconomic results are worth noting. First, the current account balance as a percentage of a country's GDP is positive and significant at all thresholds in both the logit and TERGM specifications. This may suggest that countries are able to attract foreign bank partners when their national accounts are in surplus, or that they supply bank finance to deficit countries to maintain the balance of payments. The effect of GDP growth is negative and significant at low thresholds but insignificant at the highest in both the logit and TERGM models, which indicates (as we would expect) that these relationships are the most durable.

Interestingly, in the TERGMs banking crises affect the probability of tie formation only at the lowest strata, and this effect is positive. It is unlikely that suffering from a bank crisis makes it more likely that foreign investors wish to become exposed to a country, so this result most likely reflects the sample period: nearly all of the banking crises from 1999-2009 occurred in 2008-2009, and these crises tended to hit highly-internationalized banking systems such as the United States, United Kingdom, Iceland, and Ireland. In particular, the positive relationship may reflect a contagion mechanism whereby countries exposed to the U.S. suffered from the spread of the subprime crisis. If so, this would further reflect the influence of the U.S. in global banking.

The differences between the logit and TERGM models are especially pronounced for some of the political variables. In particular, regime type is a significant predictor of attractiveness in the logistic regression at all thresholds but is insignificant at traditional levels

in the network models which include endogenous processes. Had the results been similarly insignificant across both classes of models we might conclude that these variables are “sticky”, meaning that they do not often change. But the differences across the models again suggests that a logistic specification may be prey to omitted variable bias by overestimating the effect of regime type. This qualifies the routine claim that more democratic countries are better able to reassure global capital markets, at least in terms of aggregated banking markets.

The opposite is true for the regulatory institution variable: the regression models show no effect which is distinguishable from zero, while the network models show that at the two lowest strata banks are less likely to be active in a foreign system in which domestic banks are regulated by their central bank. At the two lowest thresholds the significantly negative effect that locating a regulatory central bank has on forming ties provides an additional piece of evidence that domestic central banks may be working to provide a competitive advantage for the firms they regulate (Copelovitch and Singer 2008), and that this arrangement impacts financial market behaviors (Winecoff 2014). If bestowing rents prevents countries from gaining prominence in the global financial system this could actually work to reduce a country’s financial power.

Capital account liberalization is positively associated with cross-national banking relationships at each threshold, supporting the intuition that financial openness is a prerequisite for establishing cross-national bank ties. This has implications for the rise of emerging markets. There has been much speculation that emerging economies are poised to dominate global capital markets in the coming years; some accounts suggest that this is already happening (Cohen and DeLong 2010; Subramanian 2011). This analysis suggests that such conclusions are premature. Consider as examples the often-discussed BRIC countries – Brazil, Russia, India, and China.³⁰ If capital account liberalization is a prerequisite for

³⁰In 2009, their KAOPEN scores (on a scale of -1.86 to 2.44 where higher indicates greater openness) were 0.41, 0.15, -1.17, and -1.17 respectively. Anything below 0 is below the world mean, but for developed

power in the banking network then all of them are lagging behind the curve. After having a closed capital account for many years, Brazil modestly liberalized during the 2000s. But Brazil never reached anything near full openness, and they re-enacted capital controls following the global financial crisis. Russia's capital account was mostly closed until 2009, when several liberalizations were enacted. But these were fairly minimal, and they remain more closed than the typical country. India and China remain among the most closed countries in the world in terms of capital movement. These countries are most commonly believed to move into a global (rather than regional) leadership position due to their large populations, rapid growth rates, and increasing embeddedness in trade and production systems, but all of the reported models suggest that this is unlikely even absent higher-order structural processes, at least until they enact serious reforms.³¹

Dyadic variables are also related to the probability that national banking systems become linked, but like the monadic variables their statistical significance is sometimes affected by whether structural processes are included in the model or not. Assortative mixing according to regime type is negatively associated with tie formation at each threshold in the logit models but not in the TERGMs.³² Thus, both the individual and joint effect of regime type is overstated by the logit models which assume independence of observations.³³ The same is not true for regional proximity – which is significantly related to tie formation at all strata – or a similar income, which has a positive effect on international bank linkages that

countries the mean is 1.26. All of these countries remain much more closed to finance than they are to trade.

³¹There is some evidence that China is aware of this and is beginning to take action. But these steps have been very small. As a result, China's presence in global banking is slight; indeed, China is barely even observable in the network (Oatley et al. 2013).

³²Joint democracy is operationalized as both countries having a Polity2 score greater than or equal to 4. The results do not change if regime type similarity is operationalized as the same Polity2 score.

³³The same result has been found in other issue-areas (Cranmer and Desmarais 2011*b*). It is therefore worth considering whether this is true more generally in cross-national empirical work. If so, we might wonder why. One possibility is that, absent crises, democratic polities do not care about things like cross-national banking ties, economic sanctions, investment treaties, or the minutiae of trade policy. This would probably not surprise comparativists (Erikson, Mackuen, and Stimson 2008), but such contingencies are not yet well-developed in IPE models.

is statistically distinguishable from zero at the two higher strata in both model types. This suggests that, at least in terms of proximity and income levels, like is attracted to like. As discussed above, this assortative mixing can provide autonomy, by shielding countries from outside pressure. Recent regionalization efforts may be understood in this light, although the European crisis – which was only beginning as the sample period ended – may change this dynamic moving forward.

The network models strongly demonstrate the importance of endogenous structural processes in the global banking system. The effect of direct links is captured by two geometrically weighted degree (GWID and GWOD) terms in the model, one which captures the in-degree distribution (i receives bank finance from j) and one which captures the out-degree distribution (i sends bank finance to j).³⁴ These terms are analogous to more traditional k-star statistics, but are more parsimonious (Hunter and Handcock 2006). Rather than specifying a model which includes a separate parameter for 2-star, 3-star, 4-star, etc., the GWID and GWOD terms captures the general effect, geometrically weighted with a decay parameter. As such, these terms reflect “anti-preferential attachment” mechanisms which operate within the network (Hunter 2007). A positive coefficient indicates that the probability that an additional tie will attract future ties decreases geometrically with node degree. As we can see, both GWID and GWOD are negative and statistically significant at all thresholds, which provides strong evidence that preferential attachment is driving part of both the in-degree and out-degree distributions within the network: countries which strongly-tied to the rest of the network are more likely to attract new connections than weakly-tied countries even after accounting for the state of the rest of the network.

³⁴All of the geometrically weighted measures require specification of a decay parameter α . There is no statistical rule for how this should be done. Rather, the appropriate α is selected via an inductive process for improving model fit. In almost all cases the qualitative results do not change under different α although the quantitative results vary. That was true in my case. I specified these models under a wide variety of α . The substantive interpretation of the results was consistent, although several magnitudes changed. The models I report are some of the most conservative models, i.e. those in which the structural processes were given a relatively low weight.

We are also interested in the effect of indirect ties. The geometrically weighted edge-wise shared partners statistic (GWESP) measures whether national banking systems which are tied together are more likely to have more than one shared partner than would be expected by chance. For example, if the U.S. and U.K. are tied to each other, we would expect them *both* to be tied to others, such as Germany, Canada, or France. The geometrically weighted dyadwise shared partners statistic (GWDSP) indicates whether countries with shared partners tend to cluster together whether or not they are directly connected.³⁵ In other words, if two national banking systems share one partner, then GWDSP estimates whether they are more likely to share other partners. When GWESP and GWDSP are included in the same model, as they are here, GWDSP represents the base effect of having shared partners – the effect when there are no direct ties between two countries – while GWESP isolates the effect for banking systems which are directly connected. Both terms are positive and statistically significant, indicating that shared partners are not attracted randomly. This indicates that triadic processes are present and salient in the global banking system.

Taken together, the endogenous effects are quite powerful at all thresholds. They indicate that power in the global banking system, as operationalized by the ability to attract and send finance capital across national borders, is driven in large part by structural processes. Thus, inequalities in global banking are likely to become exacerbated over time irrespective of the internal properties of countries or shared attributes of them, although some monadic and dyadic factors also contribute. The structural variables are highly statistically significant and substantively large at every threshold in the network models, even when the size and significance of other variables weakens. At higher strata of the network, much of the activity is determined by structural properties rather than country attributes.

³⁵GWESP and GWDSP are analogous to the alternating k-triangles and alternating 2-paths statistics, respectively.

These results provide strong support for the speculation of Oatley et al. (2013) that preferential attachment mechanisms are important in global finance, additionally suggests that higher-order processes such as triadic closure are present, and suggests that empirical or theoretical models which do not account for complex interdependencies are likely to lead to false conclusions.

2.9 Summary and Conclusion

Processes that operate at the level of the system are of increasing concern for policy-makers in the wake of the global financial crisis (Haldane 2009). Regulators have shifted focus from the internal attributes of individual firms (“too big to fail”) to the structure that arises from the connections between them (“systemically important financial institutions”, or “SIFI”). Post-crisis domestic and international regulatory reforms have thus placed greater emphasis on the supervision and control of these prominent units, and place greater regulatory burdens on them. In the recent revision of the international Basel capital accords, for example, SIFIs may need to maintain 40% higher equity-to-assets ratios than other firms because of their systemic risk. Institutions which engage them as counterparties will also be required to maintain additional capital as protection against counterparty risk. Thus, the Basel Committee recognizes that system stability depends on the ways in which institutions are interdependent, which is not a pure function of size (Bank for International Settlements 2011). So there is an increasing understanding that not only should regulatory efforts not be conducted only at local levels, they should be less concerned with the risk-taking activities of individual firms and more concerned with the broader system of financial linkages.³⁶

Despite the increasing importance given to system structure by policymakers, awareness of it has so far not percolated far into international political economy scholarship,

³⁶While regulators place increasing importance on systemic risk and patterns of connections, they have not articulated a clear sense of which systemic properties they believe to be important. This remains an important question for future analysis.

where theories of interdependence are often presented in terms of diffusion.³⁷ Some of these processes include norm diffusion (Abdelal 2007; Chwieroth 2007, 2009), competitive pressures generating a “race to the bottom” (Elkins, Guzman, and Simmons 2006), competitive pressures generating a “climb to the top” (Prakash and Potoski 2007), the spread of liberalization as a general phenomenon (Simmons and Elkins 2004; Pitlik 2007), and policy diffusion based on national similarities (Brooks 2007) or multinational production chains (Greenhill, Mosley, and Prakash 2009). While this literature has made many theoretical and empirical advances, studies of diffusion are concerned with the spread of policies rather than outcomes (Gilardi 2012). Moreover, diffusion is only one type of interdependent process, and does not consider the overall structure of relationships to be meaningful, insofar as diffusion analyses typically do not include endogenous processes.³⁸ Very little work in international political economy has considered structural dynamics in a theoretical context which employs an inferential quantitative methodology.³⁹ A major goal of this study is to try to address that gap, using the most thorough extant data available to shed light on a question of obvious importance for conceptions of power in the world economy: what drives developments in the global banking system?

In the six years since the onset of the global financial crisis *International Organization* has not published any research articles related to the crisis, limiting its discussion to a single post-crisis survey of the pre-crisis literature on financial regulation (Helleiner and Pagliari 2011). *International Interactions* published a highly-critical set of commentaries on the state of international political economy in light of the crisis. The *Review of International Political Economy* has had two special issues related to the crisis. The most recent, in 2012, concerned the governance of global financial markets from a variety of perspectives;

³⁷When they are considered at all (Keohane 2009).

³⁸Diffusion analyses posit a relationship between some unit *i* and another unit *j*. Such an analysis is thus *relational* but it is not *systemic*: a diffusion analysis might not pick up the effect of unit *k* (and *h* and etc.) on both *i* and *j*. A network analysis would.

³⁹An important exception is Ward, Ahlquist, and Rozenas (2013).

no articles examined how these markets are formed or how they perform. The previous special issue, from 2009, contained case studies of previous crises in Argentina, Russia, Turkey, and Malaysia and Taiwan but no articles on the functioning of the *global* financial system. One article reviewed recent books on diffusion, but concerned itself almost entirely with policy (rather than outcome) diffusion (Meseguer and Gilardi 2009); another focused on particular technologies associated with financial innovation and the need for “bottom-up” explanations of the politics of finance (Mügge 2009).

While it is impossible to know for sure why global finance has been neglected by IPE (Mosley and Singer 2009), one possibility is that it has been difficult to find a quantitative methodology which shares the assumptions of much prior theory. Prior to the crisis empirical IPE had overwhelmingly converged on a set of statistical methodologies that emphasized hypothesis testing but assumed that observations were independent from each other and distributed identically (Cohen 2009*b*; Maliniak and Tierney 2009; Oatley 2011). Theories of global finance remained systemic, and typically assumed that observations were not independent but interdependent (Cohen 2006; Keohane 2009; Helleiner 2011). Recent advances in inferential network statistics have made it possible to include node- and dyad-level covariates along with structural parameters in the same model, thus allowing hypothesis testing in a systemic context that encourages theorizing the structural dynamics. One class of models in the exponential random graph family is used in this paper. The results indicate that monadic, dyadic, and systemic characteristics all impact the development of the global banking system.

This paper contributes to the theoretical and empirical literature on global banking. It conceptualizes power in the global banking system as resulting from the ability to attract and supply bank finance internationally. It theorizes that monadic, dyadic, and systemic inputs can impact the distribution of banking power in linear, multiplicative, and exponential ways respectively. This approach suggests that both country- and dyad-level variables –

such as the size of the economy or common levels of development – and endogenous structural processes – such as preferential attachment and triadic closure – affect the ability to form the cross-national banking relationships which are the basis of financial power. To test these expectations, I employ a temporal inferential network model to analyze effects at all three strata, operationalized as thresholds of tie strength, and finds important dynamics at each level. The network model is compared to a regression-based approach which does not include structural processes, and the findings suggest that neglecting structural processes is likely to lead to false inferences.

This paper makes contributions on theoretical and methodological grounds. Theoretically, it provides a “formal, systematic analysis of the sources [and] determinants” of financial power which has so far been missing from the political economy literature (Cohen 2000). Methodologically, it has shown how the global banking system may be analyzed using quantitative inferential models in a way which goes beyond a comparison of relative differences in national attributes, and why it is important to do so. As such, it provides an opportunity for research under the positivist epistemology preferred by American international political economists which is neither “myopic” nor “reductionist” (Cohen 2009*b*; Oatley 2011).

Future research might examine other parts of the global financial system – such as direct investment, portfolio investment involving non-bank entities, and the currency system – to see if they are organized similarly to the banking network. The applicability of the complex network approach can also be generalized to other aspects of global politics. Strange (1987) emphasized the importance of power in four subsystems: global security, trade and production, knowledge, and finance. Some scholars have begun looking at elements of these subsystems using complex network theory and methodologies, but there is room for much more progress along these lines.⁴⁰ In particular, the analysis of multiplex networks –

⁴⁰Exponential random graph models and their extensions have been utilized in studies of the alliance regime (Cranmer, Desmarais, and Kirkland 2012; Cranmer, Desmarais, and Menninga 2012), militarized

networks of networks – would allow us to examine how certain dimensions of global politics (e.g. prominence in global banking) affects other dimensions of global politics (e.g. prominence in global trade).

Finally, the analysis here suggests that there may be limits to the utility of “unpacking the black box” of domestic politics, at least insofar as we seek to explain global outcomes from local conditions. While some domestic variables have an impact on outcomes in the global banking system, the effect of regime type in particular is contingent upon what type of model is estimated. When observations are assumed to be independent, regime type has a positive effect on the formation of cross-national banking relationships. When observations are modeled as interdependent it does not. This follows other recent analyses which have similarly found the effect of regime type to be overstated in the trade system (Oatley 2011; Ward, Ahlquist, and Rozenas 2013) and security system (Cranmer and Desmarais 2011*b*). Future work needs to take more seriously the ways in which domestic and international factors interact within the context of a complex adaptive system.

disputes (Cranmer and Desmarais 2011*b*), sanctions system (Cranmer, Desmarais, and Henrich 2013), and terrorist networks (Cranmer and Desmarais 2011*a*), while international trade has been modeled using latent space approaches (Ward, Ahlquist, and Rozenas 2013). But these studies have barely scratched the surface.

3 BEYOND TOO BIG TO FAIL: POLITICAL INSTITUTIONS, REGULATORY REGIMES, AND BANK BEHAVIORS

Underlying the dominant theories of financial regulation is the view that market processes create a prisoner's dilemma: competition erodes profits and thus does not benefit incumbent firms, but the pursuit of profit incentivizes excessive risk-taking which periodically culminates in financial instability that generates negative social externalities. All would be better off if firms converged on more prudent behavior, but each individual firm is better off acting more riskily. Absent intervention by governments a suboptimal result is likely. Regulation can alter the structure of market interactions in Pareto-improving ways by halting the deterioration of lending practices and promoting financial stability. Because regulations are political creations, however, they are susceptible to "capture" whereby influential private actors manipulate public policy for their own benefit at the expense of the society at large. For this reason policymakers and scholars have traditionally focused on the conditions under which regulations are likely to promote social welfare rather than private rents.¹

I argue that these accounts fundamentally misunderstand the role of financial institutions as intermediaries between suppliers and demanders of finance capital. Because financial firms must first attract capital in order to profit from distributing it, they face multiple incentives from markets. Competitive pressures do incentivize firms to engage in riskier lending as traditional race to the bottom accounts describe, but there is a countervailing

¹See, e.g., Pigou (1932); Demsetz (1968); Stigler (1971); Peltzman (1976, 1989); Kapstein (1989); Oatley and Nabors (1998); Barth, Caprio Jr., and Levine (2001); Simmons (2001); Singer (2004); Drezner (2007).

market incentive to prudence: safer firms can access finance at more attractive rates. Because financial institutions profit by maximizing the spread between the return to assets and cost of liabilities, at some margins a safer firm may also be a more competitive firm. As such, we should expect heterogeneity in firm behavior: some will signal risk management, others will signal prudence. Both are competitive strategies for profit-maximizing firms operating at different margins. Firms will differentiate their behaviors based on their individual characteristics, their position within the national market, the national market's position within the global market, and variation in political institutions, macroeconomic fundamentals, and regulatory policies.

I start from the assumption that what matters to financial firms is the *risk-adjusted* rate of return. High-risk/high-return strategies are not necessarily more appealing than low-risk/low-return strategies for all firms. This basic understanding of firm incentives has not been well-assimilated into theories of the political economy of finance. It has been hinted at, particularly in studies of foreign direct and portfolio investment which posit that political risk is highly salient to investors, thus suggesting that financial investors are risk averse rather than risk acceptant, but have not been incorporated into models of financial firms' preferences more generally.² The literature on financial regulations uniformly assumes opposite preferences.

Analyzing whether firms are either risk-seeking or risk-averse is, I contend, the wrong approach. It presumes that firms are homogenous: they will either race to the bottom or climb to the top; either way, their behaviors will converge. Yet an understanding that firms are concerned with risk-adjusted return suggests that firms should choose a variety of investment behaviors, as there are many risk-reward mixes which will yield a similar risk-adjusted return in expectation. Therefore, we should expect firm behavior to be heterogeneous and, as I demonstrate below, this is what we observe. To explain why different

²See, e.g., Mosley (2003); Tomz (2007).

firms choose different investment strategies, I extend into a political economy context a small literature in financial economics concerned with firms' "preferred habitat". Different firms prefer to operate in different market locales: some pursue arbitrage strategies, others are "vanilla" banks, still others trade in junk bonds. Some large institutions may exist within several locales simultaneously; most firms in the global banking system exist within a specific market locality.

This article thus contributes to several literatures. It agrees with Strange (1992) that analyses at the firm-level are increasingly important to political economy, and with Mosley and Singer (2009) that this is especially true for financial firms. It agrees with the finding of Young (2012) that such an accounting requires a reconsideration of the ways in which financial firms influence politics (and vice versa), and provides a partial explanation of how firms' policy preferences may be formed. It also provides an account of firm behaviors which may be usefully applied to the growing literature studying comparative financial regulations.³

The article proceeds as follows. In the next section I briefly describe the common view of financial markets which undergirds extant political economy theories of regulation, show empirically that these assumptions of firm behaviors are not realistic, and discuss the implications of this for existing theories concerning the relationship between financial firms and governments. Following that, I present an alternative theory of bank behavior which focuses on their position within a political economy, and generate hypotheses that follow from that logic. I then construct and conduct an empirical test of these hypotheses using a Bayesian regression analysis of the best observational firm-level data available before summarizing and concluding.

³E.g., Copelovitch and Singer (2008); Winecoff (2014).

3.1 The Common View of Bank Behavior

Standard political economy accounts of bank behavior are seemingly inferred from the capital structure irrelevance principle of the representative agent model of Modigliani and Miller (1958): given certain assumptions – efficient markets, zero transaction costs or taxes, symmetrical information – the value of a firm is unaffected by whether it is financed by equity or debt.⁴ However, under common conditions of taxation such as the deduction of interest payments, equity financing becomes relatively more expensive and debt financing becomes more attractive (Modigliani and Miller 1963). Thus, in real-world political economies firms have an incentive to leverage their equity capital, thus multiplying gains (or losses) from their asset portfolios. In the typical account, this incentive is only diminished by the willingness of lenders to continue extending debt finance (“market discipline”), or by regulatory requirements which force firms to finance their operations with a minimum level of equity capital to mitigate against the risk of insolvency.⁵ In this framework, even with symmetrical information and no transaction costs, absent taxation firms are risk-neutral but in the face of taxation firms are risk-acceptant.

In other words, given simple assumptions, there is an expectation that firms will “race to the bottom” by progressively increasing leverage in order to finance risk-taking activities. Funding via equity capital is costly: it represents foregone earning potential. But financing asset accumulation via debt can also be costly: it increases the sensitivity that a bank has to the risk in its asset portfolio. If banks increase leverage too much their counterparties’ investments will be less secure, which may cause them to demand higher financing costs (e.g. a higher interest rate) as compensation. So a profit-maximizing firm must consider

⁴In terms of basic accounting a firm’s assets less its liabilities equals its equity. Whether asset accumulation is funded by increasing equity or debt is thus trivial.

⁵Firms with high leverage may be pushed into insolvency by even relatively small downturns in asset performance, since a small equity base must cover a large set of liabilities. The case for regulation on welfare grounds is that financial instability has negative societal effects, so government should limit the extent to which firms may accept risk while managing others’ money.

two variables pertaining to the opposite sides of their balance sheet: the amount of risk in their asset portfolio, and the cost of their financing operations. Enough income must be earned from assets to pay off liabilities. High leverage requires high returns in order to be profitable; lower leverage requires lower returns. To generate high returns, firms will be more likely to accept larger risks.

In its simplest form, a so-called “vanilla” bank which accepts deposits and makes loans, banks can increase profit in two ways: they can lend more at any given rate of profit, or they can lend the same amount at a higher rate of profit. The rate of profit is determined by the difference between the cost of a firm’s liabilities (i.e. its deposits) and the return on its assets (i.e. the loans it extends). When banks merely channel funds from savers to borrowers, profits are earned by exploiting an interest rate spread which arises from managing risk inherent in maturity mismatches: borrowers wish to borrow long term, while creditors prefer to lend for shorter durations. Deposits are paid an interest rate, while loans are charged an interest rate. The bank’s profit is the difference between the quantity of funds deposited and the quantity of funds lent, adjusted by their respective interest rates. The interest rates are determined by risk. Banks charge higher interest rates to riskier borrowers or for longer term loans. Banks pay little interest on demand deposits, as they are of short duration and are very low risk. The same dynamic exists in non-vanilla banking systems, where bank assets and liabilities may come in the form of complex financial instruments rather than simple loans and deposits. Restating the above in a slightly more general way, banks can increase profit either by earning more from their assets, which may involve increased risk-taking, or by paying less for their liabilities.

Even vanilla banking markets could contain race to the bottom dynamics. As banks compete for profits, the spread between income earned from assets and fees paid to liabilities will shrink. Banks will seek to capture market share by charging less on assets, or

by paying more on liabilities. The cumulative result is that banks lend more at lower margins, which leaves them susceptible to illiquidity or insolvency should their investments under-perform. Conversely, banks may seek to maximize the interest rate differential by making riskier loans and charging a premium for them. Eventually this strategy may also leave firms susceptible to market downturns or other idiosyncratic risk. Both behaviors are generally present in the run-up to banking crises, such as the one triggered by the subprime mortgage collapse.⁶

Continuing this logic, the more competitive a market is the greater the temptation for banks to lend more and/or lend more riskily. In this way, banking markets represent a prisoner's dilemma. If banks could make credible commitments to not undercut their competitors, they could all lend a reasonable amount at a reasonable interest rate, guaranteeing a reasonable profit at low risk in perpetuity. But banks cannot make such a commitment, since each firm benefits from capturing more market share. The result is that competitive pressures drive risk accumulation which may eventually culminate in a crash. A third-party intervener, in the case a government, is needed to change the structure of the strategic interaction by making a commitment to prudent behavior credible. This is done through regulation, by setting a floor under which risk-taking activities cannot fall.

This process is mirrored in the global political economy. Each state benefits when their firms possess a competitive advantage over their foreign rivals. But the pursuit of that advantage can lead to a situation where each state allows its firms to accumulate assets via debt finance rather than equity finance. If all states participate, and competition forces them to do so, financial markets may generate quite a lot of instability while profits are

⁶It was not just risky mortgage lenders, investment banks, and hedge funds which suffered from the crisis. Money market mutual funds "broke the buck", meaning that their shares dropped below \$1 in value. Prior to the subprime crisis, this had happened once in the nearly four decades since money market funds have been in operation; during the subprime crisis the oldest money market fund, the Reserve Primary Fund, broke the buck, and Federal Reserve researchers conservatively estimated that at least thirty-one others, and possibly as many as seventy-eight, would have done so had their management companies not intervened in an unprecedented manner (Brady, Anadu, and Cooper 2012).

competed away.⁷ As states become more tightly integrated and international markets more competitive, so the thinking goes, instability can spread from jurisdiction to jurisdiction in ways which are unpredictable *ex ante*.⁸ A credible international regulatory standard is necessary to alter the structure of the interaction so that defection is no longer rewarded, thus preventing the origination and spread of crises. Such regulatory requirements have typically involved mandating a minimum level of equity capital which banks must maintain against the risk of default in their asset portfolios.

Such a story expects banks in aggregate to behave as in figure 3.1, which represents the portion of banks' asset accumulation which is funded by equity (i.e. "tier 1") capital: competition should force homogeneity – variance in bank capital-to-assets ratios should be low – and the central tendency should be to match the regulatory minima, plus a small buffer to protect against idiosyncratic risk. To behave in any other way would be uncompetitive, and uncompetitive firms will not last long in a dynamic market such as finance. To keep their domestic banking sectors competitive in increasingly integrated global financial markets, governments will tend not to regulate more strictly than the international regulatory standards such as the Basel capital accords. So, from the standard models we should expect convergence in bank behaviors.

I do not exaggerate the implications of the standard models with the simulation portrayed in figure 3.1. Even the complication allowing a small capital buffer is recent to the economics literature (Ngo 2006, 99): "Virtually all models of bank decision making...

⁷This simplistic account obviously ignores another dimension: borrowers benefit when more credit is available at lower rates. As Rajan (2010) points out, governments may often wish to expand the supply of credit available to its citizens at low rates. While this aspect of the politics of finance is certainly important, it is beyond the scope of this analysis.

⁸Like other parts of this section, for purposes of logical clarity this assertion is overly simplistic. As Oatley et al. (2013) point out, not all financial integration is equal, and not all financial crises are equally likely to spread through the system. Accordingly, this point should be taken as illustrative of one possibility, not a certainty.

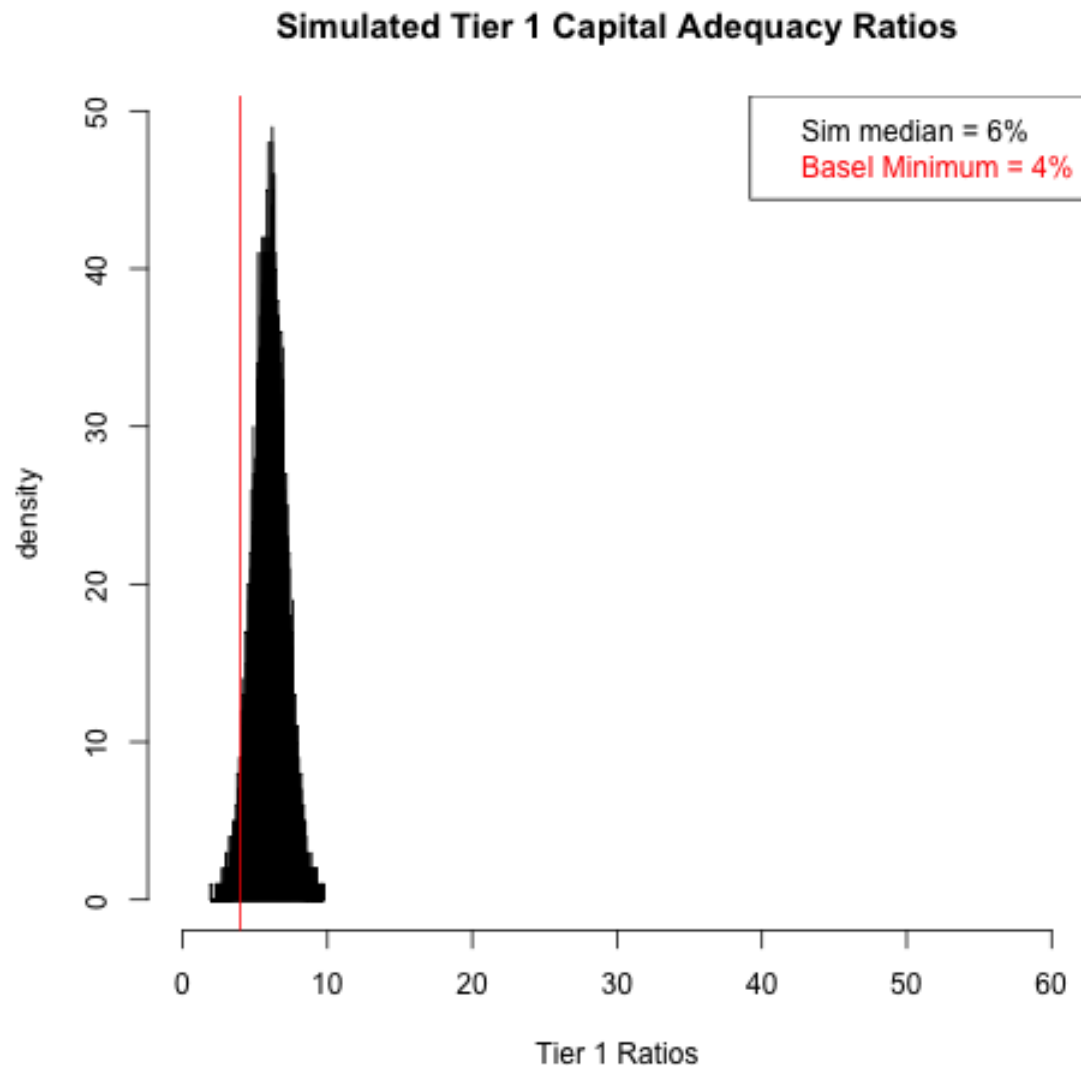


Figure 3.1: *The view of bank behavior fundamental to prevalent theories of regulation: due to competitive pressures, banks behave similarly and minimally comply with statutory regulations such as the international Basel capital accords.*

tended to assume that capital requirements are binding constraints on bank behavior.” Absent those constraints banks would increase leverage, which implies increased risk. The capital buffer, represented by the distance between the regulatory standard (red vertical line) and the majority of the density in figure 3.1, was modeled as nothing more than insurance against an accidental erosion of capital which would lead to closure of the firm by

regulators.

The political economy literature puts it even more bluntly, as Meseguer and Gilardi (2009) noted in a post-crisis survey: “[C]ompetition has caused a race to the bottom in trade barriers, capital account regulations, tax rates, and government intervention in the economy in general.” This echoes the rationale behind the origination of global capital regulations as recounted by (Kapstein 1989, 324): “In an interdependent financial community in which every state wants to enhance or maintain the competitiveness of its banking sector, deregulation by one state must be countered by that of others. This competitive spiral forces regulation toward its lowest common denominator.”

There’s just one problem: banks do not behave this way.⁹ As figure 3.2 demonstrates, the central tendency of bank behavior is to be well above the regulatory minimum, and the variance is quite large. There does not appear to be a race to the bottom *or* a climb to the top. Instead, banks differentiate themselves. Remember the role that investor confidence plays: in a world in which firms are racing to the bottom, a firm that behaves less riskily can distinguish itself from other firms by signaling its quality. In the vanilla case, if depositors are convinced that their funds will be safer at the prudent firm they will demand a lower interest rate for their deposits, thus increasing the interest rate spread (and profit) for that firm. Firms that behave too riskily will find their access to finance limited. So markets can reward firms that climb to the top, those that race to the bottom, and those which pursue a mixed strategy. Rather than expecting market pressures to homogenize firm behavior, we should expect diversification as firms invest asymmetrically in pursuit of profits.¹⁰ The difference between figure 3.1 and figure 3.2 is puzzling from the perspective of prior theory.

Also puzzling is the fact that we observe this diversification within and across countries and time, as figure 3.3 shows. This has major implications for the ways in which

⁹Neither do governments (Walter 2012).

¹⁰Indeed, firms differentiate themselves even in how they conceptualize, measure, and report profit (Mackenzie 2005).

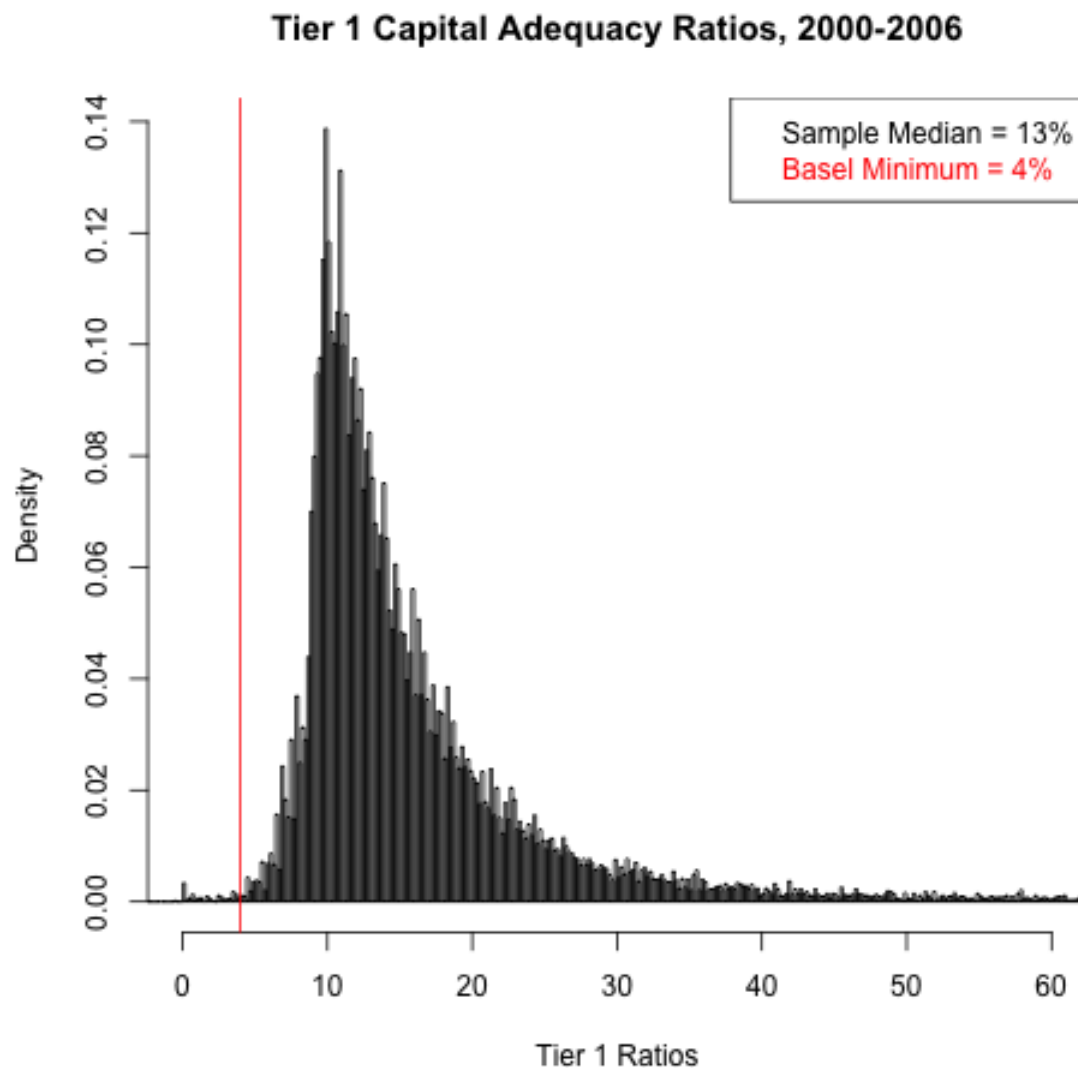


Figure 3.2: *Risk-weighted tier 1 capital adequacy ratios, 2000-2006. The central tendency is higher and the variance is wider than standard theories would expect, indicating no homogenous race to the bottom.*

political economists understand the relationship between firms and governments. Governments responded to the subprime crisis by tightening regulatory structures at the domestic

and international levels.¹¹ The ostensible purpose of these regulatory reforms is to counteract race to the bottom dynamics in financial markets: absent regulation, firms utilize progressively riskier lending strategies in order to capture greater market share.¹² Absent regulation, eventually this “mania” will culminate in instability and crisis.¹³ Embedded in this account are two substantive claims: one regarding the behavior of private actors operating within a competitive market system, and the other regarding the effect of regulatory policy in conditioning those behaviors. We have seen above that the former claim is highly questionable; the latter may be as well.

The standard public interest case for economic regulations focuses on their potential for improving social welfare, especially their ability to correct market failures that arise when some economic activity generates negative externalities, monopoly conditions, or other market failure.¹⁴ Rules restricting banking activities generally focus on the social costs associated with bank failures. These include counterparty default risk, where losses in one bank prevents it from meeting its obligations to other firms, which may in turn lead

¹¹At the domestic level many countries have made drastic revisions to their regulatory codes. In the United States, for example, the Dodd-Frank Wall Street Reform and Consumer Protection Act is “arguably the most significant financial legislation in modern history” according to Kathleen Casey, then a Commissioner of the Securities and Exchange Commission (<http://www.sec.gov/news/speech/2011/spch012311klc.htm>, last accessed August 16, 2012). At the international level, the Basel Committee on Banking Supervision, housed at the Bank for International Settlements, agreed on a new global standard – its third in three decades – regulating banking activities.

¹²Although some revisionist accounts, such as Friedman and Kraus (2011), argue that the activity of banks in the lead-up to the crisis does not comport with a view of risk maximization, noting that banks overwhelmingly invested in highly-rated securities which were insured by credit default swaps. These assets were privileged by regulatory structures such as the Basel accords. In this view, the crisis resulted from risk *concentration* rather than risk *taking*, and this concentration is at least partly as response to the alteration of incentives caused by earlier regulatory reforms.

¹³This view was presented at least as early as Marx (1867) and has been reiterated by many since, including Polanyi (1944) and Minsky (1986). But this view is also dominant in orthodox political economy, notably Kindleberger and Aliber (2005) and Reinhart and Rogoff (2009). The government’s role in intervening during panics was first articulated by Bagehot (1873). For a historical description of central bank activities during crises, and a journalistic comparison of central banks’ responses to the 2007 crisis, see Irwin (2013).

¹⁴There is a long economic literature concerned with this question. For classic examples see Pigou (1932) and Demsetz (1968). An in-depth treatment of this literature is found throughout Crew and Parker (2006). Hägg (1997) surveys the economics literature from a European perspective.

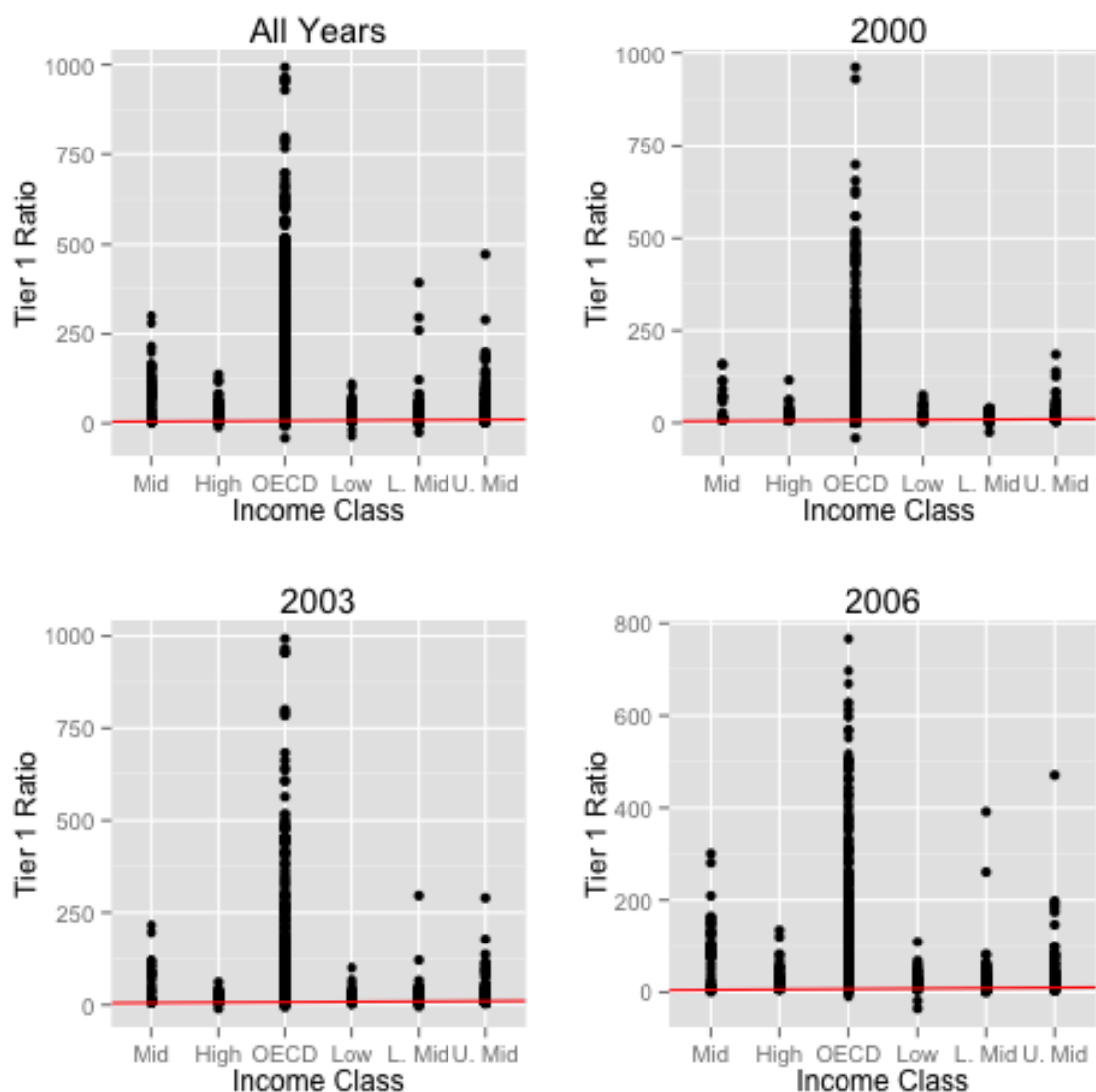


Figure 3.3: *Risk-weighted tier 1 capital adequacy ratios, 2000-2006, by World Bank income class. The horizontal red line is the minimum tier 1 ratio under the Basel accords. There is a quote a lot of variation both within and across these groups, and within and across time periods.*

to illiquidity or even insolvency in those firms; depositor losses; output losses in the real economy stemming from bank collapses and a fall in available credit; and potential public sector financing of illiquid or insolvent firms. To the extent that these costs are not borne by the banks that incur them they represent negative externalities. Policymakers try to protect their economies from these effects by restricting the risk-taking activities of banks. If they

are successful, the market failure will be mitigated.

A second strand of research, originating in the public choice school of economics, argues that the effect of regulation on markets can itself lead to market failure. Powerful private sector agents may be able to manipulate regulations to entrench their position as market leaders, thus collecting rents from society and creating inefficiency in regulated markets.¹⁵ When resources are expended in pursuit of rent capture rather than productive enterprise, the economic result is socially suboptimal. Such an outcome not only reflects political inequities, it may exacerbate them.¹⁶

While early research was focused on domestic economies, later scholarship extended the logic to international markets and emphasized the role of politics in influencing the creation and reformation of regulatory regimes. Kapstein (1989, 1991) presents a public interest account of regulatory harmonization, arguing that the first international Basel accord on banking supervision as being welfare-enhancing, as it halted competitive pressures that put downward pressures on firm practices. Thus, it provided a “level playing field” on which competition could occur thus halting a race to the bottom. Others – including Krasner (1991); Oatley and Nabors (1998); Simmons (2001); Drezner (2007) – emphasized the role that state power plays in affecting the content and timing of international regulatory harmonization, and argues that globalization provides new opportunities for rent capture. By skewing international agreements in ways that benefit their firms, powerful states can potentially increase domestic financial stability *and* domestic competitiveness. Far from leveling the playing field, this research argues that the first Basel accord tilted it in favor of the entrenched states at the center of the system (especially the United States and United Kingdom) at the expense of their nascent challengers (especially Germany and Japan).

Both of these traditions portray the relationship between regulation and competitiveness

¹⁵See, e.g., Stigler (1971); Peltzman (1976, 1989).

¹⁶Worry about the political influence of financiers is ubiquitous throughout history. One notable recent example is Johnson and Kwak (2011).

as a race to the bottom. They emphasize the downward pressures markets put on prudential behavior, and expect firms to find regulations onerous. Taken together, these views of regulatory politics expect firms to minimally comply with regulatory burdens if they are in compliance at all. That is, they expect figure 3.1 to accurately describe banking markets. As it does not, these accounts of regulatory politics are deficient in some way.

Nor can this behavior be explained by the emerging literature on private regulations. Scholars have recently begun paying attention to the role that “private politics” plays in governing the global economy. Concluding a special issue of *Business and Politics* dedicated to the topic, Büthe (2010) agrees with the definition of private politics as designed to “influence economic activity... without reliance on public institutions or officeholders” (Baron 2001, 7). Often these private regulations are enacted by market participants in an effort to ward off public interference – when market activities generate negative social externalities – or to harmonize production standards to facilitate the development of scale economies.¹⁷ While private regulations may be powerful constraints on private action in many contexts, in the case of banking the politics has been public, not private, as there are no international private sector professional organizations enforcing “best practices” above minimum capital requirements.¹⁸ Moreover, the private regulations literature assumes the same firm incentives as the public regulations literature, and so would generally not expect regulatory over-compliance in the absence of non-public constraints.

Others have argued, and demonstrated empirically, that the “race to the bottom” narrative does not well describe other types of markets. Some of the extant “capital competition” literature identifies other mechanisms that affect policy choices and market responses. Basinger and Hallerberg (2004) provide an empirical test of a tournament model showing

¹⁷Others, such as Vogel (2009) and Prakash and Potoski (2007) emphasize “civil regulation”, in which non-state actors seek to constrain global firms through professional associations, standards of best practices, and other means. For a thorough review of this literature see Vogel (2008).

¹⁸Singer (2007) presents theory and evidence explaining some of why and how this has been the case in banking but not in securities markets.

that a country's capital taxation policies are informed by domestic political considerations and the political institutions of competitor countries. In most cases, they find, domestic political constraints insure against a sprint to low capital taxation. Mosley (2000, 2003) finds that markets prioritize certain macroeconomic policies when making decisions on where to allocate capital, but usually in ways that encourage policy stability, rather than erode it.¹⁹ Other studies have found that markets in many industries often, if selectively, reward (or do not punish) firms that maintain standards above their legal requirements.²⁰

However, the causal mechanisms described by these studies are not likely to obtain in global banking for several reasons. First, the "California effect" literature describes a different phenomenon than the one under observation here: that once *de jure* regulatory innovations are enacted in one jurisdiction they tend to carry over into other jurisdictions *de facto*, often because multinational corporations wish to maintain uniform production standards. In the case of banking there is no such regulatory innovation; firms are over-complying on their own. Additionally, "California effect" explanations generally involve transnational firms exporting advanced-economy standards to emerging markets. While this might explain some the activity of some financial institutions, it cannot explain the majority of them. In particular, it cannot explain the heterogeneity of financial institutions within the same jurisdiction. Second, the observation that governments often do not race to the bottom when setting regulatory policy does not explain why firms over-comply with the regulations that already exist. Standard models of government over-regulation – that is,

¹⁹There is some evidence of herding behavior, as policies diffuse through the system. Simmons and Elkins (2004) note the spatial and temporal clustering patterns in economic liberalization movements. Pitlik (2007) shows that economic liberalization, as measured by a broad index of economic freedom, percolated through the OECD from 1970-2000 in a way consistent with the expectations of the diffusion literature. Chwieroth (2007, 2009) focuses on the role of epistemic communities and norms, respectively, in driving the liberalization of finance. My point is not to dispute the findings of these articles which emphasize convergence, but rather to note that at least in the area of banking markets, there is still quite a lot of cross-national *divergence* in need of explanation.

²⁰See, e.g., Garcia-Johnson (2000), Mosley and Uno (2007), Mosley (2008, 2010), and Greenhill, Mosley, and Prakash (2009).

regulation of the domestic economy in ways stricter than international minimum standards – generally rely on bottom-up explanations rooted in domestic politics. Standard models of financial firm behavior have the opposite expectation of grassroots pressure, as competition is expected to generate downward pressure on standards.²¹

Perhaps surprisingly, there is also little micro-level theory in financial economics that can explain this phenomenon. Much of the economics literature on financial market behavior, such as that in the efficient markets hypothesis (EMH) tradition, ignores the role of regulation almost entirely.²² The EMH tradition suggests that regulation is at best unnecessary and at worst undesirable: markets perform best when they are least constrained. If there is no need to explain regulation then there is even less need to explain firms' responses to it, so the EMH tradition contributes little to this conversation.²³

As noted above, some recent literature presents over-compliance as a simple buffer to protect against falling into regulatory non-compliance. Barrios and Blanco (2003) present a model of firm incentives under two conditions – one in which firms face minimum capital requirements and one in which they do not – and show theoretically and through an empirical analysis of Spanish banks that maintaining a capital buffer is optimal when firms are regulated so long as the sanction for non-compliance is sufficiently severe. Similarly, Ngo (2006) presents a model of “precautionary” over-compliance in which there is a profit-maximizing equilibrium for banks to over-comply with capital regulations, but only if the expected cost of regulatory breach is lower than cost of raising additional capital.²⁴ In other words, these studies still suggest that bank behavior is dominated by a race to the bottom,

²¹Note that there may be an exception here, if domestic politics force local governments to regulate domestic financial sectors more strictly than the international requirement. I consider this possibility in greater detail below.

²²See, e.g., Fama (1965, 1970); Merton (1973).

²³It should also be noted that EMH is about asset prices, particularly the prices of financial instruments, and not about firms' attitudes towards risk *per se*. It is worth mentioning, however, since firms' profits depend on the price differences on the asset and liabilities sides of the balance sheet.

²⁴Additionally, Ngo finds that these pressures are stronger when the sanction from regulators is higher.

but condition that dynamic on the presence of capital regulation. There are at least two reasons to doubt these accounts. First, the amount of over-compliance is – in many cases at least – well beyond what would be required to mitigate fear of regulatory breach. Second, the variation in over-compliance both within and across regulatory jurisdictions suggests that other factors are influencing banks’ behaviors.

One plausible explanation for over-compliance is market discipline. That is, markets may punish firms which take on excessive risk, or reward prudent firms, by lowering the price they must pay for finance. Indeed, market discipline played a key role in the first major revision to the Basel Capital Accord, comprising one of the three “pillars” intended to promote financial stability.²⁵ In the words of the Basel Committee on Banking Supervision (2001):

Pillar 3 recognises that market discipline has the potential to reinforce capital regulation and other supervisory efforts to promote safety and soundness in banks and financial systems. Market discipline imposes strong incentives on banks to conduct their business in a safe, sound and efficient manner. It can also provide a bank with an incentive to maintain a strong capital base as a cushion against potential future losses arising from its risk exposures.

The Basel Committee, in other words, expected over-compliance with capital regulations. It might even be inferred that they expected markets to play the largest role in disciplining banks, as the statutory capital requirements in the Basel accords were well below typical bank behavior.²⁶ The international capital regulation, therefore, contained at its core the belief that firms would *not* race to the bottom, that competitive markets did *not*

²⁵The other two were statutory minimum capital requirements and the supervisory review process.

²⁶In their most recent revision to the Basel accords, which followed the subprime crisis, the Basel Committee has drastically increased statutory requirements and reduced the reliance on market discipline in their regulatory framework.

represent a prisoner's dilemma, and therefore that only minimal regulation was necessary.²⁷ But emphasizing market discipline suggests homogeneity in firms' behaviors, and we have already seen that the opposite is empirically true.

Partially motivated by a desire to bridge the gap between theory and observation, a small empirical literature from several disciplines has begun to examine the phenomenon of regulatory over-compliance. Here, too, there is disagreement. In an early example, Peltzman (1970) found that increasing capital regulations had no effect on bank behaviors. Somewhat more recently, Jacques and Nigro (1997) found that they did. In an analysis of Indian firms, Ghosh and Das (2005) argue that firm behaviors are influenced primarily by markets when markets are competitive, but are sensitive to capital requirements when markets are uncompetitive. In a panel study of seventy-eight large firms in twelve industrial countries, Brewer III, Kaufman, and Wall (2008) find the opposite: banks hold more capital when markets are less competitive and when regulatory requirements are stricter, while also finding that bank-specific factors such as firm size influence capital holdings.

A study of OECD firms in 1999 found that "[t]he *direct* effect of regulation, measured in terms of regulatory power and stringency, seems ambiguous" (Bernauer and Koubi 2006, 510). Nevertheless, they argue that statutory regulations and market discipline may be complements rather than substitutes. That is, markets reward prudent firms but they also reward firms operating in prudent financial systems. Some firms could benefit by free-riding on the safe behavior of others. This, in turn, could put downward pressure on capital cushions that protect against firm insolvency more generally as firms try to maintain competitiveness. Regulations can eliminate this free-riding behavior by mandating a minimum capital adequacy requirement, while markets reward over-compliance with it. In this way, markets and regulations can reinforce each other. Christensen, Hail, and Leuz (2011) examine securities regulations in the European Union, and find that firms' cost of capital declines as

²⁷The view of policymakers, in other words, was at odds with that of predominant theory.

regulations get tighter, indicating that there is a market reward for prudence. While similar in some respects, this differs from the Bernauer and Koubi finding in both scope – banks versus securities firms – and the central mechanism for establishing market credibility – state versus firm. But here, again, the main question is about the central tendency of the distribution, not the spread.

These questions have become more pressing since the subprime crisis. Unfortunately, we still have few definitive answers. The ambiguity is likely due to several factors. First, many prior studies are restricted in empirical scope to particular countries, years, or firms because of data limitations. Second, they generally attempt to demonstrate whether firms race to the bottom *or* climb to the top as they are disciplined by markets, when it is conceivable that both factors are in operation simultaneously – to varying extents – across time and space, as firms try to maximize the spread between the return on their assets and the cost of their liabilities at multiple margins. Third, they generally neglect the broader political economy within which financial firms are embedded. Fourth, they often treat firms as functionally equivalent, which leads to an expectation that they will behave similarly under similar conditions. None of the papers cited above include several key political variables along with firm-level variables in the theoretical or empirical models. In the remainder of this paper I attempt to improve on all four of these dimensions.

3.2 Embedding Firms Within Political Economies

If we are to construct a realistic theory of bank behavior which considers the broad political, economic, and financial environments with which they operate, we might begin by calling into question the usefulness of representative agent models such as that proposed by Modigliani and Miller (1958, 1963). Indeed, researchers in the burgeoning social science of finance tradition have done so, noting that the Modigliani and Miller model was not “performative”, in that it did not influence behavior after being proposed, nearly as much

as later models such as the capital asset pricing model (Mackenzie 2006).²⁸ We need not go far afield to do so: contemporaneous to Modigliani and Miller, Culbertson (1957) proposed a model in which investors have a “preferred habitat”, which was extended in the following years (Modigliani and Sutch 1967; Modigliani and Shiller 1973). This model suggests that heterogenous agents have heterogenous preferences over investments, and demand a risk premium to invest outside of their preferred habitat. Firms, in other words, wish to occupy different positions within the market, make different sorts of investments, take on different types (and amounts) of risk. The aggregate result of firms operating within their own habitats does not deviate from an efficient market under typical assumptions (Mishkin 1980).

Both the original preferred-habitat model and recent formal applications of it have focused on the term structure of bond maturities and opportunities for arbitrage (Vayanos and Vila 2011; Guibaud, Nosbusch, and Vayanos 2013), but there is no *a priori* reason why the framework is not generalizable.²⁹ In fact, such complications are desperately needed. In his 2011 Presidential Address to the American Finance Association, John Cochrane concluded with the following:

Discount rates vary a lot more than we thought. Most of the puzzles and anomalies that we face amount to discount-rate variation we do not understand. Our theoretical controversies are about how discount rates are formed. We need to recognize and incorporate discount-rate variation in applied procedures.³⁰

²⁸It’s worth noting that performativity theories would also expect convergence in behavior rather than diversity.

²⁹I thank Iain Hardie for exposure to Vayanos and Vila (2011).

³⁰Cochrane specifically referenced preferred habitat theory as a way to complicate representative agent approaches in productive ways.

Despite their flexibility, and the fact that preferred-habitat models empirically outperform representative agent models, they are seldom employed in financial economics and (to my knowledge) have never been employed in the political economy literature. Discount rates can vary according to risk-tolerance, and firm preferences over risk can be influenced by variables at multiple levels: micro-variation occurs at the level of the firm, meso-variation occurs at the level of the national political economy, while macro-variation occurs in the global political economy. Each of these levels condition banks' attitudes towards risk, but they must respond to all of them simultaneously.

The well-being of banks is always contingent upon the state of the broader economy. Because banks “borrow short to lend long” – meaning that the term of their assets is longer than the term of their liabilities – banks are susceptible to unexpected macroeconomic changes. If a recession leads to a sufficiently large increase in the number of defaults on loans issued by banks, then they will not have sufficient capital (or liquidity) to meet their obligations. Even banks which are fundamentally sound in normal times can be rendered insolvent by major economic shocks. To protect themselves, during periods of economic distress banks will often sharply curtail lending and protect their equity. Conversely, in expansionary periods bankers will be willing to extend credit to producers and consumers with a reasonable hope that they will be repaid.

This simple logic is well-understood, but contained within it is an expectation that banks may decrease risk-taking in some contexts even absent restrictions on their activities. Extending the thought a bit further, we might expect banks to have some incentive for signaling stability even when the economy is performing well.³¹ Banks that are capable of credibly signaling a prudential approach will be able to attract finance at lower cost during economic expansions, thus increasing the spread between the return to assets and the cost of liabilities. Behaving in this way may help them maintain confidence during economic

³¹In fact they frequently do in advertisements, stressing their longevity and stability as a means of signaling security to investors.

contractions. Alternatively, banks may choose to increase risk-taking during economic expansions when the likelihood of repayment is highest, again increasing (but in a different way) the spread between the return to assets and the cost of liabilities.

Considering the broader macroeconomic environment within which banks operate would lead us to a different expectation than traditional political economy models would suggest: banks may choose to emphasize prudence even absent regulation, or they may respond to positive economic conditions by increasing risk-taking. The ratio of bank capital to its assets will grow if the former and shrink if the latter. There is no *a priori* reason to presume that either effect will dominate in all circumstances, since there is an economic logic underpinning both strategies.

In a similar way, banks may respond in varied ways to changed monetary conditions. Monetary policy affects the macroeconomy indirectly; it must be channeled through banks. If central banks wish to increase nominal growth rates they will increase the money supply through open market operations and by lowering the interest rate paid at their discount windows. An increase in the money supply affects banks in two ways: first, by decreasing the cost of funds available to them, banks will make investments even at lower expected return; second, because most financial contracts are specified in nominal terms, an increase in the price level has the effect of lowering the real rate of return on investments. For this reason, price inflation is said to benefit borrowers and harm lenders. Banks, however, are both borrowers *and* lenders. Their position is improved by access to lower-cost finance with which to generate some nominal return, but weakened by a decrease in the real rate of return on assets already under contract.³² Again, they may respond to a price level increase in asymmetric ways: by accepting the same level of risk but with lower cost of finance, or by accepting more risk.

³²This simplification neglects such important matters as whether the increase in money supply was expected, how large the time mismatch is between the maturity of assets and liabilities, and other such factors. I use it simply to illustrate that the same macroeconomic development – a price level increase – could motivate opposite bank responses.

Faced with these different macroeconomic conditions, different banks may prefer different approaches in an attempt to succeed in competitive markets. Microeconomic factors will certainly play a role. These at first may appear to be idiosyncratic – particularly in a large-N analysis – but there are reasons to suspect that, in general, different types of firms may have different preferences over the type and amount of risk they are willing to accept. These relate to individual firms' places within the macrofinancial environment. Some firms may focus on burnishing their reputation as a safe intermediary, channelling funds from savers to borrowers in low-risk ways. We might expect firms that primarily or exclusively engage in retail banking – such as commercial banks – to place a particularly high emphasis on improving perceptions of their security. We might also expect firms that are publicly listed on an equity market to privilege prudence, both because of shareholder discipline and also because public disclosure laws demand greater transparency from these firms. Since there is a way for them to be scrutinized, and a group for whom scrutinizing is rational, the incentive to appear prudent is stronger for this type of firm than for private equity firms who engage in more speculative trade.

The firms with the greatest need to signal prudence to markets and the least ability to do so are those whose activities are opaque but still attract scrutiny. If these firms are successful in signaling prudence – whether they are risky or not – then they may profit by attracting finance at low cost. One way to do this is by increasing capital-to-asset ratios via regulatory arbitrage.³³ Investment banks are often in this position. Many of their activities are complex enough that they appear above board to the investors, regulators, ratings agencies, and counterparties who scrutinize them, but entail greater risk-taking than more simple forms of banking. Commercial banks are in the opposite position, since their activities are far

³³In particular the manipulation of the risk-weight baskets that have become a hallmark of capital regulations in the era of the Basel accords. For one example of this in practice see the discussion of Friedman (2009) and Friedman and Kraus (2011), who provide a microeconomic rationale for the over-investment in securities backed by subprime mortgages, credit default swaps, and the sovereign debt of peripheral OECD economies.

more transparent. As a result, we might expect investment banks to signal greater prudence via higher capital-to-asset ratios than commercial banks.

Similarly, we might expect large firms – which tend to be better diversified – to have less need to signal prudence than smaller firms, who are more susceptible to idiosyncratic risk.³⁴ Banks operating within large, deep financial markets will have a greater incentive to signal safety to investors because of the presence of a larger number of competitor firms. Banks operating in countries with high savings rates will have an easier time attracting finance whether they signal prudence or not.

All of these dynamics are embedded within a macropolitical system. Monetary policy is set by central banks. The mechanisms for calculating capital-to-assets ratios are determined by regulatory authorities, who also determine the minimum amounts of capital financial institutions must hold. While the relationship between governments and finance is complicated, multidimensional, and in some ways symbiotic, for the purposes of this paper I wish to take the political context within which financial firms compete as exogenously given and theorize about how different political institutions and policies might influence firm behaviors.³⁵ There are at least two categories of macropolitical variables which must be considered: the institutional governance framework, and the policy choices of the governors. In the former category we could place the choice of regulatory institution – whether the central bank or another institution – and whether the government is consolidated, respects property rights, and faces popular pressure through a democratic process. In the latter category we may include statutory regulations that affect banks directly, such as minimum capital adequacy ratios, but also policy choices that influence banks indirectly, like the resolution of the macroeconomic “Trilemma”.³⁶ Previous literature has demonstrated that

³⁴Some of these large firms may also benefit from implicit or explicit bailout guarantees.

³⁵For the modal firm this is an accurate reflection of reality. First Bank of Chapel Hill has negligible influence over the stance of monetary policy.

³⁶That is, a government can only choose two of exchange rate stability, monetary independence, and capital account openness.

financiers prefer stable, transparent governments that respect property rights over unstable, inscrutable, confiscatory governments (Mosley 2003), and that central banks which also regulate financial sectors pursue more bank-friendly monetary policies than non-regulatory central banks (Copelovitch and Singer 2008; Winecoff 2014). Nothing in the discussion presented here contradicts these expectations.

Decisions over the trilemma could play a significant role in conditioning firm behaviors. Previous literature has asserted that protectionist financial policies, such as closing of the capital account, may induce prudence in financial markets (Rosenbluth and Schaap 2003; Barth, Caprio Jr., and Levine 2001). These accounts assume that such protectionist policies will alleviate strains arising from the race to the bottom; if race to the bottom dynamics do not exist in the first place, however, then there is no reason to expect banks to alter their behaviors in a major way. In fact, if the removal of foreign competition prevents market discipline from taking hold, then local firms may act more riskily while securing rents from society. If central banks retain monetary independence, then banks will know that they will be able to respond to cyclical downturns with countercyclical monetary policy. They may also expect central banks to act as lenders of last resort during periods of financial distress. As mentioned above, if central banks also regulate the banking sector they will often provide tailor monetary policy to needs of the banking sector more than they otherwise would. Therefore, we should expect banks operating in systems where the central bank possesses a large degree of monetary independence to act less safely than other banks.

3.3 Expected Relationships

The previous discussion leads to several hypotheses concerning the behavior of banks, which are summarized in table 3.1. In general, we should expect bank-level characteristics to have a greater impact than regulatory variables, since banks operating within the same market have incentives to differentiate their behaviors in order to perform well within their preferred habitat. Therefore, in expectation the average effect of many policy variables

should be small and perhaps indistinguishable from zero at traditional levels of statistical significance, particularly when viewed across time (since variables such as political institutions do not vary much within countries).

Large firms (measured by assets) should have lower capital-to-assets ratios, meaning that their assets are funded by higher levels of debt and/or their asset portfolios are riskier.³⁷ There are several reasons for this expectation. First, large “too big to fail” firms may have such systemic importance that an implicit (or explicit) guarantee of government support in times of need gives them license to act more riskily without repercussions from markets. Second, larger banks are more likely to be active in international markets, which increases the competitive pressures they face to capture market share (Brewer III, Kaufman, and Wall 2008). Third, larger banks are more likely to be better diversified, which can reduce their susceptibility to a market downturn, thus making high capital holdings less necessary for signaling prudence.

Other bank-level characteristics should also have an effect on firms’ capital ratios. Publicly-owned banks that are listed on equity exchanges should act less riskily than privately-owned firms, as indicated by higher capital ratios, as shareholders have an opportunity to discipline them. Different types of institutions should maintain different levels of capital. Firms with riskier or more opaque asset portfolios, such as investment banks, will need to maintain higher capital ratios to maintain investor confidence than firms with less risky asset portfolios, like traditional commercial banks.

Several policy variables should be associated with banks’ capital ratios. A country’s openness to foreign capital affects the competitive environment firms operate in. Rosenbluth and Schaap (2003) argue that “profit-padding” regulations, such as financial protectionism through capital controls, can induce prudent behavior from firms. Conversely, less-protected firms, those subject to more foreign competition, will be able to maintain

³⁷For a discussion of why I focus on capital-to-assets ratios, as well as definitions, see the appendix.

a large capital base without losing market share. So we should expect firms operating in more open jurisdictions to maintain lower capital ratios than those in less open jurisdictions. The other macroeconomic “Trilemma” variables could also impact the environment within which banks operate. If banks have confidence that the management of the macroeconomy will be conducted well, then they will have less need of protecting against economy-wide downturns. Thus, monetary independence for central banks should be associated with lower capital ratios, while fixed exchange rates are associated with greater capital adequacy.

Specific features of the national regulatory environment may also influence bank behaviors. To the extent that over-compliance is a common practice, and figure 3.2 indicates that it is, we should expect national minimum ratios to have little effect on most banks’ behavior. However, banks may expect preferential policy when they are regulated by central banks (Copelovitch and Singer 2008), and this may encourage them to act more riskily than they would if monetary and regulatory authority were separated (Winecoff 2014). This expectation should be exacerbated when regulatory central banks have monetary independence (i.e., they do not have to maintain a fixed exchange rate). Deposit insurance schemes are commonly viewed as leading to moral hazard as markets have less incentive to discipline financial institutions (McCoy 2006), although some empirical evidence supports an alternative model (Gropp and Vesala 2004).

The macroeconomic environment in which banks operate may also condition their actions. Specifically, economic growth rates, wealth levels, inflation rates, savings rates, and the size of the financial sector may influence bank behaviors. Lower income countries are likely to have smaller, less competitive, and less sophisticated financial markets. As national income increases, therefore, financial technology and market monitoring mechanisms should also increase, causing firms to increase capital buffers. As the reference group in the models below are high income non-OECD countries, I would expect firms operating

Variable	Direction
Publicly Listed	+
Investment Bank	+
Commercial Bank	-
Firm Size	-
Banking Sector Size	-
Domestic Savings Rate	-
Inflation Rate	+
Amount of Internationalization	-
Low Income	-
Lower-Middle Income	-
Upper-Middle Income	-
OECD	+
Growth Rate	+
Capital Account Openness	-
Exchange Rate Stability	+
Monetary Independence	-
Deposit Insurance	-
Regulatory Central Bank	-
Minimum Capital Requirement	~
Regime Type	~

Table 3.1: *Expected determinants of banks' capital ratios. The baseline institution is a bankholding corporation in a non-OECD high income country.*

in less wealthy economies to have lower ratios.

When economies are growing firms have less need to act riskily in order to boost profits, thus they will be more likely to fund asset accumulation via equity rather than debt. When inflation is high funding via debt becomes more attractive, as it does when domestic savings are high (i.e. when borrowing costs are low). If the race to the bottom narrative is true, then larger banking sectors should force imprudent behavior as profits are competed away. The amount of foreign claims on domestic banks provides an indication of the health of the domestic financial sector. If domestic banks are in good condition they will attract foreign interest at greater rates, and will also have less need to signal prudence via overly large capital buffers.

3.4 Data

The dependent variable is bank capital ratios (CAR) taken, along with with other bank-level characteristics, from the Bureau van Dijk's BankScope database of financial firms.³⁸ To minimize cross-national variation in how supplementary capital ratios are calculated, and thus more closely compare like-to-like, I follow previous literature and focus on core tier 1 capital (Bernauer and Koubi 2006), which are transformed to the logarithmic scale to reduce the influence of outliers. These data are pooled, and I include controls for country and year to account for idiosyncratic temporal or national effects. Explanatory variables include other firm-level measures from the BankScope data set, including whether a firm is listed on a public exchange (Listed). I also include a firm's total assets as a measure of firm size, which has also been transformed to the logarithmic scale.

At the national level I include several types of variables: macropolitical, macroeconomic, and macrofinancial. Considering the first of these, I include the minimum capital ratio that governments mandate firms maintain and a binary variable indicating whether the banking regulator is a central bank (= 1) or a separate agency (= 0), both taken from the World Bank surveys described below, as is a dummy indicating whether bank deposits are guaranteed by the government. I also include several institutional variables corresponding to the political environment within which firms operate. I include each of the three components of the "Trilemma indexes" – monetary independence, exchange rate stability, and capital account openness – described by Aizenman, Chinn, and Ito (2008). All three are bounded in between zero and one, with higher values indicating greater policy flexibility in

³⁸BankScope contains data from many different types of financial firms, including real estate lenders, government-owned banks, cooperatives, and others. Because this analysis focuses on the interplay between market pressures and public regulations, I only include firms likely to be subject to the sort of capital requirements under study. Therefore, I limit the sample to commercial banks, bank holding corporations, and investment banks, and control for firm type. While BankScope is the largest data base of financial firms, it is not universal. It tends to overrepresent large firms in more developed countries. Nevertheless, it remains the most complete set of firm-level financial data. I discuss how capital ratios are calculated and why they are important in an appendix.

that area.³⁹ I also control for the type of political regime that governs the countries within which banks operate, using the Polity2 score from the POLITY IV data set. Higher scores on this measure indicate a more democratic country.

I capture the macroeconomic environment using several variables, all taken from the World Bank World Development Indicators. First, I indicate what income class a country belongs to, which is an ordered categorical variable (broken up into a series of binary variables) that can take on values of “low income”, “low middle income”, “upper middle income”, “non-OECD high income”, and “OECD high income”. I also include the GDP growth rate, gross domestic savings rate, and inflation rate (GDP deflator). Each of these are transformed to the logarithmic scale. The current account balance as a percentage of GDP is also included, as the country’s national accounts impact net capital flows into or out of a country.

To take account of the macrofinancial environment firms face, I include three variables. The first is the total amount of assets controlled by the domestic banking sector. These came from the same BankScope data as the firm-level variables, and was created by simply summing each individual firm’s asset holdings for each country-year included in the sample. The second is the gross domestic savings rate (% GDP) for each country-year, which comes from the World Bank World Development Indicators data set. The last is the amount of “internationalization” of a country’s banking sector, measured as the amount of foreign claims on that banking sector. These data are taken from the Bank for International Settlements consolidated banking statistics on an immediate borrower basis.

There are several data limitations. No cross-sectional time series data on government

³⁹Due to the ‘n-1’ phenomenon, one state in a system of ‘n’ countries can maintain all of monetary independence, exchange rate stability, and capital openness. The authors ascribe this role to the United States, but the formula used in computing the values of the index is undefined for this country, thus creating missing data. I therefore imputed the highest value for each variable – indicating greater policy flexibility – for the U.S.

regulations presently exists. The best data come from the World Bank “Banking Regulation and Supervision” surveys. These surveys – which asked government officials dozens of questions related to banking supervision, including what the minimum capital adequacy ratio was in their jurisdiction and which agency regulated the domestic banking sector – represent the best cross-national data on government policies related to financial market supervision. While response to the survey was not universal, a majority of countries participated in each year.⁴⁰ Therefore, in order to include statutory regulations, the existence of deposit insurance, and the location of regulatory authority in the analysis, I restrict the analysis to the years in which those surveys were concluded.⁴¹ The survey was conducted with the goal of transparency, so the collectors of the survey information made the results public and encouraged reporting of discrepancies between survey responses and actual practice. Nevertheless, some divergence between *de jure* responses and *de facto* practices may exist. While these surveys leave some things to be desired, they remain the most complete and accurate cross-national data on governments’ regulatory policies available at this time.

Restricting the analysis to these years follows from, but is an improvement on, previous literature that examined banks’ capital ratios. It improves previous literature in several ways. First, it looks at all three periods in which the surveys were conducted, and examines the largest number of firms across jurisdictions. Previous studies either focused exclusively on the United States (Bernauer and Koubi 2002, 2009), a single time period (Bernauer and Koubi 2006), or a severely limited sample of firms (Brewer III, Kaufman, and Wall 2008). I include all investment banks, commercial banks, and bank-holding corporations for all countries and years available. Therefore, to my knowledge, the analysis presented here is the most comprehensive yet undertaken in terms of each of firms, countries, and years.

⁴⁰Non-respondents were generally the smallest and poorest countries. All OECD members participated in each of the three surveys.

⁴¹The years included are 2000, 2003, and 2006. An additional survey was released in 2012, but data for that year is not available for most of the variables in the model. For a discussion of the surveys see Barth, Caprio Jr., and Levine (2001); Barth, Caprio Jr., and Levine (2008).

More specifically, to my knowledge it is the only study of the political economy of banking to include banks from emerging markets in a comparative sample.

3.5 Method

I analyze these data using Bayesian regression methods, which employ different assumptions about the data generating process from frequentist or likelihoodist approaches. Bayesian models approach the observed data as fixed – rather than sampled randomly from a population – and the coefficients as drawn a random distribution rather than a point estimate of the true value of a parameter existing in nature. The distribution of the coefficients – called the “posterior” – is interpreted using standard measures of central tendency and dispersion, but because Bayesian methods estimate a proper probability density for the posterior, within a Bayesian context we are not limited to simple tests of statistical significance. Instead, we can estimate with precision the probability that an effect is positive or negative by considering how much of the parameter’s distribution is above and below zero. In addition to different assumptions about the data generating process and attractive interpretive properties, Bayesian methods allow – indeed require – the incorporation of prior beliefs about the effects of explanatory variables on the outcome variable.⁴² In my case, because the size of my data set is large enough for the results to be driven by the data even with strong priors, I specify several models using low-information priors.⁴³

All models have the same specification of the determinants of banks’ tier 1 capital ratios and employ diffuse normal priors – which contain little information outside of the observed data – for all parameters. The empirical model is a Bayesian regression estimated using the `MCMCpack` package in the R statistical environment. The `MCMCpack` package uses Markov chain Monte Carlo (MCMC) simulations to estimate the distribution of the

⁴²Mathematically, likelihood approaches incorporate “flat” priors as well, which assigns an equal likelihood to all possible values of the parameter, whereas Bayesian approaches accommodate any specification of prior beliefs as well as subjective confidence in those prior beliefs.

⁴³Employing low-information priors reduces the importance of subjective beliefs about the model’s performance previous to estimation and gives more weight to the observed data.

posterior. In this case, I discarded the first 50,000 simulations as burn-in, and estimated 500,000 post burn-in iterations of the chain. I specify four models. One for each year for which the World Bank surveys discussed above were conducted – 2000, 2003, 2006 – and one which pools all years.

3.6 Results

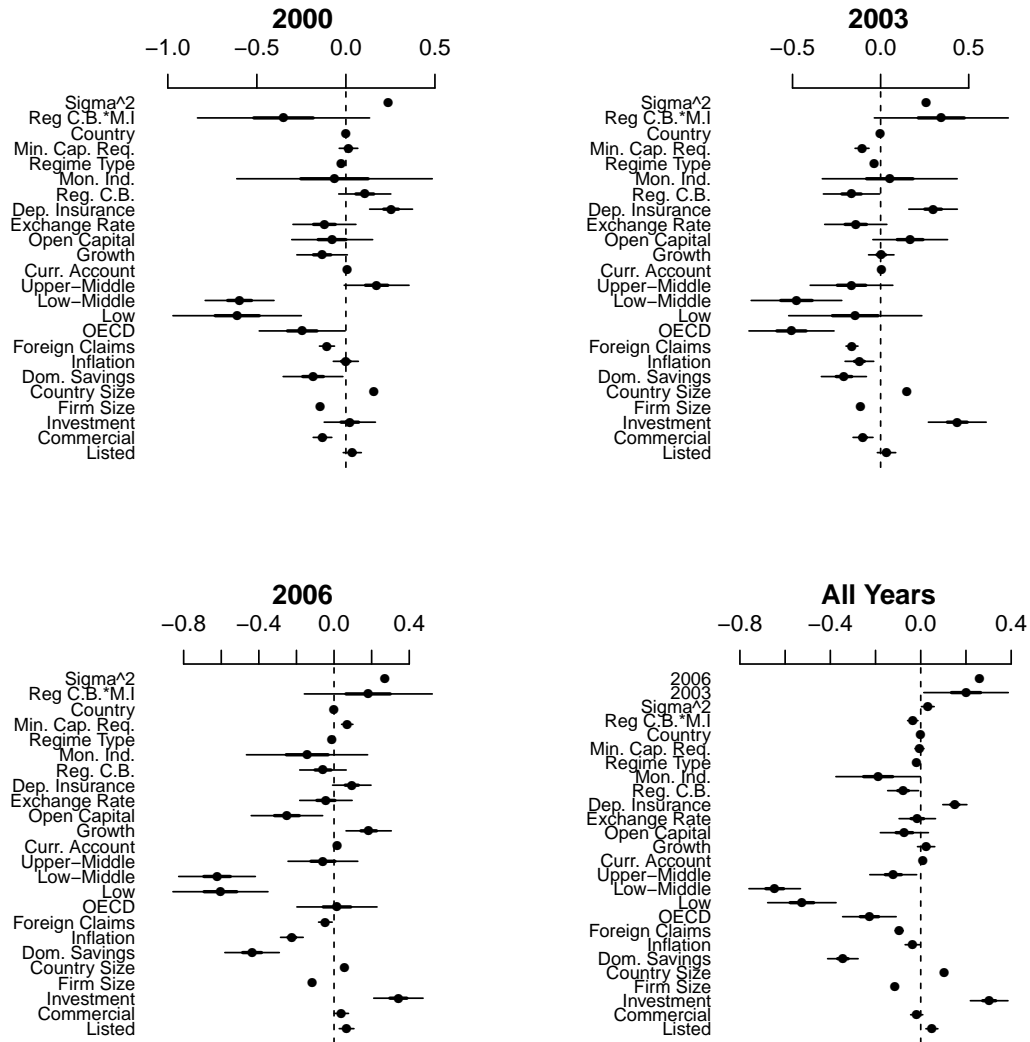


Figure 3.4: *Correlates of banks' risk-weighted tier 1 capital adequacy ratios as estimated by a Bayesian linear regression.*

Figure 3.4 presents the results from the Bayesian linear regressions on banks' tier 1

capital adequacy ratios for each year in which the World Bank conducted surveys on bank supervision, as well as a pooled model with controls for year.⁴⁴ The Bayesian version of coefficient estimates – posterior mean – is the point estimate, while the 95% credible interval represents the spread of the distribution. The results are mostly stable across the sample period although, as we might expect, there is some variation across time. Banks were on average better capitalized in 2003 and 2006 than they were in 2000 (the base year). In no sample are banks sensitive to the type of political regime.

The firm-level explanatory variables typically have large and substantively important effects on firms' risk-taking behaviors as measured by capital adequacy ratios. Banks that are publicly listed on equity exchanges have higher capital ratios than firms that retain private ownership, although the mean effect is most easily distinguishable from zero in 2006. This is not surprising, as we would expect public shareholders to demand more prudent management of risks and because publicly-listed firms have greater legal requirements for transparency, which incentivizes prudence. Commercial banks tend to have a smaller capital cushion than the reference group – bank holding corporations – in the earlier years in the sample, while investment banks have much higher ratios in the later years. This provides some evidence that investment banks have a greater need to signal prudence, as their investment activities are more opaque. It also calls into question traditional race to the bottom narratives, as investment banks are typically regulated less stringently than deposit-taking institutions. Larger firms, as measured by the amount of total assets controlled by the firm, tend to have lower capital ratios on average. This relationship is persistent at all periods, and is substantively meaningful. Large firms might maintain lower capital ratios because they are better diversified – as some portfolio theory would suggest – or because they possess an implicit government bailout guarantee – which weakens the discipline of markets. Disentangling these effects would be a profitable extension of this analysis for

⁴⁴The results for each model are depicted individually (i.e. in a larger format) in the appendix.

political economists.

Macrofinancial variables have some of the largest and most consistent effects. Firms which operate in large domestic banking markets, as measured by the aggregate assets controlled by the banks in the sample, have higher tier 1 capital ratios. To the extent that larger financial sectors are more competitive, this provides further suggestive evidence against the race to the bottom. It also provides some reason to question whether financialization of the economy, at least as measured by raw size, necessarily leads to increased risk-taking; the finding that larger banking sectors are associated with better firms capitalization may demonstrate increased market discipline. At the same time, when banks have easy access to depositor funds, as measured by the domestic savings rate, asset-financing via equity capital rather than debt tends to be lower. This, again, suggests a market discipline mechanism may be an important driver of firm capitalization. The amount that a banking system is internationalized, as measured by the number of foreign claims on domestic banks, is associated with lower firm capital ratios but the substantive effect is fairly weak. This indicates that any effects from exposure to foreign competition, at least as measured by counterparty participation, are fairly minimal.

The effect of macroeconomic variables is mixed. The inflation rate does not have an impact on bank capital ratios which is consistently distinguishable from zero, which supports the findings of prior work (Winecoff 2014).⁴⁵ The effect of economic growth is similarly small and inconsistent, while the current account balance as a percentage of domestic GDP is unrelated to banks' capital ratios.

Banks which operate in all income categories other than the base category – high income non-OECD countries – maintain lower capital ratios on average except for banks in upper-middle income countries, where the difference is typically not statistically significant at normal levels (and changes sign). Banks in poorer countries have much lower

⁴⁵However, the impact of the inflation variable becomes more important as we move forward in time: by 2006 the negative association with bank capital is larger and statistically significant at traditional levels.

ratios. This could be due to weaker market discipline, less bureaucratic capacity which could enforce regulations, or different bank-state relations in poorer than in richer countries. Banks in OECD economies also have lower ratios, however. These economies have the most extensive regulatory and the best means to enforce them. Perhaps this relationship indicates that market confidence is improved by having strong regulatory capacity. If so, Bernauer and Koubi (2006) could be correct in concluding that markets and governments are complements rather than substitutes. It could also indicate capture of the regulatory apparatus by more-financialized economies, but the regulatory structure of these economies had mostly harmonized via the Basel capital accords during the sample period and there is no evidence that monitoring or enforcement was *worse* in OECD economies than others during the 2000s.

The relationship between policy variables and bank capital adequacy is weak in most cases. Interestingly, the level of minimum capital requirements does not have a consistent effect on the amount of core capital relative to assets that banks maintain, and when pooling all three years there is no association. This contradicts the finding Jacques and Nigro (1997) and Brewer III, Kaufman, and Wall (2008), suggesting that their analyses may have suffered from omitting relevant variables or from selection effects due to smaller sample sizes. It also suggests that post-crisis regulatory reform efforts which have focused on improving bank capital may not have the desired effect. Banks operating in systems where deposits are insured by the government are better capitalized on average, which may indicate that deposit insurance schemes do not foster moral hazard that would encourage firms to act more riskily. Banks regulated by central banks have less capital against their assets in three of the four models, and the effect is statistically distinguishable from zero in the pooled model.

The “Trilemma” variables also have little to do with bank behaviors, on average, after the effect of the other variables is considered. Capital account openness is negatively

related with bank capital in 2006, but not in the other years or the pooled model. This calls into question the argument made by Rosenbluth and Schaap (2003) that governments will be able to induce prudential behavior by domestic firms by limiting foreign competition; if anything, the opposite is true. Exchange rate stability has no statistically significant relationship with capital ratios and neither does monetary independence. The interaction between monetary independence and a central bank having a regulatory mandate has no multiplicative effect.

Taken together, these results that firms risk behaviors as measured by risk-weighted capital-to-assets ratios vary according to the macroeconomic and macrofinancial environments in which firms operate, and vary according to some macropolitical factors but not others. There is also meaningful variation at the microeconomic level. This suggests that trying to analyze any one of these factors outside of the context of the others is likely to lead to incomplete, if not false, inferences regarding the determinants of firms' risk behaviors. The results thus agree with Bernauer and Koubi (2006): the direct effect of capital adequacy regulation on firm behaviors is decidedly mixed and may be overstated by policymakers, especially by comparison to firm-level and country-level variables. There does not appear to be any consistent race to the bottom or climb to the top. Instead, firms differentiate themselves according to their type and position within markets.

3.7 Conclusion

Previous political economy of finance research has typically assumed that banks "race to the bottom" by acting more riskily when faced with competition. Theories of regulatory politics have been constructed based on this belief, which assumes that the central tendency of bank behavior should be minimal compliance with regulations, if not avoidance, and the variance should be low as all firms are pressured by markets. This paper provides descriptive evidence that these expectations are not borne out: banks routinely over-comply with capital adequacy regulations to a large extent, and the variance in bank behaviors is

significant.

I argue that this indicates a need to shift political economy theory of financial behavior away from representative agent models such as those based upon the capital structure irrelevance principal of Modigliani and Miller (1958, 1963) and towards a model which allows firm behaviors to vary based upon their “preferred habitat” (Vayanos and Vila 2011; Guibaud, Nosbusch, and Vayanos 2013). There are two advantages to such a shift. First, it provides a more realistic framework within which firms behaviors may be examined. Second, it allows us to appropriately embed firms within a political and economic context, thus allowing us to consider how firm preferences over policy may be formed. A Bayesian regression analysis of the determinants of firm behaviors shows that variables at the level of the firm are important, but so are national and international political and economic variables.

Understanding how financial firms behave is of intrinsic interest for policymakers and scholars of political economy (Strange 1992; Mosley and Singer 2009), but it also has implications for theories of regulatory politics. Recent scholarship has called into question standard accounts of rent capture via lobbying (Young 2012), but to this point there are few alternative perspectives from which new theory may be constructed. The preferred habitat framework employed here provides one such avenue.

One advantage of this approach is that public interest and public choice accounts of regulatory politics may be embedded within it in a way which allows firms’ preferences to differ. Regulatory reform efforts before and since the global financial crisis have been contended by financial firms which operate in different segments of the market. For example, parts of the international Basel capital accords which rely on internal risk models to determine appropriate capital ratios have been criticized by firms who do not have the technical expertise required to develop such models internally. As a result, the United States did not become fully compliant with second Basel accord (Berger 2006). The United States was

not alone in partial compliance (Financial Stability Institute 2012), as many countries have overstated their *de facto* accession to global capital standards (Walter 2008a). Comparative analyses of these phenomena may be enriched by reference to comparative habitats.

There are limits to the analysis presented here. I have only looked at one operationalization of firm behavior – tier 1 capital ratios of commercial banks, investment banks, and bank holding corporations – over a relative short period of time. A more sustained data collection effort should be able to extend the time series. Of particular interest may be a pre- and post-crisis comparison of firms behaviors, and the extension of such analyses beyond banks to other types of financial institutions. Did the internationalization of the subprime crisis have a transformative impact on financial markets? Have different types of firms responded to regulatory changes in asymmetric ways? These sorts of questions will become increasingly important to policymakers as the post-crisis revisions to the international Basel accord are phased in from now until 2019 and as domestic regulations – such as the Dodd-Frank Act in the United States – are implemented.

An additional extension might hone in on the behaviors of transnational firms. Many large financial institutions now have a presence in multiple regulatory jurisdictions. To what extent do they prefer international regulatory harmonization as that would minimize compliance costs relative to taking advantage of lax taxation and disclosure requirements in financial havens? And what are the effect on the domestic political economies that serve as havens? The fact that some of the severest effects of the recent global financial crisis occurred in haven countries like Ireland, Cyprus, and Iceland provides some indication of the risks involved with courting global finance. On the other hand, countries such as Switzerland and the Caribbean tax shelters came through the crisis relatively unscathed.

Understanding the relationship between firm behaviors and crisis is also important, but is not explored in this analysis. The period from 2000-2006 was remarkably crisis-free compared to the 1990s and later 2000s. Some of the firm behaviors uncovered in this paper

may have been reactive to the 1990s crises, or may have changed significantly following the subprime crisis. Both crisis periods culminated in a major reform to the Basel capital accords as well as many significant domestic reforms. The ways in which firms' risk-taking activities were related to these crises surely had an impact on – and were responsive to – regulatory reform efforts. As before, extending the time series back backward and forward could provide more of an insight into the particular features of financial market behaviors.

Finally, this paper is not able to fully embed firms into the global financial system. While detailed analysis of cross-national financial interdependencies do not exist – or at least are not available publicly – at the firm level, the global nature of the recent crisis underscores the importance of understanding how developments in one jurisdiction can impact financial health elsewhere. Moreover, as financial markets become increasingly globalized firms' locating firms habitats within national political economies will become less and less useful.

A CHAPTER 3 APPENDIX

A.1 Why Focus on Capital Ratios?

There are two basic categories of banking regulations. The first are “prudential” standards – such as minimum capital-to-assets ratios (CAR) – which restrict the amount of risk to which a bank may expose itself. The second are “profit-padding” standards, in which governments insulate domestic firms from foreign competition.¹ Lower minimum CAR allow banks to seek greater profits through taking on greater risks. Less competition allows incumbent banks to earn a profit without exposure to excessive risk. By providing domestic banking sectors with rents, national governments intend to reduce excessive risk-taking and promote systemic stability. Rosenbluth and Schaap (2003) argue that banks lobby for either lower prudential standards or greater protection from competition, and governments emphasize one type or the other depending on national characteristics. Singer (2004, 2007) argues that regulators seek to balance stability and competitiveness through a mix of regulatory independence and international harmonization.

International harmonization of prudential regulatory standards became necessary following the collapse of the Bretton Woods system of capital controls, while technological advances led to a large increase in financial integration. Policymakers in advanced industrial economies preferred an international financial system where restrictions on capital

¹Scholars have used different names for similar classifications of regulation type. For example, the “confidence” regulations in Singer (2004) are not unlike the “prudential” regulations in Rosenbluth and Schaap (2003) or the “helping-hand” regulations in Barth, Caprio Jr., and Levine (2001). Singer’s “competitiveness” regulations are not unlike the “profit-padding” regulations in Rosenbluth and Schaap (2003) or the “grabbing-hand” regulations in Barth, Caprio Jr., and Levine (2001).

mobility were few.² The desire for capital liberalization reduced the amount of profit-padding regulatory options available to policymakers, thus increasing the importance of common prudential standards. As a result, international regulations have focused on capital adequacy rather than protectionism. In fact, the Basel committee has often emphasized the importance of competition as a means of monitoring and disciplining banks. Market discipline is the “third pillar” of the second Basel accord.³ The choice to maintain open, competitive capital markets meant that capital adequacy became the bedrock of prudential regimes at both the domestic and international levels. It became the focal point for international harmonization efforts, beginning with Basel I, and remains so to the present.

These requirements generally take the form of capital-to-assets ratios, often weighted according to the riskiness of a bank’s asset portfolio. The basic formula for CAR is simply $\frac{\text{Capital}}{\text{Assets}}$. Basel I specified two tiers of capital, separated by quality. Tier 1 capital (core capital) includes equity capital and disclosed reserves, while tier 2 capital (supplementary capital) includes subordinated debt, undisclosed reserves, revaluation reserves, and hybrid instruments.⁴ Additionally, asset types are weighted according to their perceived risk. So the Basel CAR formula is $\frac{\text{Tier1}+\text{Tier2}}{\text{RWA}} \geq \gamma$, where *RWA* is a firm’s risk-weighted assets and γ is some threshold of risk tolerance. Under Basel I and II, $\gamma = 4\%$ for tier 1 capital and $\gamma = 8\%$ for tier 1 + tier 2 capital.

The relationship between capital-to-assets ratios and leverage is as follows. Assets can be financed by either equity or debt. Tier 1 capital ratios measure the amount of a

²For detailed descriptions of how and why this preference for open capital markets became a broadly-shared norm, see Helleiner (1994), Abdelal (2007), and Chwioroth (2007, 2009).

³Basel III lessens the reliance on market discipline in favor of higher statutory requirements.

⁴There is some cross-national variation in what qualifies as tier 1 and tier 2 capital under the Basel accords. For the most part, the definition of tier 1 capital is the same for all countries, except that some forms of preferred stock qualify as tier 1 capital for American bank holding companies. The definition of tier 2 capital is largely left up to national regulators, and cross-national variations are sometimes quite significant. Part of the Basel III negotiations have involved tightening these definitions, and focusing more on core Tier 1 capital. In other words, to require higher quality capital reserves, as well as higher quantity. This has been a contentious process, as described in more detail below.

Type of Asset	Risk-Weight
Cash	0%
OECD sovereign debt	
Claims on OECD banks	20%
Claims on OECD securities firms	
Municipal debt	
Residential mortgages	50%
Unsecured loans	100%
Claims on non-OECD banks	
Fixed assets	

Table A.1: *Basel Risk Weights By Asset Type. This basic weighting schedule was in place during the period under observation.*

firm's financing which comes from equity: $\frac{Equity}{Assets}$. Leverage is the ratio of a firm's debt to its equity: $\frac{Debt}{Equity}$. Therefore, tier 1 capital ratios are the inverse of leverage, with a transformation allowing for variance in the risk of different types of assets. Table A.1 shows a basic risk-weighting schedule under the first Basel accord.⁵ As an example, a bank holding \$100 in U.S. Treasury bills would have to hold zero capital guaranteeing against default risk, as OECD sovereign debt is considered risk-less. However, loans to commercial enterprises carry a 100% risk-weight, so banks would have to hold \$8 in capital against \$100 in unsecured commercial loans, of which \$4 must be tier 1 ($\$100 * 1.00 * 0.08 = \8). Banks would have to reserve \$2 in capital against \$100 in securities issued by OECD firms or governments, of which \$1 must be core capital, since the risk-weight for these assets was 20% ($\$100 * 0.2 * 0.08 = \2).⁶

Capital ratios are important for regulators and investors because they provide an assessment of a bank's risk profile in a way that is fairly easy compare across firms and jurisdictions. For this reason they have formed the foundation of prudential regulatory

⁵These are given in the "International Convergence of Capital Measurement and Capital Standards", the official name of Basel I, available on the BIS website at <http://www.bis.org/publ/bcbasc111.pdf>. The second Basel accord complicated these ratios, primarily by allowing more variation within asset classes according to riskiness as rated by credit agencies, bank's internal models, or domestic regulators.

⁶For a more detailed discussion of how often this worked in practice, see Friedman (2009).

regimes. They are not without fault, however. Many of the securitized investment vehicles at the center of the subprime crisis required less capital to protect against default risk than the underlying assets would have required if unsecuritized. When those investments failed to pay off, many firms were left without sufficient capital to remain solvent. Nor do minimum capital ratios correct over-leveraging and illiquidity, both of which contributed to the severity of the recent crash. Indeed, high capital ratios can even make sick firms look well.

As the *Financial Times* noted:

The five largest US financial institutions subject to Basel capital rules that either failed or were forced into government-assisted mergers in 2008 – Bear Stearns, Washington Mutual, Lehman Brothers, Wachovia and Merrill Lynch – had regulatory capital ratios ranging from 12.3 per cent to 16.1 per cent as of their last quarterly disclosures before they were effectively shut down. The capital levels of these five banks were between 50 per cent and 100 per cent above the minimums and 23 per cent to 61 per cent higher than the well-capitalised standard. The strong implication is that capital levels for most banks – and especially for large institutions that raise systemic risk concerns – are set by market expectations, not regulatory rules (Kuritzkes and Scott 2009).

In other words, markets considered the legal requirements to be too low, and demanded more. As it happens, markets were more correct than governments, but they still underestimated the risk these firms were carrying on their books (and, sometimes, off of them). Nevertheless, regulators and investors will continue to rely on capital ratios as a measure of a firm's risk exposure, because a more detailed assessment of every firm would be prohibitively expensive. Capital ratios provide important information regarding the risk profile of firms, and along with new restrictions on leverage and liquidity, formed the backbone of the Basel III revision of global rules. For these reasons, using capital ratios as the dependent variable in a study of bank behaviors and regulatory politics is the obvious choice.

A.2 Model Results: 2000

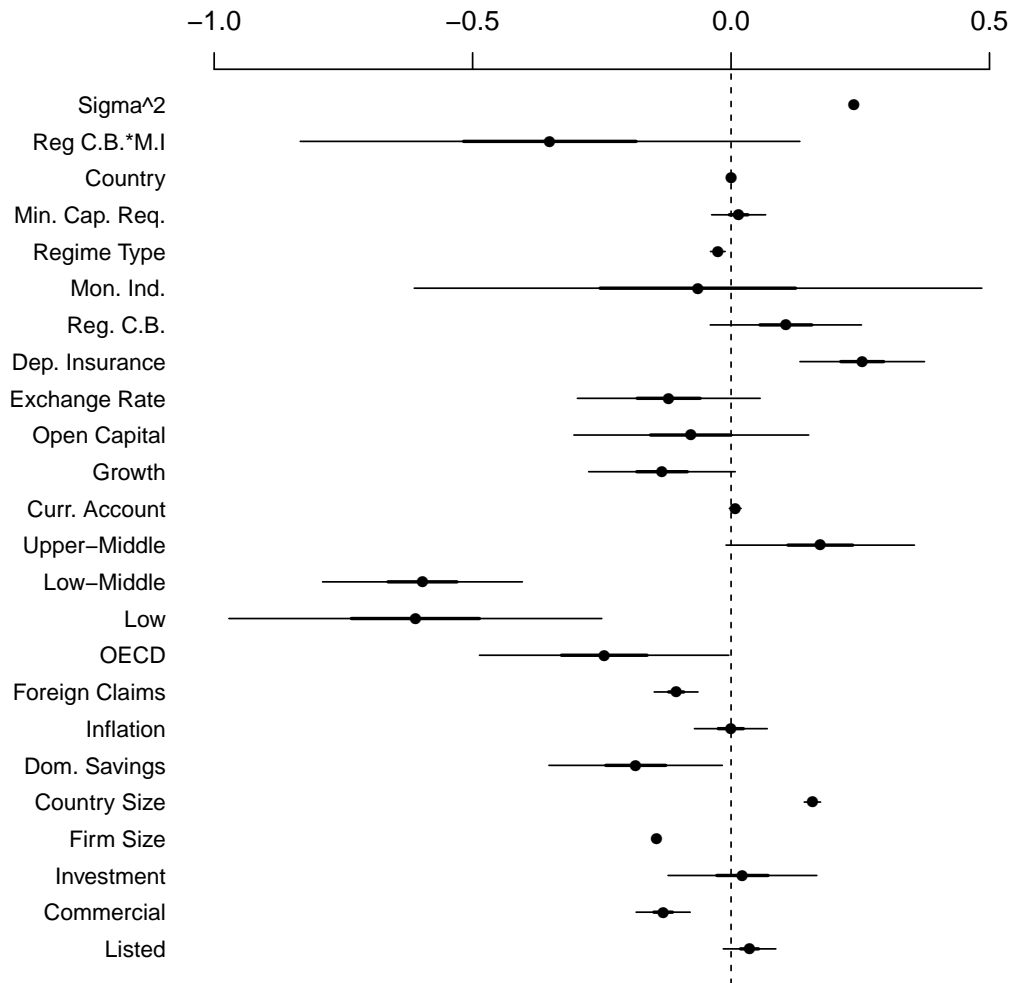


Figure A.1: *Correlates of banks' risk-weighted tier 1 capital adequacy ratios as estimated by a Bayesian linear regression in the year 2000.*

A.3 Model Results: 2003

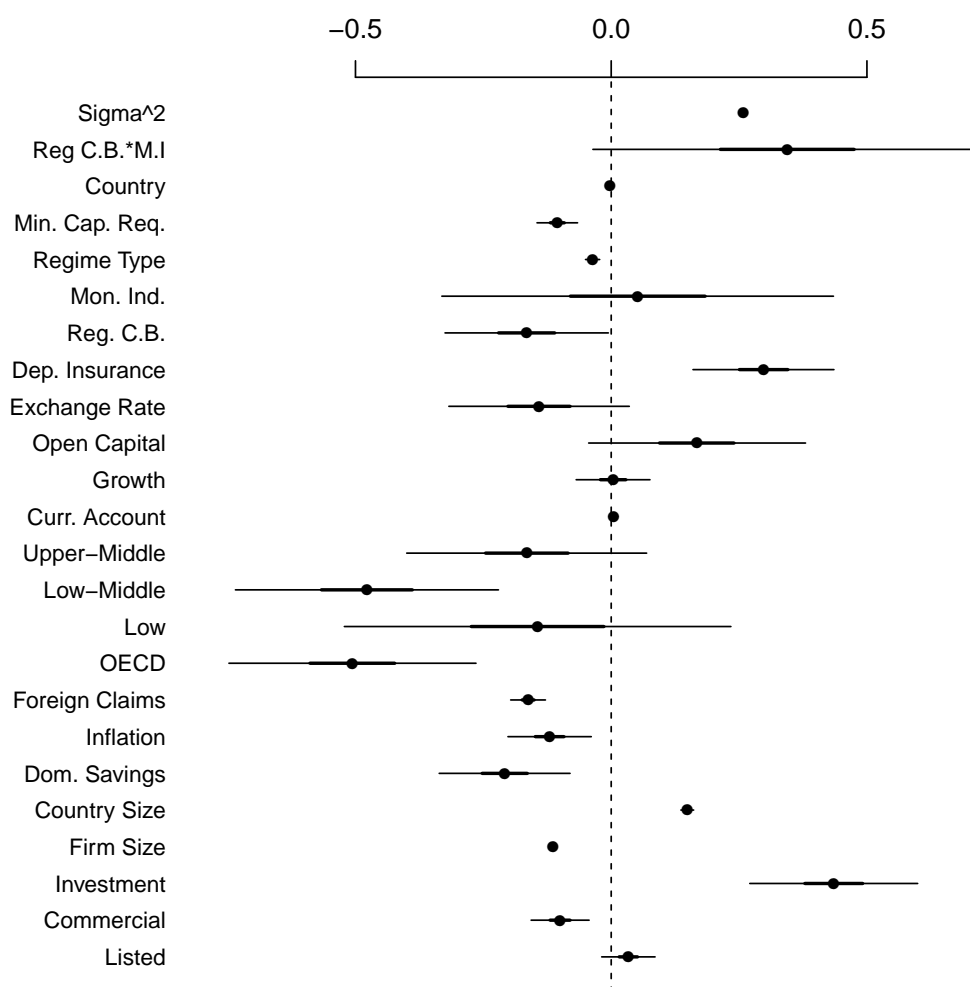


Figure A.2: *Correlates of banks' risk-weighted tier 1 capital adequacy ratios as estimated by a Bayesian linear regression in the year 2003.*

A.4 Model Results: 2006

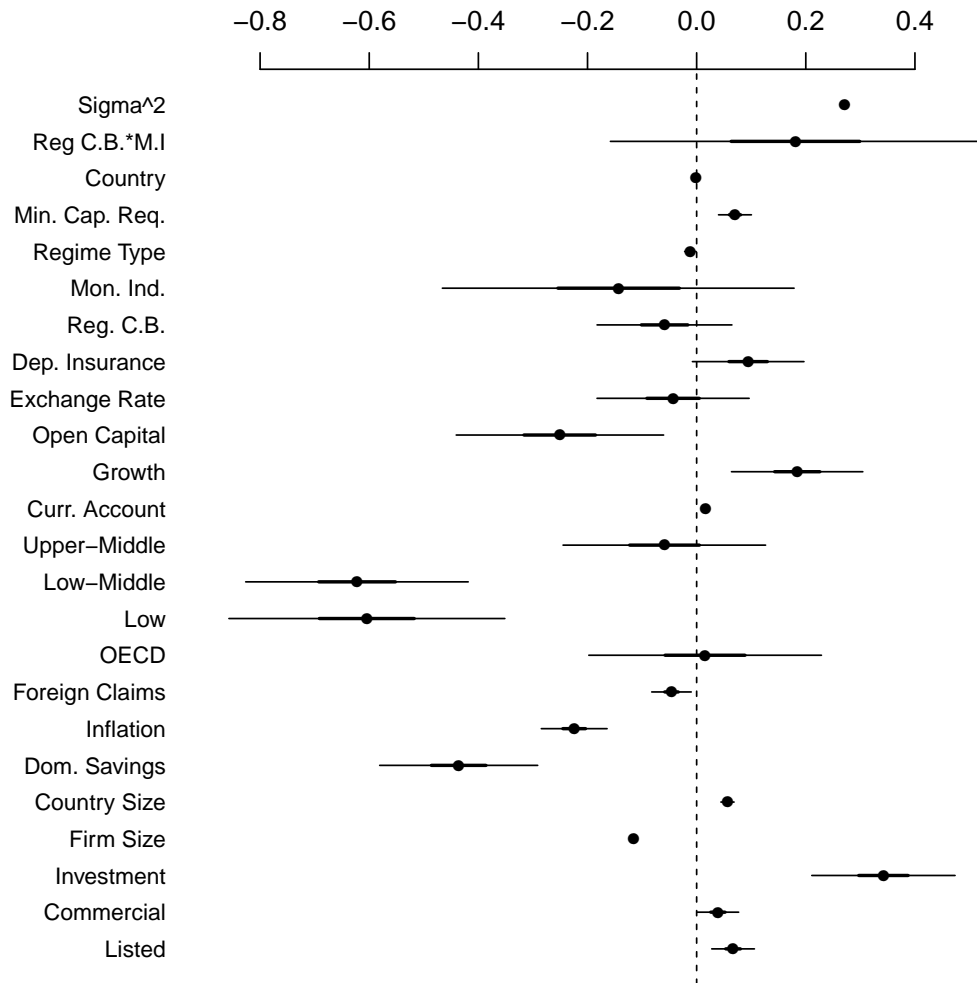


Figure A.3: *Correlates of banks' risk-weighted tier 1 capital adequacy ratios as estimated by a Bayesian linear regression in the year 2006.*

A.5 Model Results: All Years

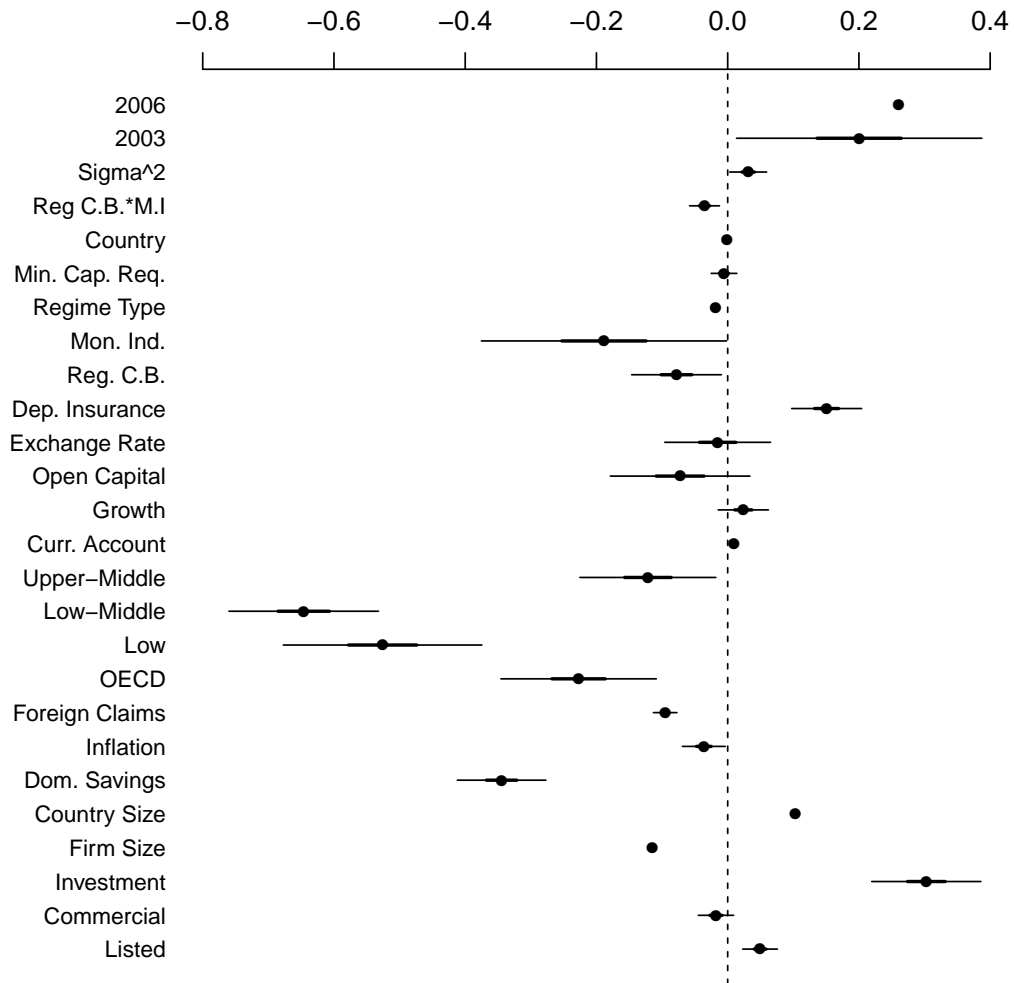


Figure A.4: *Correlates of banks' risk-weighted tier 1 capital adequacy ratios as estimated by a Bayesian linear regression in all sample years.*

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