

GLOBALIZATION PRESSURES AND THE STATE:
THE WORLDWIDE SPREAD OF CENTRAL BANK INDEPENDENCE

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Abstract

We examine the impact of globalization on state structures in the specific instance of the central bank. Following the world-system, world-society and neo-institutional perspectives in sociology, we assume that states are in cultural, political and economic competition with each other, thereby seeking to maintain their position and status, frequently by adopting organizational forms or practices that make them isomorphic with their environment. We predict that countries boost the independence of their central bank from the political power as their exposure to foreign trade, investment, and multilateral lending increases. We also model the cross-national dynamic process of diffusion of central bank independence by examining the impact of cohesive and role-equivalent trade relationships between countries. We test our hypotheses with information on 71 countries between 1990 and 2000, using both event-history modeling and fixed-effects panel-corrected regression. Controlling for domestic variables of a macroeconomic and political nature, we find empirical support for each our predictions. We conclude that globalization pressures have the effect of strengthening certain parts of the state at the expense of others, and raise concerns about the degree of democratic oversight of technocratic institutions.

One of the most prominent themes of the globalization literature in the social sciences is the impact that increasing cross-border flows of goods, services, capital, people and information exert on the institution of the modern nation-state. Many scholars have highlighted the ways in which economic and financial globalization undermine the state's capacity to act and regulate. Thus, in Sovereignty at Bay, the political economist Raymond Vernon (1971:249, 265-270, 284) noticed that the spread of multinational corporations creates "destructive political tensions," and that there is a "need to reestablish balance" between political and economic institutions. More recently, the historian Paul Kennedy (1993:53-64, 122-134) asserted that governments are losing control in the wake of globalization. Other scholars have argued that globalization challenges the state's autonomy and capacity for independent decision-making, raising "questions about the meaning of sovereignty in its external sense of a system ordered in terms of mutually exclusive territoriality" (Kobrin 1997:157, 159; see also Mazlish 1993:4; Sakamoto 1994:19, 36; Cox 1996:26-27; Rodrik 1997:1-6). In each of these analyses, the modern state is seen as being at the mercy of globalization.

Sociologists have also joined this debate. Many have pointed out the relative weakness of the state in the face of globalization, warning about the "attenuation of the state" (Waters 1995:96-123), its "decline" (McMichael 1996:197-207), even its "timebound" or ephemeral character in world-historical perspective (Albrow 1997:164). In a more nuanced analysis, Evans (1997:82-87) points out that globalization might produce an "eclipse" of the state because its associated neoliberal ideology of free markets is against the state and not because globalization is inherently against the state. "Strategies aimed at increasing state capacity in order to meet rising demand for

collective goods and social protection look foolish in an ideological climate that resolutely denies the state's potential contribution to general welfare" (Evans 1997:85). He further argues that the state may stage a comeback if there is a "return of the ideological pendulum," or a transformation of the state and a development of new elements of state-society synergy.

Political scientists and sociologists who study expansionary spending and social welfare policies have also pointed out that the effect of globalization on the state is profoundly shaped by the ideology informing policymaking, and that states are not necessarily limited by globalization in the kinds of policies that they can pursue (Pierson 1994:1-9; Fligstein 2001; Gilpin 2000:312-315; Huber and Stephens 2001; Garrett 1998, 1999).¹ "Globalization certainly poses new problems for states, but it also strengthens the world-cultural principle that nation-states are the primary actors charged with identifying and managing those problems on behalf of their societies... [The state] may have less autonomy than earlier but it clearly has more to do" (Meyer et al. 1997:157).

Some scholars build on this reasoning to argue that states should not be seen as passive pawns but rather as "adapting, whether out of necessity or desire" (O'Riain 2000:205). After all, macrosociological theorists have long maintained that the global arena is a "playground" for states, where they compete for economic, military, diplomatic, and political supremacy and survival. Thus, the world-system or the international arena, far from threatening states, actually fosters them (Wallerstein 1974; Poulantzas 1974:73; Tilly 1992). World-society scholars consider competition among

¹ Other scholars disagree on this point (Rodrik 1997:49-67; Vernon 1998:172-175; Stryker 1998:7-8, 14-15, 17, 32-33).

states to be a phenomenon that contributes to an intensification of “formal organizing” (Meyer et al. 1997; Jepperson and Meyer 1991).

In a similar vein, international relations scholars highlight that globalization has changed the nature of the state, without necessarily debilitating or minimizing it. From a neorealist perspective, globalization reinforces the importance of domestic policies, as states jockey for position in the global economy and seek to advance the interests of their firms, resulting in a “mixed system,” increasingly globalized and at the same time fragmented (Gilpin 1987:389-406, 2000:51, 319-323; Berger 1996:7-21). After all, “today’s globalization is authored by states and is primarily about reorganizing rather than bypassing them” (Panitch 1996:84-86). In this view, globalization has brought about three kinds of power shifts around the world: from weak to strong states, from states to markets, and from labor markets to financial markets, with some power evaporating or dispersing (Strange 1996:4-6, 189; Garrett 1998; see also Hirst and Thompson 1996:143-149, 170-194; Sassen 1996:25-30; Wade 1996). Thus, globalization induces a transformation of the state, not necessarily its diminution (Cox 1987:254-259; Stopford and Strange 1991:1-2, 97-136; Held et al. 1999:436-444). “Power has shifted not away from the state but within the state, i.e. from industry or labor ministries towards economy ministries and central banks” (Cox 1992:30-31).

We agree that globalization has shifted power around the state. The existing literature, however, has not explored empirically the mechanisms that account for such a shift. We recognize that globalization is an important process but without accepting one-dimensional accounts of the wholesome demise of the state (or of its strengthening, for that matter). Rather, we assume that variation in the autonomy and strength of the state

and of its constituent parts does occur across countries and over time in response to both domestic and global forces. We consider the autonomy and strength of the state as a continuum that is amenable to empirical examination (Carruthers 1994; Guillén 2001a). The goal of the paper is to analyze theoretically and empirically the impact of globalization on specific state structures, controlling for domestic macroeconomic and political characteristics. We examine the case of the independence of the central bank from the executive branch of government as an instance in which both global and domestic factors affect the autonomy and strength of different parts of the state.

The Global Economy, the Central Bank, and Policymaking

The central bank is one of the key institutions of the modern rational state, one that all countries must establish if they are to be part of the world community (Meyer et al. 1997). Its role in the economy is certainly crucial: by influencing short-term interest rates, undertaking open market operations, and enforcing reserve requirements, the central bank controls the money supply. Monetary policy can have stabilizing, limiting or augmenting effects on the rates of inflation, unemployment, and economic growth. Furthermore, the actions of the central bank may affect financial stability and the currency exchange rate (Blinder 1998; Eichengreen 1998; Maxfield 1997). Central bankers, of course, can make such decisions under varying degrees of political supervision, ranging from total subservience to the goals and means set by the government to complete independence.

The central bank has not always been as autonomous or visible an institution within the state as it became during the 1990s, although the virtues of granting the central bank independence from the political power were already being trumpeted as far back as

the early 20th century (Eichengreen 1998:49). After the collapse of the global financial system in the 1930s, the next relatively orderly international monetary arrangement came into being with the Bretton Woods agreement of 1944, which introduced pegged (though adjustable) exchange rates, established controls to limit capital flows, and organized the International Monetary Fund (IMF) as the multilateral institution to assist countries with their balance-of-payments problems (Eichengreen 1998:93-96). Finance ministers became the key decision-makers, while central banks and their presidents or governors played a relatively limited and quiet role in economic and financial policymaking. During most of the post World War II period, central banks operated as yet another state agency, without much discretionary decision-making power, save for a few exceptions like the United States and Germany.

The de facto collapse of the fixed exchange rate system in 1973 led to a period of worldwide financial instability, which the increasing mobility of money across borders and the gradual removal of capital controls only exacerbated. Meanwhile, the economic crisis came hand in hand with high inflation, and mounting trade and fiscal deficits in many countries around the world (Eichengreen 1998:136-139). The most advanced industrialized countries tried to tackle the situation in several ways. One of them, the creation of the Group of Seven (G7) in 1987, was an attempt to bring about financial stability through policy coordination (Gilpin 1987:131-151). It was towards the late 1980s and early 90s that central bankers began to make headlines around the world, and that the idea of central bank independence gained support as a safeguard against the alleged ill effects of fiscally expansionary policies.

Following Evans (1997), it is also important to take into account the ideological background to the rise of the central bank to prominence because it occurred in the context of fierce theoretical and practical debates among economists over the roles and effectiveness of fiscal and monetary policies. Starting in Chile and Britain, a policymaking movement oftentimes referred to as “neoliberalism” highlighted the importance of taking politics and the state out of the economy so as to make it possible for markets to function unhindered. Neoliberalism was a direct response to Keynesianism and to other forms of state intervention in the economy. This shift in the dominant paradigm of economic policymaking neither took place simultaneously around the world, nor was embraced to the same degree across countries (Hall 1989, 1993; Haggard and Kaufman 1992; Campbell and Peterson 2001; Fourcade-Gourinchas and Babb 2002). While both sides of the debate tended to emphasize the technical aspects of their arguments, the ideological and political undertones were readily apparent. Keynesianism favors the use of fiscal policy (e.g. government spending) as a way to not only manage the business cycle, avoid recessions and generate full employment, but also achieve certain cherished political goals such as social cohesion through the creation of a “social safety net.” Neoliberalism, by contrast, proposes fiscal discipline, reductions in subsidies, tax reform, the privatization of state-owned enterprises, tax cuts, deregulation, monetary stability, and free trade and capital movements so as to foster entrepreneurship, investment, and long-run economic growth. A specific version of this policy cluster was the so-called “Washington Consensus,” a term coined in 1989 by John Williamson to refer to policies aiming at helping Latin America avoid its recurrent financial crises and achieve faster, steadier economic growth (Williamson 1990, 2000).

Neoliberal proponents made the idea of central bank independence their own. A central bank free from political contingencies is supposed to be in a position to pursue the goals of fiscal discipline and monetary stability by preventing the rest of the state from engaging in discretionary deficit spending. By controlling the inflation rate and preventing the government from causing inflationary shocks that could momentarily boost output, the central bank is heralded as a necessary check to self-interested politicians. Whereas dependent central banks could lend to the government and to public institutions, an independent central bank is barred from either activity, thus imposing austerity and stability on the economy. The idea of an independent central bank matches the technocratic ethos of the neoliberal paradigm, with its purportedly objective, non-partisan, disinterested, and depoliticized approach to policymaking. It is also an idea that is frequently associated with the push for economic and financial globalization because, according to the conventional economic wisdom, global markets can only operate successfully with a high degree of institutional convergence, that is, with the adoption of similar institutions, policies and practices throughout the world (Sachs 2000). It is only fair to note, however, that not all economists or policymakers in favor of an independent central bank are neoliberal in their overall policy orientation (Eijffinger and Hoberichts 1998). Central banks can play wider policy roles. For instance, a central bank can be a guarantee to foreign investors that the value of their holdings will not be undermined.

The Idea of Central Bank Independence

Central bank independence refers to its insulation from influences and pressures by government officials, especially elected ones. Although the central bank is an

instrument of the state-as-an-actor model, the very idea of independence is based on the premise that the state is an institution in which different groups vie for power and influence (Skocpol 1985). If the state is a “polymorphous crystallization of social power” (Mann 1993), then central bank independence is best conceptualized as the re-centering of social power in the hands of economic technocrats and financial interests, following the group-affiliation tradition spelled out by Carruthers (1994).

The theoretical justification for central bank independence lies in the realm of agency theory in economics. Barro and Gordon (1983) applied the “time-inconsistency” problem developed in principal-agent frameworks to central banking (see also the earlier statement by Auernheimer 1974). In particular, they posited that a central bank that is politically dependent on the government tends to impress an inflationary bias on the economy. According to their theory, governments have a preference for high employment and for minimal variations around a target inflation rate (Fuhrer 1997). According to this view, however, once the inflation rate target is set, in order to win the favors of the electorate the government has a strong incentive to inflate, thus increasing the employment rate by exploiting the short-run trade-off between unemployment and inflation predicted by the Phillips curve. Neoclassical economics consequently developed a rational-expectations framework, whereby social actors will expect the government’s faltering commitment to low inflation, and will incorporate a higher inflation rate in their decisions, thus neutralizing any effects on employment and producing a rate of inflation higher than it would be under a regime of credibility (Cukierman 1994).

A solution to this agency problem—the one favored by the neoliberal policy paradigm—is to grant the central bank independence over monetary policy from any kind

of political interference (Cukierman 1994; Grilli, Masciandaro and Tabellini 1991). The central bank expresses its commitment to low inflation and price stability by inscribing it in its statute. Rogoff (1985) suggests a further modification to central banking practices, advocating the appointment of a president or governor whose preference for low inflation is stronger than that of the general public, thus equating political conservatism with credibility of commitment (however, see Eijffinger and Hoberichts 1998 for the distinction between conservativeness and independence). The coronation of this logic is the creation of an efficient institution: “If central bank independence is on average associated with lower inflation, there is no systematic impact on real output growth, nor on its variability. Thus, having an independent central bank is almost like having a free lunch; there are benefits but no apparent costs in terms of macroeconomic performances” (Grilli et al. 1991:375).

The increasing consensus among economists about the advantages of central bank independence did not immediately result in cross-national diffusion (Keefer and Stasavage 2002). Figure 1 shows the number of countries that implemented legal changes to their central bank charters towards greater independence. During the 1990s as many as 17 countries in Eastern Europe and the former Soviet Union made statutory changes towards greater independence; 13 countries in Western Europe; 11 countries in Latin America; 9 countries in Africa; and 4 countries in Asia. Only 24 countries without a strongly independent central bank as of 1989 did not introduce any statutory changes during the 1990s.² During the same decade only Malta reduced the degree of central bank

² Eastern European and post-Soviet region: Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Kyrgyz Republic, Latvia, Lithuania, Macedonia (FYR), Moldova, Poland,

independence. By contrast, between the collapse of the Bretton Woods order in the early 1970s and 1989, only 8 countries made statutory changes to their central banks.³ Thus, the decade of the 90s is the appropriate time-frame for analysis.

Explaining the Adoption of Central Bank Independence

Slovak Republic, Slovenia, Turkey, Ukraine, Uzbekistan, Yugoslavia FR (Serbia/Montenegro). Western Europe: Austria, Finland, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Portugal, Spain, Sweden, Switzerland, UK. Central/South American region: Argentina, The Bahamas, Bolivia, Chile, Colombia, Costa Rica, Honduras, Nicaragua, Peru, Uruguay, Venezuela. Africa: Botswana, Congo Dem. Rep., Egypt, Ethiopia, Ghana, Kenya, South Africa, Tanzania, Zimbabwe. Asia: Rep. of Korea, Japan, Indonesia, Philippines. Also, New Zealand pushed towards central bank independence. Countries that did not introduce changes include: Australia, Barbados, Brazil, Canada, China, Denmark, Lebanon, Malaysia, Morocco, Nepal, Nigeria, Pakistan (where discussion about CBI in the 1980s did not translate into statutory changes), Qatar, Singapore, and the United States. Since ex-Soviet countries only became independent after 1989, we followed a different coding procedure. For event-history analyses we only considered changes in central bank independence after the establishment of a central bank. The pooled time-series, cross-section regressions include fixed effects, thus taking into account only changes over time.

³ Democratic Republic of Congo, Israel, Republic of Korea, Mexico, Portugal, Spain, Switzerland and Zambia. However, in each of these cases the most significant changes towards central bank independence occurred during the 1990s.

Our theoretical approach to the issue of the impact of globalization on the state in the specific instance of central bank independence draws from world-system, world-society and neo-institutional theories in sociology. We observe that states are in cultural, political and economic competition with each other. This idea was first developed into the sociological theory of the world-system by Immanuel Wallerstein (1974). Recent empirical research within this tradition has found that states seek to maintain their status in the hierarchy of the world-system, which is structured in terms of patterns of economic exchange, diplomacy and military competition that tend to perpetuate a system of core, semi-peripheral and peripheral states (Smith & White 1992; Van Rossem 1996). The world-society perspective, which builds on selective aspects of the world-system approach, extends this line of reasoning when arguing that

by structuring so much modern value and activity in a system of explicit cultural, political, military, and economic competition and competitive isomorphism, the nation-state system (a) further intensifies the rationalization of society, but especially (b) increases the likelihood that this rationalization will lead to or be vested in formal organizing. It drives formal organizing both in the state, as state apparatus, and in society, as 'private' formal organization (Jepperson and Meyer 1991:209).

The process by which organizations such as firms or states adopt similar structural forms or practices is the central concern of neo-institutional theory (Meyer and Rowan 1977; DiMaggio and Powell 1983). Actors and organizations behave in isomorphic ways in order to maintain their status and secure legitimacy within the normative social structure in which they are situated; they are coerced into adopting the practices or

structures espoused by other organizations on which they are dependent; and/or they imitate each other when uncertainty makes the assessment of cause-effect relationships problematic or when their bounded rationality renders it impractical to assess each and every available alternative course of action. Each of these dynamics invites organizations to adopt practices and structures that, over time, make them more similar to one another.

It is important to note that the world-system, world-society and neo-institutional perspectives are based on the premise that organizations and states are in competition with one another. Two key observations about competitive dynamics are necessary. First, the three theoretical perspectives underline that competition is not only economic in nature but also cultural and political. Second, the world-society and neo-institutional approaches point out that, while competition is a necessary condition, isomorphic organizational change does not take place unless there are specific coercive, normative and mimetic mechanisms enabling and directing change (DiMaggio and Powell 1983; Meyer et al. 1996). Before we examine these international institutional forces, let us summarize the literature's arguments and findings regarding the domestic reasons for central bank independence.

Domestic Economic and Political Factors

The existing empirical literature on the adoption of central bank independence focuses on domestic economic and political factors. First, much research has explored the link between central bank independence and inflation rates, the assumption being that over time countries would learn, hopefully not the hard way, that inflation can be subdued by granting the central bank independence, although not all of the evidence is

consistent with the argument (e.g. Cukierman 1994; Grilli, Masciandaro and Tabellini 1991; Forder 1999). Second, countries with a high degree of political turnover are predicted to be more likely to grant a technocratic institution independence over politically charged matters so that the party currently in power can “tie the hands of its successor” (Goodman 1991; Boylan 2001).⁴ Third, central bank independence is more likely to occur the higher the degree of party fractionalization because it is a function of the potential conflict of interest between the government, on the one hand, and its legislative backbenchers and coalition partners, on the other. The more fractionalized the party system, the more scope there is for a conflict of interest between the government and other political forces. Interests threatened by the executive’s autonomy to make economic policy will seek to remove monetary policy from the government’s choice set (Bernhard 1998; Keefer and Stasavage 1998). And fourth, an independent central bank is deemed to be functionally consistent with political systems characterized by democracy, political freedom and stability, i.e. systems that include checks and balances on the discretionary behavior of the various branches of the government and the state (Bagheri and Habibi 1998; Moser 1999; Lohmann 1998).

Controlling for the economic and political characteristics suggested by the above arguments, we focus our theoretical analysis on the impact of global institutional forces on central bank independence. We examine two types of effects: (1) international coercive pressures that affect countries, including their dependency on foreign trade, investment, and multilateral lending; and (2) cross-national international influences that

⁴ It should be noted that some previous empirical research has found precisely the opposite effect (De Haan and Van T’Hag 1995).

operate through the network of bilateral trade ties in the forms of cohesion and role-equivalence effects. Let us address each of these in turn.

International Coercion

Neo-institutional and world-society theories predict that dependent organizations or states are more likely to engage in isomorphic change. Thus, Meyer et al. (1997:157) argue that more dependent actors or states in the global system are more inclined to adopt formal structures or practices as they attempt to meet “the expanding externally defined requirements of rational actorhood.” World-system researchers have identified a country’s dependence on foreign trade, foreign investment or multilateral lending as underlying status competition among states (Van Rossem 1996).

Trade creates dependency because as a country increasingly relies on foreign markets in order to obtain inputs or sell its products, its status and prestige in the world becomes more important. As neorealist international relations scholars have noted, globalization and trade induce states to selectively engage in trade regionalism, industry protectionism, and mercantilistic competition in response to changes in the international location of economic activities (Gilpin 1987:389-406, 2000:51, 319-323). From this perspective, governments seek strong currencies—and hence lower inflation—as a way to enhance national status and prestige in the global arena. For instance, states with lower inflation and a stronger currency carry more weight in international trade negotiations (Helleiner 1994). There is also evidence indicating that the public, especially in export-oriented countries, prefers low inflation not only as a way to protect their purchasing power but also as a sign of national prestige (Shiller 1996). Indeed, historical research on

the creation of territorial currencies has shown its contribution to the formation of nationalist identities and the affirmation of territorial sovereignty and international power-prestige (Helleiner 2003).

Foreign direct investment is a second coercive international influence because it makes countries depend on the decisions made by organizations—multinational firms—headquartered abroad, one of the main examples of coercive isomorphism observed by neo-institutional theorists. The issue concerning foreign investment is the recipient country's credibility within the international financial community. Politicians are likely to favor central bank independence in order to continue attracting foreign capital (Maxfield 1997; McNamara 2002). The control of monetary variables by an independent central bank is assumed to reassure foreign investors that the value of their investment will hold into the future because inflation will be kept low and the exchange rate will not shift adversely to their interests. While Maxfield (1997) suggests that existing foreign direct (as opposed to portfolio) investors are not particularly keen on an independent central banking authority because they can exploit more direct and reliable information channels, we nonetheless argue that foreign direct investors such as multinational firms would favor independent central bank policies to the extent that they use host countries as export platforms, which has been increasingly the case with foreign direct investment since the 1980s (UNCTD 2002).

The third type of international coercive pressure became salient during the 1990s. The International Monetary Fund (IMF)—the agency in charge of assisting countries in financial difficulty—has increasingly attached certain conditions, including an independent central bank, to its lending agreements. Although the IMF has had the

authority to demand certain terms as a condition of lending since 1952, the agency's enhanced visibility and stature in global financial affairs started during the Reagan Presidency, which marshaled the idea of policy convergence across countries as the most effective way to fight financial turbulence in global markets. The Reagan administration saw in the IMF the institution that could impose and monitor a set of guidelines to ensure "responsible" or "disciplined" economic policymaking around the world (Gilpin 1987:150-160). (Reagan's own policies, however, propelled U.S. fiscal and trade deficits to historical records.)

In the language of IMF-borrower agreements, country commitments to reach certain targets or to implement institutional reforms are called "conditionality terms." During the 1990s, the average IMF program included three times as many terms as during the previous decade. The record was set in the agreement with Indonesia, which contained 140 conditionality terms (Goldstein 2001:39). The IMF justifies conditionality terms on the grounds that they help countries signal credibility to the international financial community and "securing this depends not only on short-run macroeconomic management given an existing set of institutions, but also on the quality of the institutions themselves. These could include "budgetary institutions [...], the central bank (covering independence, competence, etc.), the regulatory regime governing banks and financial markets, and so on" (Khan and Sharma 2001:20-21).

Gaining access to the detailed terms of all IMF programs is not possible for confidentiality reasons (Goldstein 2001). This limitation notwithstanding, the few available letters of intent that countries submit to the IMF as a condition for obtaining credit include an explicit commitment to making the central bank more independent. For

instance, the letter of intent sent to the IMF by the government of Indonesia on November 13, 1998 with the goal of securing multilateral financing stated that

We are moving ahead with strengthening the regulatory and prudential framework for the banking system. A draft central bank law providing for independence of the Bank of Indonesia will be introduced into Parliament by end-December 1998. The banking law has been recently amended by Parliament and has entered into force, following its signature by the President; it permits major improvements in the areas of bank licensing and ownership, openness to foreign direct investment, bank secrecy, and empowerment of IBRA (Indonesian Bank Restructuring Agency).

In a subsequent memorandum sent to the IMF, Indonesia reiterated the importance of central bank independence by stressing control over inflation as its primary target.⁵

Similarly, the letter of intent signed by the Democratic Republic of Congo on April 12, 2002 stated that “the new statutes of the central bank (BCC), which enshrine its independence, will be published with some delay in April 2002 to ensure their consistency with our Constitution.” Thailand, in its letter of intent to the IMF dated September 21, 1999, mentions the parliamentary discussion of “a new Central Bank Act (which would strengthen the Bank of Thailand and enhance its accountability).” And the

⁵ Memorandum of Economic and Financial Policies Medium-Term Strategy and Policies for 1999/2000 and 2000, signed on January 20, 2000, and letters of intent sent to the IMF: <http://www.imf.org/external/np/loi/101998.htm> and <http://www.imf.org/external/np/loi/2000/idn/01/>.

Republic of Korea, in a case extensively discussed by Stiglitz (2002) as an example of unwarranted IMF meddling with a country's domestic affairs, similarly specified in its December 3, 1997 letter of intent to the IMF that "shortly following the Presidential elections in December, a special session of the National Assembly will be called to pass [...] a revised Bank of Korea Act, which provides for central bank independence, with price stability as its main mandate."⁶

These quotations suggest that negotiations with the IMF are a mechanism through which the coercive power of the latter is manifested, as many economists have pointed out (Rodrik 1999; McNamara 2002; Stiglitz 2002; Goldstein 2001). As in the cases of foreign trade and foreign direct investment, loans from the IMF make countries dependent, and therefore more likely to adopt formal structures or practices that help them enhance, or at least maintain, their status and legitimacy within the international community (Jepperson and Meyer 1991; Meyer et al. 1997). This argument is also consistent with the coercive mechanism predicting isomorphism in a field of organizations (states, in this case) as it becomes more "dependent upon a single (or several similar) source of support for vital resources" (DiMaggio and Powell 1983:155).

Given that a country's dependence on trade, foreign investment or multilateral lending makes it more likely to conform to world standards regarding the organization of

⁶ The letter from the Democratic Republic of Congo to the IMF is available at <http://www.imf.org/external/np/loi/2002/cod/02/index.htm>; the one from Thailand at <http://www.imf.org/external/np/loi/1999/092199.htm>; the one from the Republic of Korea at <http://www.imf.org/external/np/loi/120397.htm> .

the state so as to maintain its status and legitimacy in a global arena characterized by economic, political and cultural competition, we formulate:

Hypothesis 1: The greater the exposure to foreign trade, foreign investment, or multilateral lending, the more independent the central bank.

Cross-National Networks

As suggested by the world-society and neo-institutional approaches, the diffusion of practices in the global economy is not only driven by coercion but also by the network of ties linking countries to one another, which tend to generate the diffusion of organizational forms and practices for normative and competitive reasons (Guler et al. 2002). Michael Mann has argued that the debate over globalization should be couched in terms of different socio-spatial networks. “Is the social significance of national and international networks declining relative to some combination of local and transnational networks? And to the extent that global networks are emerging, what is the relative contribution to them of national/international versus local/transnational networks?” (Mann 1997:476). The antecedents of this view in sociology go back to world-system theory, whose ideas about the importance of inter-state networks were borrowed from the pioneering studies of international financial circuits undertaken in the 1950s and 60s by Fernand Braudel (1977). Recent research within this tradition confirms that countries are embedded in complex patterns of trade relationships that give structure and form to the overall world-system (Smith and White 1992; Van Rossem 1996).

The world-system, world-society and neo-institutional perspectives borrow from social network analysis the concepts and the tools needed to specify and assess the ways

in which ties between actors (states in this case) shape the diffusion of practices or formal structures. Actors embedded in a network of relationships may adopt similar patterns of behavior based on two different kinds of imitation, namely, normative and competitive (DiMaggio and Powell 1983; Guler et al. 2002; Burt 1987; Mizruchi 1993). Normative imitation builds on the Durkheimian insight that social density is a determinant of social cohesion and behavioral similarity (Collins 1994). The classic formulation focuses on the social conditions that produce moral authority and “force,” i.e. a dense pattern of social organization (Durkheim 1965[1915]). Social networks in which actors share strong connections to one another will tend to adhere to a strong group identity, solidarity and conformity. Cohesive networks will produce “sacred objects”, i.e. symbols of focused attention that demarcate the boundaries of the group. Cohesive actors are predicted to imitate each other’s patterns of behavior in their quest to appear appropriate within their shared social context of dense social relationships (Strang and Tuma 1993); as the number of actors or organizations adopting a certain innovation rises, the innovation itself achieves a legitimized status (Abrahamson and Rosenkopf 1993).

We extend the argument to the international level, proposing that normative effects are likely to spread across countries that engage in intense transactions with each other, of which those that are trade-related are of particular structural significance (Guler et al. 2002). In fact, sociologists of globalization have argued that the intensity of trade transactions indicates the density of the social network in which a given country is embedded (Albrow 1997:25), and therefore points to the level of formalized conformity within the network—in this case, the independence of central banks. Trade contributes to “establishing a relationship of identification as well as interdependence,” and it does not

occur in a vacuum, for it comes hand in hand with “cultural ties” (Waters 1995:40). Research has shown that globalization is associated with more cohesive trading relationships (Kim and Shin 2002). Our argument is that countries that exhibit cohesive trade relationships are more likely to adopt similar patterns of behavior, including the granting of independence to their central banks.

Explaining central banking practices in terms of normative network pressures to adopt independence rests on the assumption that countries seek credibility in the international financial system so as to boost their status and prestige. After the collapse of the Bretton Woods agreement, currencies became tied to a different kind of standard, which, according to orthodox economists, incorporates objective knowledge of the economy so that the national currency is given a relative value correspondent to the productive capacity of the issuing country. Post-Keynesian economists and sociologists of money such as Geoffrey Ingham, however, claim that value is given by the relative success of the central bank at establishing credibility in relation to a country’s creditworthiness by abiding to procedural correctness (Ingham 2004:145, 1984). Central banks that do not conform to formalized principles compromise the credibility of their currency in the international exchange markets. Applying our network reasoning to this problem, we reformulate credibility as the achievement of cohesive ties, and failure to conform as a violation of the norms of the network. Hence, conformity arises from normative pressure as well as from the expected negative consequences of violating the norms. Central bank independence becomes a symbol of group membership; failure to recognize its “sacredness” leads to rejection from the cohesive group. The country

belonging in a trade-cohesive network crosses the insider/outsider boundary if it fails to adopt central bank independence. Accordingly, we predict:

Hypothesis 2: The more a given country trades with other countries with an independent central bank, the more independent its own central bank due to normative pressure.

The second type of imitation effect observed in the neo-institutional and social networks literatures is related to competition. DiMaggio and Powell (1983) predict that as organizations attempt to deal with poorly understood technologies and ambiguous goals, they resort to imitating other organizations that they perceive as successful competitors. Pressure to conform arises from at least two conditions: the presence of a poorly understood organizational form in a context of uncertainty; and a competitive environment whereby organizations are under threat of seeing their market position and/or social status eroded.

Shifting the argument to the country level of analysis and the central bank case, it is quite apparent that both theoretical conditions hold: central bank independence as a practice is understood in multiple and competing ways, as the presence of such rival frameworks in economic theory as Keynesianism and monetarism indicates (Forder 1999; Ingham 2004); and nation-states participate in international trade and other aspects of the global economy in which competitive pressures render the adoption of legitimized organizational forms a viable strategy for economic and institutional survival, for maintaining and enhancing their status (Van Rossem 1996; Meyer et al. 1997).

The mechanism of social comparison lies at the heart of the argument about competitive isomorphism. Competition between actors (or states) in a social structure such as that created by trading relationships is, following Burt (1987:1291), driven by their desire “to live up to their image” and “to maintain their position in the social structure,” an idea entirely consistent with the world-system and world-society perspectives. Competitors are substitutes for each other, a fact that induces status competition, with a clear consequence for the diffusion of practices: “Once the occupants of [the same] status begin adopting, ego is expected to follow suit rapidly in order to avoid the embarrassment of being the last to espouse a belief or practice that has become a recognized feature of occupying [the] status” (Burt 1987:1294; see also White 1981, 2002).

Neo-institutional and network theorists have conceptualized similarity in behavior in the context of competitive relationships in terms of structural equivalence or role equivalence, which are associated with separate notions of competition (Mizruchi 1993). It is useful to point out the differences between the two concepts. Structural equivalence refers to the extent to which two actors are related to the same third parties (Burt 1987), while role equivalence describes the extent to which two actors have similar types of relations to third parties (Winship and Mandel 1984).

Structural and role equivalence have different meanings in terms of conceptualizing trading relationships between countries. From the structural equivalence point of view, similarity occurs in a context of competition for access to the same third parties’ markets (exports) or sources of supply (imports). From a role equivalence perspective, however, what matters is the nature of the relationship and not the nodes

themselves. We define a relationship as the export or import of a particular type of product, and a role set as a country's total exports and imports by reference to each type of good, an approach pioneered by sociologists working in the world-system research tradition (Smith and White 1992; Van Rossem 1996). Winship and Mandel (1984) define role equivalence using a nested pair of dyad-by-dyad distance measures but noted that other approaches are possible. We take advantage of one alternative they mention, and define role equivalence as the overlap between two actors' role sets. Given this definition, when countries A and B trade in the same products but with a different set of countries, they are role equivalent but may not be structurally equivalent. Conversely, countries may be structurally equivalent but not role equivalent if they trade in different types of products but with the same set of countries. Thus, role equivalence captures present and potential competition in the same category of products, while structural equivalence in the context of trade is not specific enough to isolate the effect of competition because two countries may be structurally equivalent (i.e. trade with the same third parties) and yet not trade in the same commodities (Guler et al. 2002). In the context of the global economy, trading with the same third parties can hardly be an indication of competitive relationships unless the trade is in the same commodity type, that is, it is role-equivalent.

Countries that compete with each other in the same commodity markets are likely to adopt similar patterns of behavior so as not to lose ground relative to others (Guler et al. 2002). Assume that countries A and B trade with the rest of the world in the same product categories, that is, they are role-equivalent. Even when countries A and B export to different third countries, a more independent central bank in country A will likely

prompt country B to grant its own central bank more independence, for two mutually reinforcing reasons. First, the two countries are more likely to monitor each other and to seek to learn from each other if they are competitors in trade. In other words, competitive relationships create a social channel for comparison, communication, and imitation. The second reason for imitation based on role equivalence is the risk of a country failing to attract enough foreign capital under the assumption that having an independent central bank signals stability to the international financial and investment community. This argument is analogous to the idea that actors occupying equivalent positions in a social structure (peers) tend to imitate each other so as to enhance their own performance. As Burt (1997:345) noted, structural situations in which an actor has “many peers create a competitive frame of reference.” Competition invites the actor to be “tuned to peers’ job performance” (much like, in the economic sociology of Harrison White, markets are structured fields in which competitors observe each other – see White 1981 and 2002). Therefore, we expect role-equivalent countries to behave similarly because they learn from their peers how to become more effective at maintaining their status and prestige in the network of trade. We predict that:

Hypothesis 3: The more a country competes in trade against third countries with an independent central bank, the more independent its own central bank.

Data and Methods

We have collected longitudinal information on 140 countries between 1989 and 2000. The average GDP per capita for that sample was \$6,000. However, missing data on one or more of the variables reduced the sample for analysis to 71 countries, with the average GDP per capita increasing to \$11,698 (the statistical difference is highly significant). This is a reflection of the fact that richer countries tend to gather and report better statistics. In order to correct for this potential source of bias, we apply a two-stage sample selection technique. In the first stage we estimate the likelihood that a country has complete data on all of the variables used in the analysis.⁷ In the second stage we include the estimated probability as a control variable together with the other regressors. Given that our regression models also control for GDP per capita and include country fixed-effects, we are confident that our results are not biased because of sample selection issues.

Dependent Variable

We use the index defined by Cukierman et. al (1992) to measure the degree of the central bank's legal independence. There are a variety of indexes that, like Cukierman's, code the legal position of a national central bank as defined by statute, organic law or by the country's Constitution. We chose Cukierman's index because it captures directly the

⁷ We estimated the following probit model using the sample of 140 countries, where the numbers in parentheses are the standard errors of the coefficients: Probability of inclusion in the sample = 9.4019 (25.1970) + .2911*GDP per capita (.0368) -.0167*Government Consumption (.0069) + .0440*Check & Balances (.0069) -.0112*Illiteracy rate (.0025) - .0057* Calendar year (-.0057).

extent to which the central bank is independent from the political power and because it is the most widely used.⁸ The index is a continuous score ranging between zero and one, where one indicates maximum independence. It is obtained by aggregating sixteen characteristics of central-bank charters describing four aspects: procedures concerning the governor of the central bank (appointment, dismissal and legal term of office); relationship between the government and the bank, and the location of authority over monetary policies; objectives of the central bank; and relationship between the government and the bank in terms of borrowing (see the Appendix). Depending on the configurations of these four aspects, some of the individual components may not be applicable, since they aim at refining the impact of central bank activities only if they are permitted in the charter. For example, if a central bank is barred from lending to the government (see Appendix, aspect 4, points a and b), the subsequent refinements are not meaningful (e.g. preferred interest rates on advances to the government). In such cases, the weights are recalibrated so as to avoid any biases.

The index is available by decade from the 1940s to the 80s for a sample of 70 countries. Cukierman et al. (2002) updated it for the 1990s for a sample of 26 post-socialist countries. We reproduced their methodology to code all countries in the sample for each year between 1990 and 2000. Specifically, we collected all relevant legislation

⁸ The GMT index (Grilli, Masciandaro and Tabellini 1991), the Bade and Parkin index (Bade and Parkin 1982, in Bernhard 1998), and the Alesina and Summers index (Alesina and Summers 1993) are among the most used competing indexes. The Cukierman index presents a series of advantages over the others besides those mentioned above, such as greater sample size, clarity and time coverage.

(charters, statutes, organic laws and constitutional laws) primarily through the official webpage of the national central bank, and updated the index accordingly. We checked that our coding was consistent with the secondary literature (De Haan 1997; Tavelli et al. 1998; Jacomé 2001). Cronbach's alpha for the updated index is .89, well above the usual thresholds, indicating that the various components of the index capture the same construct. We focus our analysis on the 1990-2000 period because of constraints on data availability, and because the 22 countries that changed the degree of independence of their central banks between 1950 and 1989 introduced very small adjustments to their legal codes. The bulk of the global spread of central bank independence occurred after 1989.

It is important to note that the Cukierman index is an interpretive tool of legal codes, and as such, it embodies two assumptions: (1) a legalistic as opposed to a behavioral approach is desirable in gauging central bank independence; and (2) central bank independence is an objectively measurable construct. The first assumption is potentially problematic: indeed, several important studies indicate that extremely independent central banks such as the Bundesbank react to political pressures when their institutional basis is undermined by antagonistic political coalitions (Lohmann 1998; for other countries, see Maxfield 1997; Moser 1999; Bernhard 1998). The critique that there is an important gap between a legal code and an institutional practice is certainly germane: in legal studies, a similar distinction is drawn between the formal and the material constitution. The issue is thus one of validity, i.e. whether the index measures what it is supposed to.

We believe that a legal measure of central bank independence is an appropriate and valid indicator of central bank independence for three mutually reinforcing reasons. First, economists argue that the mere adoption of a legal statute guaranteeing central bank independence dampens inflationary expectations in the economy. Consumers, workers, investors and companies expect an independent central bank to fight inflation more forcefully than one subject to governmental influence, even without the bank taking any kind of specific action. Hence, the “mere” passage of a law has real, practical implications because an independent central bank creates a “regime of credibility” in the pursuit of monetary stability. To the extent that actors believe the central bank will take action to curb inflation, it may not be necessary for it to actually take action (Barro and Gordon 1983; Cuckierman 1994).

The second reason in favor of using a legal indicator of central bank independence is that this paper seeks to assess the extent to which globalization affects the state and the relative power of its different components. An actor, however, does not demonstrate its power only when it takes action to influence the behavior of others in a manner contrary to their interests. Power is also implicit and subtle, and it can have an effect on others even when there is no observable behavior on either the sending or the receiving end of the power relationship (Lukes 1974:54). Thus, it is sociologically meaningful and appropriate to study the legal adoption of central bank independence in order to assess how much power—explicit or implicit, observable or not—is being shifted toward that specific part of the state at the expense of others, especially the executive branch. In sum, the economic logic of expectations and the sociological idea of implicit power suggest

that a legally independent central bank can be powerful and effective even when it does not act.

Third, a legal indicator of central bank independence is appropriate because it speaks to a country's institutional and political capacity to abide by the rules that seek to guarantee the credibility of monetary commitments. Since the issue is whether the statute of an independent central bank translates into practices autonomous from the executive branch, our model follows the recent literature in political science by controlling for the political conditions that prevent such legal requirements from being overruled (Keefer and Stasavage 2002; Bernhard 1998; Bernhard, Broz and Clark 2002).

As to the objectivity of the Cukierman index, it is certainly important to note its limitations. Forder (1999) is the most passionate critic, as he points to discrepancies across cases and the allegedly arbitrary criteria used in the construction of the index. However, he is altogether opposed to code-based operationalizations of central bank independence, preferring behavioral approaches—a problem which we addressed in our discussion above. Banaian et al. (1998) and Mangano (1998) are equally concerned with issues of subjectivity, and suggest ad hoc solutions. There are, however, economists who believe in the validity of Cukierman's approach, and they adjudicate its usefulness through latent-variable-type models (Eijffinger et al. 1996).

The use of Cukierman's legal index seems appropriate because of its focus on readily observable claims contained in central bank statutes, such as the expressed commitment of the bank to low inflation, the presence of a provision for the resolution of conflict with the government, and the length and condition of tenure of the central bank governor. In our coding of the legal components of the index, we have found it to capture

quite accurately the language of the legal documents across a diverse number of cases (the 71 countries of our sample that we coded directly)—yet another expression of the degree of international isomorphism brought about by globalization. The critique is perhaps more germane to previous decades in which states experimented with inward-oriented models of economic and social development.

Explanatory Variables

We measure international pressures in three ways: trade openness, which indicates a country's exposure to foreign trade, and is measured as the value of imports plus exports divided by GDP (World Bank 2002); the value of inward foreign direct investment (FDI) stock also divided by GDP, available from the United Nations' World Investment Report (UNCTD 2002); and the value of IMF lending divided by GDP (World Bank 2002).

To capture the effects of normative imitation, we used a network measure of trade cohesion. Our network model of international trade focuses on the strength of trade ties between pairs of countries to evaluate the intensity and the direction of the diffusion of economic and political institutional practices. World-system analysis provides a strong rationale for using trade measures to characterize a global social structure (e.g. Chase-Dunn 1998; Chase-Dunn et al. 2000; Van Rossem 1996). The extent to which a given country trades with countries with independent central banks will influence its propensity to adopt an independent central bank for normative reasons. We collected bilateral commodity trade data for each year from the United Nations Global Common Database.

Formally, we constructed a measure of cohesion in trade for country i at time t as follows:

$$\text{Cohesion in Trade Effect}_{it} = \sum_j \text{CBI}_{jt-1} \times (\text{Trade}_{ijt-1} / \text{Trade}_{it-1})$$

where CBI_{jt-1} is the Central Bank Independence index for country j at time $t-1$, Trade_{ijt-1} is the total trade (import plus exports) between country i and country j in year $t-1$, and Trade_{it-1} is a country i 's total trade with all countries during the same period. This measure ranges between zero and one because both the independence index and the trade shares range between zero and one, and the trade shares cannot add up to more than unity.

To assess the effects of competitive imitation, we used a network measure of role equivalence, as suggested by Winship and Mandel (1984) and operationalized by Guler et al. (2002). Specifically, we focus on the similarities between the patterns of trade of each pair of countries as an indicator of the structural pressure to adopt central bank independence. We collected trade data by product category from the United Nations Global Common Database. The data are classified according to international standards of industrial production: we utilized the two-digit level classification, yielding 77 different product categories. Formally, for each country i and year t , we constructed export and import product category share vectors:

$$\text{EPSV}_{it} = \text{Exports}_{ikt-1} / \sum_k \text{Exports}_{ikt-1}$$

$$IPSV_{it} = \text{Imports}_{ikt-1} / \sum_k \text{Imports}_{ikt-1}$$

where Exports_{ikt-1} is the dollar value of exports from country i in product category k and year $t-1$, and Imports_{ikt-1} is the dollar value of imports to country i in product category k and year $t-1$. Following Wasserman and Faust (1994), we stacked, i.e. concatenated, the export and import product category share vectors to form a single vector PSV_{it-1} for each country i during year $t-1$. We then calculated a measure of role equivalence in trade as follows:

$$\text{Role Equivalence in Trade Effect}_{it} = \sum_j \text{CBI}_{jt-1} \times r(\text{PSV}_{it-1}, \text{PSV}_{jt-1})$$

where CBI_{jt-1} is the Central Bank Independence Index of country j in year $t-1$ and r is the Pearson correlation coefficient between the product category share vectors for countries i and j during year $t-1$. The correlation coefficient measures the extent to which there is an overlap between country i and country j in terms of their patterns of trade by product type. If the total number of countries (including all j 's as well as i) is N , this measure can theoretically range between $-(N-1)$ and $+(N-1)$. The reason is that, while the independence index ranges between zero and one, the sum of the correlation coefficients (unlike the trade shares in the cohesion measure) can be greater than unity, though not greater than $N-1$ in absolute value. Other properties of the cohesion and role equivalence measures are further assessed and discussed in Guler et al. (2002).

Control Variables

We include in all models a number of domestic political and macroeconomic variables to control for alternative explanations of the adoption of central bank independence that are not related to globalization. Given that a long research tradition in political economy establishes a link between the characteristics of the polity and central bank independence, we account for several effects. First, to control for political turnover we use the number of elections held for the lower house of the national legislature in a given year, available from the Cross-National Time-Series (CNTS) Data Archive (Banks 2001). Second, to hold constant for regime stability we used a “Weighted Conflict Index,” also obtained from the CNTS Data Archive, calculated as the weighted occurrence of events such as political assassinations, general strikes, guerrilla warfare, government crises, purges, riots, revolutions and demonstrations. And to capture the effects of institutional checks and balances on the power of the government to influence legislation we included the variable POLITY2 from the Polity IV dataset (Marshall and Jaggers 2002), which assigns each country a score between -10 (autocratic regime) and +10 (full democracy). Third, we also hold constant for party fractionalization using the index proposed by Rae (1968), calculated as one minus the sum of each party’s squared proportion of seats in the lower legislative chamber, as reported in the CNTS dataset. A higher score indicates a larger number of small parties occupying legislative seats. Regarding macroeconomic controls, we included the logged GDP per capita, government consumption as a percentage of GDP, and inflation rate (World Bank 2002; UNCTD 2002). A time trend (calendar year) is included in all models.

Method

Our data are repeated annual observations of the same fixed, i.e. not sampled, political units (countries). All variables are time-varying in nature. We report results using two different modeling strategies. First, we use event-history methods to model the adoption of an independent central bank. We express the probability P that a law increasing the independence to the central bank in country i is passed in year t as a function of the hazard ratios of selected independent variables at time $t-1$. The complementary log-log model facilitates the longitudinal analysis of binary dependent variables and handles multiple events within a single time period. The hazard of adoption is expressed by the formula $\log [-\log (1-P_{it})]$. Given that some countries experienced more than one event between 1990 and 2000, we calculate robust standard errors clustered on countries. In addition to the control variables specified above, we include a duration variable (length of time since the last event). We also control for the degree of independence of the central bank at time $t-1$ so as to account for the fact that countries with an already very independent central bank are less likely to introduce further reforms. We measured all independent variables with a one-year time lag to address reverse causation.

The event-history approach has two limitations. First, coding the simple passing of a law as an event does not take into account how much stronger the central bank becomes; hence, we define an event as a substantial increase in the central bank independence index. In order to assess robustness, we report results with three different cut-off points: a CBI index increase of .10, .15 and .20, respectively. These numbers are within the range of weights that are assigned to the major aspects coded by the Cukierman index. For example, the CBI index would increase by about .10 if the

limitations to lending to the government were made most stringent; it would increase by up to .15 if the Central Bank statute incorporated a strong commitment to price stability; and finally, it would increase by up to .20 if the policies concerning the Central Bank director made his/her position more autonomous (see the Appendix). With the .10 cut-off, reform events took place in 37 country-years; with the .15 cut-off in 33 country-years, and with the .20 cut-off in 26 country-years.

Second, the dichotomization of the CBI index (a continuous variable) clearly wastes information, no matter what cut-off point is used. Hence we also report results following a second modeling strategy, which involves estimating ordinary least squares (OLS) regressions with panel-corrected standard errors (PCSEs) and country fixed effects. The method surmounts the three estimation problems associated with pooled time-series cross-sectional data: panel heteroscedasticity, contemporaneous (i.e. cross-sectional) error correlation, and serial (i.e. longitudinal) error correlation (Beck 2001). We use the untransformed Cukierman index as our dependent variable because, even though it is bounded (it ranges between 0 and 1), the predicted values from the regression models do not exceed the bounds, thus not violating the homoscedasticity assumption of the error terms. We also ran, though do not report, the same models with the appropriate logistic transformation for bounded variables, namely, $\log [CBI/(1-CBI)]$, and did not find qualitatively different results. Given the ease of interpretation afforded by the raw index, we prefer this simpler and more intuitive model. We measured all independent variables with a one-year time lag to address reverse causation, and included fixed effects to control for auto-correlation.

Results

Tables 1 and 2 present the sample descriptive statistics and the correlation matrix. It is important to note that the Pearson correlations reported in Table 2 were calculated without country fixed effects. Table 3 reports the event-history model. Finally, table 4 reports the regression results using OLS with PCSEs and country fixed effects.

Our results indicate that international coercive, normative and mimetic pressures explain the adoption of central bank independence, lending support for each of our hypotheses. Furthermore, the results are robust to the use of different modeling approaches and to the inclusion of a sample selection adjustment. The results using event-history modeling reported in Table 3 support the prediction that dependence on IMF lending increases the probability of a reform that enhances the independence of the central bank (hypothesis 1). This result holds regardless the cut-off point used to code the dependent variable (see models 2, 3 and 4). The two other indicators of dependence (trade openness and inward foreign direct investment), however, failed to reach significance in the full model. (Trade openness is at the borderline of significance in models 2 and 3, with p-values of .051 and .055, respectively.) The results using OLS with PCSEs and country fixed-effects reported in Table 4 support hypothesis 1 in that trade openness, inward foreign direct investment and IMF lending increase the independence of the central bank. We find support for the normative and mimetic effects of cohesion and role equivalence in trade using either the event-history approach or OLS with PCSEs and fixed effects (hypotheses 2 and 3). This support is robust to the inclusion of a sample selection adjustment.

Although we argued that IMF credit and inward foreign investment are causes of central bank independence, it is possible that the reverse relationship is at work, i.e. central bank independence could be a prerequisite for, and not the effect of, greater IMF credit or inward investment. The evidence, however, corroborates the direction of causality that we have argued. The countries that increased the independence of their central bank sharply during the 1990s had experienced increases in IMF credit or inward investment prior to the adoption of a new legal statute. For instance, Albania, Argentina, and Belarus made their central banks more independent in 1993, after both IMF credit and foreign investment had increased sharply the year before. Peru's central bank acquired a new degree of independence in 1994 while foreign investment started to boom. Poland enhanced the independence of its central bank in 1992 and 1998, after both IMF credit and inward foreign investment had started to rise. Thus, the evidence indicates that the direction of causality runs from global influences (e.g. IMF, foreign investment) to central bank independence, and not vice versa.⁹

⁹ As a further test, we checked for the robustness of our results by excluding IMF credit and inward FDI from the regression, and we found no qualitative difference in the coefficients of the remaining variables. Following Vreeland (2003:90), we also calculated the probability that a country would seek an IMF loan based on a regression using as regressors the country's currency reserves, budget balance, debt service, inward foreign investment and inward portfolio investment as well as the number of countries with an IMF loan. Including this probability as an additional variable in Tables 3 or 4 did not change the pattern of results. Hence, the pressure from the IMF which we label as "global," is not originally caused by domestic characteristics.

The effects of the hypothesized variables that reached significance in the analyses reported in Tables 3 and 4 are relatively large in magnitude. The interpretation of the coefficients of the event history model 2 of Table 2 is as follows. An increase of one standard deviation in IMF credit (0.02) leads to a 18.5 percent increase in the hazard of adoption of a statutory reform that makes the central bank more independent by 0.10 points in the Cukierman index ($100 \times [\exp(8.486 \times 0.02) - 1]$). The corresponding figure for a one standard deviation increase in cohesion in trade is 101.7 percent, and in role equivalence in trade is 97.1 percent.

The OLS results in the fully specified model 3 of Table 4 can be interpreted in a more straightforward way given that the dependent variable is the raw index of central bank independence. The coefficients indicate the effect on central bank independence of a change in the explanatory variable over time. An increase in trade openness of one standard deviation results in an increase equivalent to 1/5 of the standard deviation of central bank independence ($0.084 \times 0.49 = 0.04$ or 1/5 of 0.20), 1/10 in the case of foreign direct investment, 1/20 in the case of IMF lending, 1/5 in the case of cohesion of trade, and 1/3.33 in the case of role equivalence in trade. These effects are not as small as they appear at first sight because they are net of all other independent variables in the full model and of the country fixed effects. Regardless the event history or the OLS method is used, cohesion and role equivalence in trade are the largest effects in magnitude.

Turning to the control variables, we find little support for alternative explanations based on political or macroeconomic variables of a domestic nature. In the event history regressions the time controls, calendar year, central bank independence as of year $t-1$ and the weighted conflict index were significant (Table 3). The only variable that reaches

significance in the full model using OLS with PCSEs and country fixed effects is the inflation rate, albeit with a negative sign.¹⁰

Discussion and Conclusion

The purpose of this paper was to examine the impact of globalization on the state, using the specific case of the central bank and its independence from the executive branch as the empirical setting. Our approach drew from the insights of world-system, world-society and neo-institutional theories in sociology. We argued that, due to cross-national economic, political and cultural competition in a context of globalization, the state is subject to coercive, normative and mimetic pressures. In response to them, the state reorganizes itself, with a strong tendency towards emulating the organizational forms and practices adopted by other countries.

Above and beyond the effects of domestic political and macroeconomic variables, countries more exposed to trade, foreign investment, multilateral lending, and cohesive and role-equivalent trading relationships with previous adopters are subject to isomorphic pressures. Most of our empirical results were robust to modeling approach, estimation method and the inclusion of control variables. Political or macroeconomic variables of a domestic nature failed to explain central bank independence. Thus, globalization is transforming the state structures that deal with monetary policy.

Our results do not directly address the weakening of the state as a result of globalization, but rather its reconfiguration or reorganization along more technocratic

¹⁰ Previous empirical studies have also found a negative relationship between the inflation rate and central bank independence (see Cukierman 1994; Forder 1999).

lines that tend to benefit certain groups of policymakers and external constituencies. The ideological background to these empirical findings should not be lost, however. As Susan Strange (1996) suggests, since the late 1970s governments around the world have abdicated many of their Keynesian responsibilities concerning social welfare in favor of neo-liberal regulatory models. As a by-product, they faced a fundamental crisis of legitimacy, a difficulty justifying the introduction of new policy paradigms from abroad. The state was reconfigured and restructured along technocratic lines in an attempt to make it more legitimate, shifting power from certain government agencies to others. Central banks are gaining in power, while the executive branch of government is losing control over monetary policy.

The importance of global pressures of a coercive, normative or mimetic kind when it comes to explaining central bank independence raises tantalizing questions about the constraints that globalization can place on the democratic choice that the citizenry is supposed to be able to exercise over such important matters as the structure and nature of economic policymaking institutions. The very act of granting a group of appointed (not elected) technocrats independence from the political power, i.e. from elected representatives or officials, reveals a fundamental tension in the way in which different kinds of issues are handled in modern societies. Some policy areas are subject to more or less continuous political scrutiny, and the officials in charge of them are subject to the democratic rules of the game. Others, especially monetary policy, have been socially and politically constructed as lying beyond the scope of democratic oversight and control. The fact that it is not domestic political conditions but rather global pressures which drive the adoption of the remarkable policymaking innovation of the independent central bank

raises a great many questions about the effects of globalization on democratic standards and practices. Future research could perhaps explore the possibility that, while global influences matter most, domestic economic and political conditions moderate or exacerbate the effect of international coercive, normative and mimetic forces.

While our study finds globalization to be the main cause of the transformation of state structures as exemplified by central bank independence, it is likely that a different choice of dependent variable might have found a debilitation of the state and not just a transformation. Thus, it is imperative for future research to examine how other parts of the state have been affected by increasing trade, foreign investment, multilateral lending, and network effects. For instance, an analysis of the impact of these forces on social welfare or labor agencies within the bureaucracy is needed to shed further light on the question of the evolution of the modern state. Globalization is a complicated and multifaceted process whose effects vary greatly across countries and institutional arenas. Only careful empirical investigations of a variety of related phenomena will help sociologists understand the ways in which it is changing some of our most established institutions.

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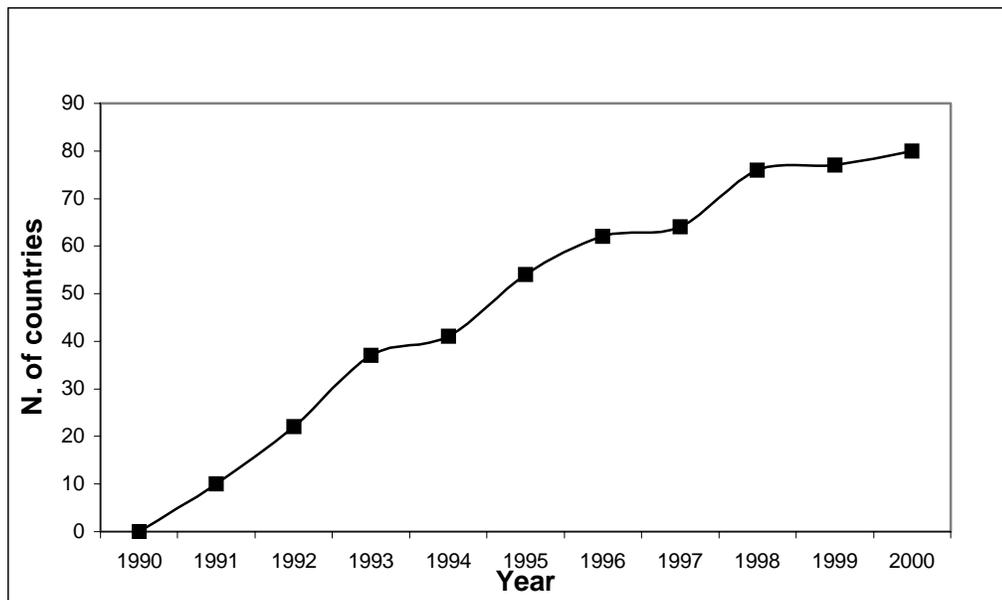
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Figure 1: Cumulative Legal Changes Towards Higher Central Bank Independence



Sources: Cukierman et al. (1992); Cukierman et al. (2002); Maxfield (1997); central bank legal statutes.

Table 1: Sample Descriptive Statistics (N=620, 71 countries)

| Variable | Mean | Std. Dev. | Min | Max |
|--|---------|-----------|-------|-------|
| Central Bank Independence, CBI | 0.47 | 0.20 | 0.14 | 0.92 |
| Trade Openness ((Imports + Exports))/GDP | 0.69 | 0.49 | 0.13 | 3.97 |
| Inward FDI Stock / GDP | 0.16 | 0.15 | 0.00 | 0.98 |
| IMF Lending / GDP | 0.01 | 0.02 | 0.00 | 0.36 |
| Cohesion in Trade | 0.42 | 0.13 | 0.15 | 0.84 |
| Role Equivalence in Trade | 8.95 | 3.77 | 1.89 | 18.70 |
| Elections | 0.27 | 0.45 | 0.00 | 2.00 |
| Weighted Conflict Index (logged) | 0.34 | 0.63 | 0.00 | 7.70 |
| Checks & Balances | 6.68 | 5.14 | -8.00 | 10.00 |
| Party Fractionalization Index | 6.40 | 2.04 | 0.00 | 9.71 |
| Government Consumption / GDP | 0.16 | 0.06 | 0.03 | 0.43 |
| GDP per capita, current dollars (logged) | 8.52 | 1.53 | 4.44 | 10.74 |
| Inflation rate (logged) | 2.02 | 1.59 | -4.09 | 8.92 |
| Calendar Year | 1995.27 | 3.09 | 1990 | 2000 |
| Probability of Sample Selection | 0.62 | 0.23 | 0.03 | 0.97 |
| Adoption of CBI (event, .10 cut-off) | 0.06 | 0.24 | 0.00 | 1.00 |
| Adoption of CBI (event, .15 cut-off) | 0.05 | 0.22 | 0.00 | 1.00 |
| Adoption of CBI (event, .20 cut-off) | 0.04 | 0.20 | 0.00 | 1.00 |

Table 2: Correlation Matrix (N=620; 71 countries)

| Variable | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|----------|----------|----------|----------|----------|----------|---------|
| 1 Central Bank Independence, CBI | 1 | | | | | | |
| 2 Trade Openness (Imports + Exports)/GDP | 0.0407 | 1 | | | | | |
| 3 Inward FDI Stock / GDP | 0.0466 | 0.6465* | 1 | | | | |
| 4 IMF Lending / GDP | -0.0106 | -0.0391 | -0.0405 | 1 | | | |
| 5 Cohesion in Trade | 0.5100* | 0.0643 | 0.1149* | -0.0957* | 1 | | |
| 6 Role Equivalence in Trade | 0.4411* | 0.1558* | 0.1982* | -0.2182* | 0.6328* | 1 | |
| 7 Elections | 0.0361 | -0.0326 | -0.0283 | -0.0134 | -0.0048 | -0.0034 | 1 |
| 8 Weighted Conflict Index (logged) | -0.0056 | -0.1929* | -0.0671 | 0.1656* | -0.1198* | -0.0955* | -0.0201 |
| 9 Checks & Balances | 0.2350* | -0.1523* | -0.0785 | -0.2220* | 0.2222* | 0.1596* | 0.0637 |
| 10 Party Fractionalization Index | 0.1749* | -0.1948* | -0.1991* | -0.0843* | 0.2957* | 0.1407* | 0.0368 |
| 11 Government Consumption / GDP | 0.0769 | 0.0428 | -0.1385* | -0.2604* | 0.2270* | 0.2042* | 0.0229 |
| 12 GDP per capita, current dollars (logged) | 0.2074* | 0.1566* | 0.1325* | -0.4294* | 0.2123* | 0.3540* | 0.0263 |
| 13 Inflation rate (logged) | -0.0645 | -0.1897* | -0.3073* | 0.2703* | -0.1703* | -0.2995* | 0.0144 |
| 14 Calendar Year | 0.3747* | 0.1299* | 0.2384* | 0.0215 | 0.7257* | 0.6233* | -0.0222 |
| 15 Probability of Sample Selection | 0.2750* | 0.0603 | 0.0707 | -0.3343* | 0.2162* | 0.3000* | 0.0464 |
| 16 Adoption of CBI (event, .10 cut-off) | 0.2587* | -0.0033 | -0.0184 | 0.02 | 0.0522 | 0.0790* | 0.031 |
| 17 Adoption of CBI (event, .15 cut-off) | 0.2672* | -0.0072 | -0.014 | 0.0067 | 0.063 | 0.1022* | 0.0339 |
| 18 Adoption of CBI (event, .20 cut-off) | 0.2702* | -0.0039 | -0.0066 | -0.0079 | 0.0596 | 0.0975* | 0.0359 |
| Variable | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| 8 Weighted Conflict Index (logged) | 1 | | | | | | |
| 9 Checks & Balances | -0.1288* | 1 | | | | | |
| 10 Party Fractionalization Index | -0.0501 | 0.4880* | 1 | | | | |
| 11 Government Consumption / GDP | -0.1742* | 0.2682* | 0.2742* | 1 | | | |
| 12 GDP per capita, current dollars (logged) | -0.2502* | 0.5733* | 0.3072* | 0.4733* | 1 | | |
| 13 Inflation rate (logged) | 0.1783* | -0.1917* | 0.0147 | -0.2564* | -0.4739* | 1 | |
| 14 Calendar Year | -0.0346 | 0.0036 | 0.1192* | 0.0134 | 0.0034 | -0.2477* | 1 |
| 15 Probability of Sample Selection | -0.2465* | 0.7691* | 0.3671* | 0.3906* | 0.9240* | -0.3894* | -0.0157 |
| 16 Adoption of CBI (event, .10 cut-off) | 0.0651 | 0.0489 | 0.0163 | -0.0052 | 0.041 | 0.0046 | 0.0332 |
| 17 Adoption of CBI (event, .15 cut-off) | 0.0678 | 0.061 | 0.0486 | 0.0041 | 0.0607 | -0.0097 | 0.0399 |
| 18 Adoption of CBI (event, .20 cut-off) | 0.0574 | 0.057 | 0.0646 | 0.0315 | 0.0818* | -0.0155 | 0.0261 |
| Variable | 15 | 16 | 17 | 18 | | | |
| 15 Probability of Sample Selection | 1 | | | | | | |
| 16 Adoption of CBI (event, .10 cut-off) | 0.0529 | 1 | | | | | |
| 17 Adoption of CBI (event, .15 cut-off) | 0.0713 | 0.9412* | 1 | | | | |
| 18 Adoption of CBI (event, .20 cut-off) | 0.0848* | 0.8305* | 0.8824* | 1 | | | |

*p<.05

Table 3: Logistic Event History Models of the Adoption of Reforms towards an Independent Central Bank, 71 countries, with lagged independent variables, 1990-2000

| | Model 1 (cut-off =.10) | Model 2 (cut-off =.10) | Model 3 (cut-off =.15) | Model 4 (cut-off =.20) |
|---|---------------------------|---------------------------|---------------------------|---------------------------|
| Trade Openness / GDP (H1+) | 0.980* (0.487) | 0.903 (0.462) | 1.046 (0.543) | 1.067 (0.717) |
| Inward Foreign Direct Investment / GDP (H1 +) | -4.310 (2.375) | -4.005 (2.252) | -4.088 (2.231) | -3.704 (2.517) |
| IMF Lending / GDP (H1+) | 10.460* (4.116) | 8.486* (4.164) | 10.802* (4.933) | 12.975** (4.920) |
| Cohesion in Trade (H2 +) | 5.685** (2.035) | 5.397** (2.015) | 5.215* (2.307) | 5.246 (2.850) |
| Role Equivalence in Trade (H3 +) | 0.169* (0.078) | 0.180* (0.080) | 0.243* (0.096) | 0.281* (0.125) |
| Elections | 0.236 (0.345) | 0.231 (0.341) | 0.259 (0.345) | 0.309 (0.393) |
| Weighted Conflict Index | 0.492* (0.205) | 0.489* (0.192) | 0.548* (0.219) | 0.564* (0.268) |
| Checks and Balances | 0.085 (0.069) | 0.014 (0.100) | 0.013 (0.111) | -0.045 (0.145) |
| Party Fractionalization | -0.102 (0.126) | -0.085 (0.126) | 0.065 (0.147) | 0.212 (0.196) |
| Government Consumption / GDP | -6.066 (4.773) | -4.976 (4.714) | -7.500 (5.272) | -6.203 (5.468) |
| GDP per capita (logged) | 0.132 (0.202) | -0.377 (0.513) | -0.350 (0.556) | -0.260 (0.659) |
| Inflation (logged) | 0.036 (0.102) | 0.021 (0.104) | -0.043 (0.112) | -0.010 (0.129) |
| Time since adoption | 0.369* (0.176) | 0.402* (0.203) | 0.342 (0.189) | 0.327 (0.211) |
| Central Bank Independence, t-1 | -4.531** (1.365) | -4.671** (1.343) | -5.237** (1.443) | -5.529** (1.706) |
| Calendar Year | -0.437* (0.181) | -0.463* (0.207) | -0.461* (0.213) | -0.511 (0.261) |
| Probability of Sample Selection | | 3.983 (3.850) | 4.220 (4.020) | 4.935 (5.106) |
| Constant | 864.600* (359.845) | 918.145* (412.877) | 913.355* (423.332) | 1,008.957 (519.637) |
| Number of Observations | 620 | 620 | 620 | 620 |
| Log likelihood | -116.10103 | -115.4106 | -102.85246 | -84.497586 |

Robust standard errors in parentheses ; * significant at 5%; ** significant at 1%

Table 4: Unstandardized Coefficients from Fixed-Effects Regressions of Central Bank Independence, 71 countries, with Panel-Corrected Standard Errors and lagged independent variables, 1990-2000

| Independent Variable | Model 1 | Model 2 | Model 3 |
|---|--------------------|----------------------|--------------------|
| Trade Openness / GDP (H1+) | 0.077** (0.030) | 0.066* (0.033) | 0.084* (0.033) |
| Inward Foreign Direct Investment / GDP (H1 +) | 0.108* (0.042) | 0.083 (0.058) | 0.110* (0.043) |
| IMF Lending / GDP (H1 +) | 0.642* (0.291) | 0.751** (0.286) | 0.599* (0.282) |
| Cohesion in Trade (H2 +) | 0.305** (0.098) | | 0.308** (0.099) |
| Role Equivalence in Trade (H3 +) | 0.016** (0.003) | | 0.016** (0.003) |
| Elections | 0.006 (0.009) | 0.005 (0.009) | 0.006 (0.009) |
| Weighted Conflict Index | 0.014 (0.007) | 0.013 (0.007) | 0.014 (0.007) |
| Checks and Balances | -0.002 (0.002) | -0.004 (0.006) | -0.007 (0.006) |
| Party Fractionalization | -0.006 (0.003) | -0.010* (0.004) | -0.006 (0.004) |
| Government Consumption / GDP | 0.002 (0.203) | 0.168 (0.227) | 0.125 (0.183) |
| GDP per capita (logged) | 0.015 (0.065) | 0.015 (0.068) | -0.002 (0.058) |
| Inflation (logged) | -0.004 (0.003) | -0.007** (0.002) | -0.005* (0.003) |
| Calendar Year | -0.003 (0.004) | 0.019** (0.002) | -0.002 (0.004) |
| Probability of Sample Selection | | 0.221 (0.367) | 0.294 (0.358) |
| Constant | 5.255 (7.095) | -37.785** (4.288) | 4.775 (6.978) |
| Observations | 620 | 620 | 620 |
| Number of Countries | 71 | 71 | 71 |
| R-Squared | 0.7816 | 0.7646 | 0.7818 |

Panel-Corrected Standard Errors in parentheses, * significant at 5%; ** significant at 1%

Appendix:

The Cukierman Index of Legal Central Bank Independence (minimum =0, maximum =1)

| Variable Number | Description of Variable | Weight | Numerical Coding |
|-----------------|---|--------|------------------|
| 1 | Chief Executive Officer (CEO) unweighted average of its four components | 0.20 | |
| | a. Term of office | | |
| | Over 8 years | | 1.00 |
| | 6 to 8 years | | 0.75 |
| | 5 years | | 0.50 |
| | 4 years | | 0.25 |
| | Under 4 years or at the discretion of the appointer | | 0.00 |
| | b. Who appoints CEO? | | |
| | Board of Central Bank | | 1.00 |
| | A council of the central bank board, executive branch, and legislative branch | | 0.75 |
| | Legislature (Congress, king) | | 0.50 |
| | Executive collectively (e.g. council of ministers) | | 0.25 |
| | One or two members of the executive branch (e.g. prime minister) | | 0.00 |
| | c. Dismissal | | |
| | No provision for dismissal | | 1.00 |
| | Only for reasons not related to policy (e.g. incapability or violation of law) | | 0.83 |
| | At the discretion of central bank board | | 0.67 |
| | At legislature's discretion | | 0.50 |
| | Unconditional dismissal possible by legislature | | 0.33 |
| | At executive's discretion | | 0.17 |
| | Unconditional dismissal possible by executive | | 0.00 |
| | d. May CEO hold other offices in government? | | |
| | No | | 1.00 |
| | Only with permission of the executive branch | | 0.50 |
| | No rule against CEO holding another office | | 0.00 |
| 2 | Policy Formulation Weighted average of its 3 components, with following weights: a: 0.25; b: 0.50; c: 0.25 | 0.15 | |
| | a. Who formulates monetary policy? | | |
| | Bank alone | | 1.00 |
| | Bank participates, but has little influence | | 0.67 |
| | Bank only advises government | | 0.33 |
| | Bank has no say | | 0.00 |
| | b. Who has final word in resolution of conflict? | | |
| | the bank, on issues clearly defined in the law as its objectives | | 1.00 |
| | Government, on policy issues not clearly defined as the bank's goals or in case of conflict within the bank | | 0.80 |
| | A council of the central bank, executive branch, | | 0.60 |

| | | | |
|---|---|------|------|
| | and legislative branch | | |
| | the legislature, on policy issues | | 0.40 |
| | The executive branch on policy issues, subject to | | 0.20 |
| | due process and possible protest by the bank | | |
| | The executive branch has unconditional priority | | 0.00 |
| | c. Role in the government's budgetary process | | |
| | Central Bank active | | 1.00 |
| | Central Bank has no influence | | 0.00 |
| 3 | Objectives | 0.15 | |
| | Price stability is the major or only objective in the charter, | | 1.00 |
| | and the central bank has the final word in case of conflict | | |
| | with other government objectives | | |
| | Price stability is the only objective | | 0.80 |
| | Price stability is one goal, with other compatible objectives, | | 0.60 |
| | such as a stable banking system | | |
| | Price stability is one goal, with potentially conflicting | | 0.40 |
| | objectives, such as full employment | | |
| | No objectives stated in the bank charter | | 0.20 |
| | Stated objectives do not include price stability | | 0.00 |
| 4 | Limitations on lending to the government | | |
| | a. Advances (limitations on nonsecuritised lending) | 0.15 | |
| | No advances permitted | | 1.00 |
| | Advances permitted, but with strict limits (e.g. | | 0.67 |
| | up to 15% of government revenue) | | |
| | Advances permitted, and the limits are loose (e.g. | | 0.33 |
| | over 15% of government revenue) | | |
| | no legal limits on lending | | 0.00 |
| | b. Securitised lending | 0.10 | |
| | Not permitted | | 1.00 |
| | Permitted, but with strict limits (e.g. | | 0.67 |
| | up to 15% of government revenue) | | |
| | Permitted, and the limits are loose | | 0.33 |
| | (e.g. over 15% of government revenue) | | |
| | no legal limits on lending | | 0.00 |
| | c. Terms of lending (maturity, interest, amount) | | |
| | Controlled by the bank | | 1.00 |
| | Specified by the bank charter | | 0.67 |
| | Agreed between the central bank and the executive | | 0.33 |
| | Decided by the executive branch alone | | 0.00 |
| | d. Potential borrowers from the bank | 0.05 | |
| | Only the central government | | 1.00 |
| | All levels of government (state + central) | | 0.67 |
| | Those mentioned above and public enterprises | | 0.33 |
| | Public and private sector | | 0.00 |
| | The following variables are averaged together into a single variable, | | |
| | which is then given the weight of | 0.10 | |
| | e. Limits of central bank lending defined in | | |
| | Currency amounts | | 1.00 |
| | Shares of central bank demand liabilities or capital | | 0.67 |
| | Shares of government revenue | | 0.33 |
| | Shares of government expenditure | | 0.00 |

| | |
|---|------|
| f. Maturity of loans | |
| Within 6 months | 1.00 |
| Within 1 year | 0.67 |
| More than 1 year | 0.33 |
| No mention of maturity in the law | 0.00 |
| g. Interest rate on loans must be | |
| Above minimum rates | 1.00 |
| At market rates | 0.75 |
| Below maximum rates | 0.50 |
| Interest rate is not mentioned | 0.25 |
| No interest in government borrowing from the central bank | 0.00 |
| h. Central bank prohibited from buying or selling government Securities in the primary market? | |
| Yes | 1.00 |
| No | 0.00 |

Source: Cukierman (1992).