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Central Bank Independence in the World: A New Dataset



Importante

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Abstract

This paper introduces the most comprehensive dataset on de jure central bank independence (CBI), including yearly data from 182 countries between 1970 and 2012. The dataset identifies statutory reforms affecting CBI, their direction, and the attributes necessary to build the Cukierman, Webb and Neyapti index. Previous datasets mostly looked at developed countries, or used non-representative samples of developing countries. The substantially broader coverage has important implications. First, the inclusion of previously underrepresented regions that exhibit distinct dynamics regarding CBI and central bank reforms suggests that sample selection may have substantially affected the generalizability of results obtained using smaller samples. Second, it affects the image we had of central bank reforms in the world, revealing more institutional reforms in the 1970s and 1980s than previously portrayed. Furthermore, some simple analyses suggest that the association between CBI and other variables of interest is very sensitive to sample size. The data coverage not only allows researchers to test competing explanations of the determinants and effects of CBI in both developed and developing countries, but it also provides a useful instrument for cross-national studies in diverse fields, from the analysis of liberalization or diffusion, to political institutions, democratization, or responses to financial crises.

Keywords:

Central Bank Independence; Reforms; Dataset; Measurement; Sample

Resumen

Este artículo presenta la base de datos más comprensiva sobre independencia legal de bancos centrales, con datos anuales de 182 países entre 1970 y 2012. La base de datos identifica reformas legales que afectan la independencia de los bancos centrales, su dirección y los atributos necesarios para construir el índice de Cukierman, Webb y Neyapti. Las bases de datos existentes hasta ahora se enfocan principalmente en países desarrollados o usan muestras no representativas de países en desarrollo. La cobertura sustancialmente más amplia de esta base de datos tiene importantes consecuencias. Primero, las regiones antes infrarrepresentadas exhiben dinámicas particulares de independencia y reformas de bancos centrales. Su inclusión sugiere que problemas de selección podrían afectar la generalizabilidad de los resultados que se obtuvieron usando muestras más reducidas. Segundo, los nuevos datos alteran la imagen que teníamos de las reformas de bancos centrales en el mundo, revelando más reformas institucionales en las décadas de 1970 y 1980 de lo que se sugería con anterioridad. Más aun, análisis simples sugieren que la asociación entre independencia del banco central y otras variables de interés es muy sensible al tamaño de muestra. La cobertura de esta base de datos no sólo permite que investigadores pongan a prueba explicaciones alternativas sobre los determinantes y efectos de la independencia de bancos centrales, sino que también proporciona un instrumento útil para estudios comparativos en diversas áreas, desde el análisis de la liberalización o difusión, al estudio de las instituciones políticas, la democratización o las respuestas a las crisis financieras.

Palabras clave:

Independencia de Bancos Centrales; Reformas; Bases de Datos; Medición; Muestra

Introduction

This paper introduces the most comprehensive dataset on *de jure* central bank independence (CBI) available to the date. The dataset identifies statutory reforms affecting CBI, their direction, and the attributes necessary to build the Cukierman, Webb and Neyapti (1992) (CWN) index in 182 countries between 1970 and 2012. The most commonly-used datasets include less than 100 countries, and cover fewer years. This dataset codes the existence of reforms in 6,675 observations, and computes the CWN index for 5,853 observations.¹ The data coverage not only allows researchers to test competing explanations on the determinants and effects of CBI in both developed and developing countries, but it also provides a useful instrument for cross-national studies in diverse fields. CBI has been a variable of interest not only for studies of the determinants and effects of monetary policy, liberalization, or diffusion, but also for the study of political institutions, democratization, or responses to crises (e.g., Adam, et al. 2011, Reenock, et al. 2013, Rosas 2006). Descriptive data shows that previous datasets' samples provide an incomplete idea of the dynamics of central bank reform in the world. Sample selection CBI is the central bank's capability of controlling monetary instruments (Bernhard 2002:21) or, inversely, CBI is the set of restrictions to the government's influence on the central bank management of monetary policy.

CBI can be restricted or increased on three dimensions: personnel, financial, and policy independence (Eijffinger and de Haan 1996:2). Personnel independence reflects limits to the government's influence on the central bank board's membership or tenure. Financial independence restricts the government's ability to use central bank's loans to fund its expenditures. If the government has direct access to central bank's reserves, monetary policy can be subordinated to fiscal policy. Finally, policy independence reflects the central bank's powers to formulate and execute monetary policy. This includes the central bank's ability to set the goals and/or chose the instruments of monetary policy (Debelle and Fischer 1995). Central banks' institutional designs vary across these dimensions, resulting in different *levels* of CBI. However, providing a continuous measure for CBI with cross-sectional and temporal validity and a broad coverage has proven to be a difficult task.

In the 1980s, CBI emerged as *the* recipe to avoid the pervasive inflationary consequences of shortsighted electoral ambitions. The practical advice derived from the "rules versus discretion" literature (Barro 1986, Barro and Gordon 1983a, b, Rogoff 1985) was to solve the time-inconsistency problem (Kydland and Prescott

¹ The largest publicly available dataset includes only 2,433 observations (41.6% of this sample).

1977) by delegating the control of monetary policy to independent central banks.² International agencies and policy makers embraced this advice (Bernhard, et al. 2002:699, International Monetary Fund 1999, World Bank 1992).

The need to test the theoretical argument, and assess the consequences of delegation to central banks, spurred the interest in measuring CBI. Many studies show the stabilizing effects of CBI on the economy: CBI is linked to lower inflation, reduced variation in inflation and output, increased credibility of the monetary policy, and lower uncertainty among economic agents (e.g., Bodea and Hicks 2015a, Bordo and Capie 1994, Cukierman 1992, Cukierman, et al. 2002, Cukierman, et al. 1992, Eijffinger and de Haan 1996, Persson and Tabellini 1990, Prast 1997, Rogoff 1985, Schaling 1995). The literature also shows that CBI has important political consequences (e.g., Bernhard and Leblang 2002, Clark, et al. 2013).

Beyond the consequences of CBI, researchers in the fields of international and comparative political economy (e.g., Bernhard 2002, Broz 2002, Clark 2002, Hallerberg 2002), and those interested in the politics of delegation (e.g., Bendor, et al. 2001), reforms (Acemoglu, et al. 2008), and diffusion (e.g., Polillo and Guillén 2005) have paid particular attention to the determinants of CBI. Although economic reasons would justify the establishment of independent central banks, the variance CBI across countries is not explained just by economic fundamentals. However, the few studies on the determinants of CBI have limitations. Most of these works show the determinants of CBI in *developed* countries (Bernhard 2002, Broz 2002, Clark 2002, Pistori, et al. 2011). Studies including both developed and developing countries are either cross-sectional analyses (Crowe 2008, Crowe and Meade 2007) or are based on not-necessarily representative samples (Berggren, et al. 2014, Bodea and Hicks 2015b). Although there is agreement regarding the possibility that the determinants of central bank reform and CBI are different in developed and developing countries, data seldom allow us to test competing explanations on both sets of countries.

Limited data availability suggests limits to our knowledge on these matters.³ Because the countries included in previous datasets are not representative world or regional samples, it is possible that results on global samples are biased. And additional problem is that most previous data coding efforts focused on legislation that was in force in certain years, providing valuable cross-sectional information, but little insight on variation within countries.

To solve these issues, one needs to collect legislation from most countries in the world, including legislation that has been revoked, and partial reforms affecting CBI.

² Particularly, Rogoff (1985) argues that delegating monetary policy to a more conservative central banker, or giving the central bank incentives to achieve an immediate monetary target reduces the time-consistent rate of inflation.

³ Siklos (2008:803) suggests that data problems may even affect the definition of CBI because empirical studies usually define CBI “sufficiently loosely [...] to fit the particular needs of the group of countries under investigation.” He attributes this to the fact that “the empirical evidence [...] has focused either on the experiences of developed or the less developed world, but ordinarily not both,” and highlights “the inevitable constraints imposed by the availability of limited data as well as variations in the quality of the data across countries. This is especially true of investigations that consider the historical record of the last decade or two.”

The sources are not necessarily centralized⁴ and, depending on the legal system, may include primary or secondary legislation, and central banks' internal rules. Furthermore, codification of countries where English is not the official language has additional challenges: although sometimes there are unofficial translations into English, I have found mistakes that could have misled scholars building other datasets.

The rest of this paper proceeds as follows. The next section describes existing datasets and justifies the utility of this *de jure* measurement. Section three describes the data collection process and compares this dataset to other available databases, particularly in three dimensions: geographic coverage, number and direction of identified reforms, and levels of CBI (total CWN index and its components). Section four presents some simple exercises to show the potential impact of both sample selection and a finer-grained identification of reforms, on inflation, unemployment and growth. Section five concludes.

Measuring CBI

Most empirical studies using CBI as dependent or independent variable base their measures of CBI on central banks statutes (*de jure* CBI) (Alesina 1988, Alesina, et al. 1989, Cukierman 1992, Grilli, et al. 1991). Some scholars have used measures of *de facto* CBI, based on questionnaires (Beblavy 2003, Blinder 2000, Cukierman, et al. 1992, Fry, et al. 1996) or in the turnover rate (TOR) of central bankers (Cukierman and Webb 1995, Cukierman, et al. 1992, de Haan and Siermann 1996). However, questionnaires may not be the most reliable measure of CBI, particularly because of the cross-sectional comparability, and they are not available for many country or years. Furthermore, although Cukierman and others found the TOR to be a predictor of inflation in developing countries, other studies have challenged this finding because of endogeneity (Dreher, et al. 2008): central bankers that are unsuccessful in controlling inflation are replaced more often.⁵

Measures based on statutes have been criticized because laws do not contemplate every single contingency that might affect the relations between the central bank and the government. Furthermore, deviations from the law are not infrequent. Even independent central banks can be influenced by the government's appointments and threats to the bank's independence (Lohmann 1998). Taking that to an extreme, other scholars attribute the behavior of the central banks to "the accident of personalities" (Goodhart 1989:295). Siklos, on the other hand, regrets that the literature on CBI "has downplayed to an excessive degree the importance of the design of central bank legislation" (Siklos 2008:804). In spite of criticisms, reliance on a legal-based measure is useful for several reasons. First, a measure of statutory CBI allows collecting

⁴ I did not have access to the IMF's Central Bank Legislation Database (CBLD), restricted to central banks and IMF personnel. Access to this dataset may help completing or contrasting the sources used for this codification.

⁵ Jácome and Vázquez (2008) find the opposite result for a sample of Latin American countries.

comparable cross-sectional data across time. These data allows looking for systematic differences across observations. Second, and more importantly, the utility of the measure depends on the research question for which it is used: statutory measures of CBI are useful to assess governments' institutional choices, that is, when and to what extent governments give independence to their central banks – or limit it.

Although there are differences among different scores of *de jure* CBI (Alesina, et al. 1989, Cukierman 1992, Grilli, et al. 1991), their correlation with inflation variables is comparable. I use Cukierman, Webb, and Neyapti's (CWN) criteria instead of other available measures of CBI (Alesina, et al. 1989, Grilli, et al. 1991) for several reasons: First, CWN's criteria for coding are clear and easily replicable. Second, CWN's component variables are exhaustive and allow further recodifications for other purposes,⁶ and allow the study of particular components of the index (Banaian, et al. 1998).⁷ Furthermore, it has been widely used – “the current state of the art of measurement of *de jure* CBI” (Acemoglu, et al. 2008:20) – , and its larger cross-sectional and historical coverage allowed me to check the reliability of my own coding.

Other scholars have extended CWN's original coding, which covered up to 72 countries between 1950 and 1989 (on a country-decade basis), and up to 26 post-communist countries for 1991-1998. For example, Polillo and Guillén (2005) extend the CWN index to the period 1990-2000 for 71 countries, Crowe and Meade coded 76 countries in 2003, and Bodea and Hicks (2015b) coded CBI for 81 countries between 1972 and 2008. Although the literature reports results based on other datasets, not all the data are publicly available (e.g., Daunfeldt, et al. 2013, Momani and St.Amand 2014, Wessels 2006).

The dataset

Coding process and descriptive information

The dataset codes central bank legislation in 182 countries, creating 16 variables used to compute the CWN index, the CWN weighted and unweighted indices, the existence and direction of reform, the creation of a central bank in a given year and whether the country is member of a regional central bank. I coded constitutions, laws, amendments, and decrees that directly refer to central banks, and central bank charters. Legislation was collected from online sources and books, and it was coded for all countries that had available texts in English, Spanish, French or Portuguese.⁸ I tracked earlier reforms by consulting laws that were explicitly referred as derogated

⁶ For example, Arnone et al. (2007:39-40) present a table to convert CWN scores to the Grilli, Masciandaro, and Tabellini (1991) scale. Siklos (2008) combines *de jure* and *de facto* indicators of CBI in a single measure.

⁷ For example, Banaian, et al.(1998) criticize the CWN composition and weights but they are able to select principal components of this index and test their effects.

⁸ For Suriname's and Turkmenistan's legislation, I used automated translations from Dutch and Russian, respectively.

by new laws, by using national legislatures' search engines, and central banks' official information services. The dataset codes 1,067 documents (see online supplementary materials). If reforms were partial amendments, only the variables affected by the amendments were recoded. If reforms did not affect CBI, they were not coded as reforms.

When legislation was not available, variables included in the CWN index were not coded. However, if the central bank explained in its own institutional information (or official "history" of the institution) that there was an institutional reform in a given year, and the information clearly allowed me to determine whether the reform increased or decreased CBI, that CBI decrease or increase was recorded.

Coding was performed in four independent instances: (1) I compiled and coded all the sample for the period 1970-2008 in 2009; (2) one research assistant (RA) compiled and two RAs coded the period 2009-2011 during 2012, and (3) one RA compiled and two RAs coded the period 1970-2012 in 2013-2014 as a reliability check on the coding already done of overlapping years. In this last instance, approximately 15% of the laws coded by each of the RAs were recoded by the other person, and weekly meetings were held to discuss differences between the two coders and to agree about criteria. This third wave of coding produced a second score for each variable for the period that overlapped the previous two waves (1970-2011). (4) In the last stage, I compared both scores for each country-year. When the scores coincided, I kept the coding as it was. If I found a discrepancy, I went back to the laws to re-evaluate them, and decided the appropriate coding.

The dataset relies on Cukierman (1992) and Cukierman, Webb and Neyapti's (1992) rules to code central bank legislation. I obtained primary sources for 178 countries, between 1970 and 2012.⁹ Each piece of legislation was coded on 16 dimensions related to four components of CBI, on a country-year basis: CEO's characteristics (appointment, dismissal, and term of office of the chief executive officer of the bank); policy formulation attributions (who formulates and has the final decision in monetary policy, and the role of the central bank in the budget process); central bank's objectives; and central bank's limitations on lending to the public sector. These 16 components are also combined into a single weighted index, ranging from 0 (lowest) to 1 (highest) CBI. I also computed the CWN unweighted index. See online supplementary materials for coding and weighting rules.

The dataset includes additional variables: whether the central bank was created in a given year, the presence of a central bank reform that affects CBI in a given year, its direction (CBI increase or decrease), and whether the central bank is a regional entity. The dataset includes 6,685 observations for central bank reforms, and identifies 376 reforms affecting CBI (the variable reform is coded for 181 countries, except for Panama which is coded only for the CWN index).¹⁰ Of those reforms, 274 increase

⁹ For four countries (of the 182 in the dataset), I did not find primary sources to code the CWN components. However, I found reliable secondary sources to code the existence of reforms.

¹⁰ Strictly speaking, the Panamanian National Bank is not technically a central bank. However, other datasets code legislation on the Panamanian National Bank. I include the codification of the CWN variables, but do not code

CBI, 55 decrease CBI, and 37 have a zero net-effect on CWN's weighted index.¹¹ It also includes 5,853 observations with scores for the CWN legal index of CBI. This dataset differs from previous datasets in three aspects: First, its coverage is significantly broader (240% larger) than the largest publicly available dataset (Bodea and Hicks 2015b). Second, I include variables that account for the existence of central bank reforms and their direction, even when there is no information on the specific dimensions of CBI that were reformed. Although these categorical variables do not provide information on the magnitude of the reform, some studies can still benefit from accounting for the existence and direction of reforms. Finally, two additional variables register whether the central bank was created in a given year, and whether the country's monetary policy is in the hands of a regional monetary union (e.g., the members of the Central Bank of West African States).

Table I shows descriptive statistics for this dataset and other available datasets (Bodea and Hicks 2015b, Crowe and Meade 2007, Cukierman, et al. 1992, Neyapti and Dinçer 2008, Polillo and Guillén 2005), for comparison purposes.

the reform variable for this country. This is why the number of countries examined does not match the number of countries with scores for the reform variables.

¹¹ See below.

TABLE I. DESCRIPTIVE STATISTICS AND COMPARISON WITH OTHER DATASETS (1970-2012)

VARIABLE	OBS	MEAN	STD. DEV.	MIN	MAX
YEAR	6728	1992.819	12.07787	1970	2012
CB CREATION	6685	.0094241	.0966264	0	1
CB REFORM	6685	.0562453	.2304121	0	1
DIRECTION_AUTHOR	6675	.032809	.2195887	-1	1
DIRECTION_POLILLO (*)	1004	.0557769	.2339067	-1	1
DIRECTION_BODEA&HICKS (*)	2433	.0332922	.2260787	-1	1
CBI INCREASE	6675	.0410487	.1984177	0	1
CBI DECREASE	6675	.0082397	.0904048	0	1
CBI_AUTHOR	5853	.489177	.2033732	.017	.979
CBI_CWN	1564	.3562835	.1338974	.09	.894
CBI_POLILLO&GUILLEN	1004	.4516932	.1856446	.1	.92
CBI_CROWE&MEADE	96	.6130208	.2020741	.17	.98
CBI_BODEA&HICKS	2433	.4758816	.2151628	.01	.96
CBI_AUTHOR (UNWEIGHTED)	5853	.4961941	.1996075	.021	.974
REGIONAL CB	6685	.1395662	.3465623	0	1

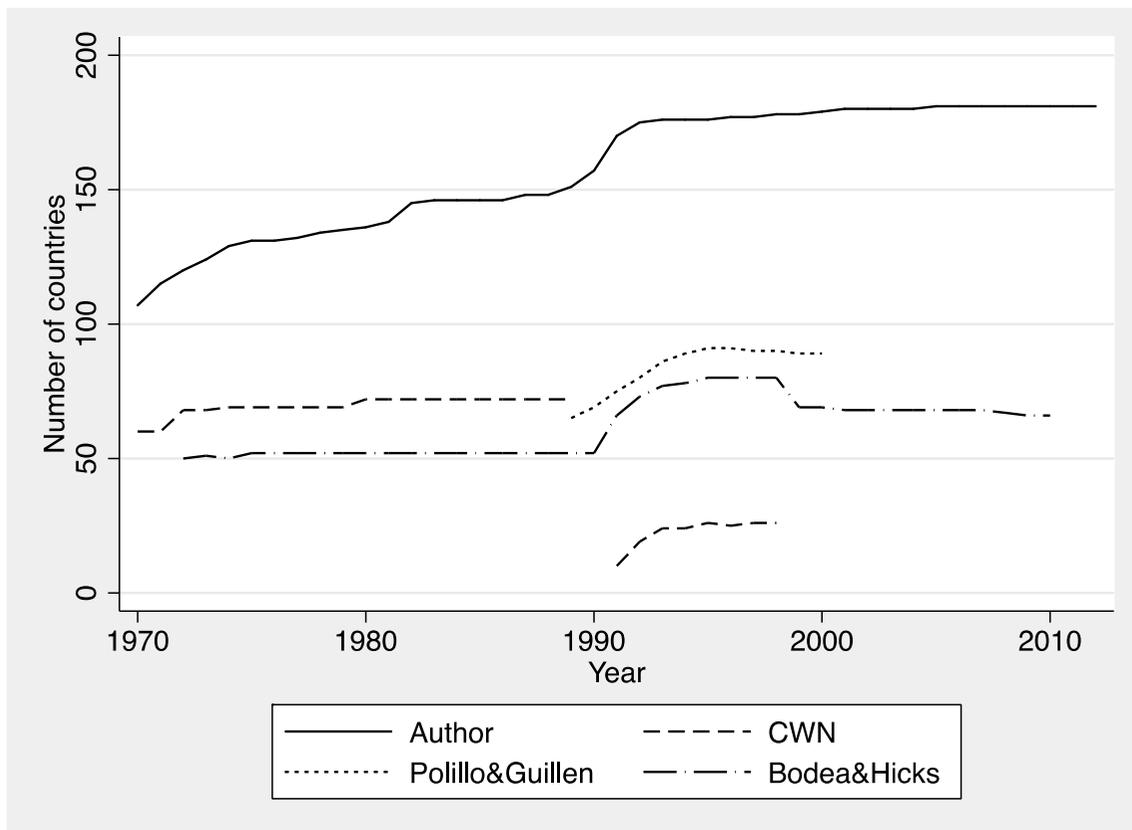
Notes: (*) Calculated from changes in their CWN scores.

Regarding the coding for the CWN index, the difference in means shown in Table I is misleading because the samples are different. The correlation between this dataset and the other four datasets ranges between .86 (Polillo and Guillen) and .92 (CWN). This reflects a substantial consistency in the coding criteria of overlapping observations. Differences in coding often result from omitted reforms or coding of the year of the reforms in other datasets (see the correlation matrix in appendix I).

Geographic coverage

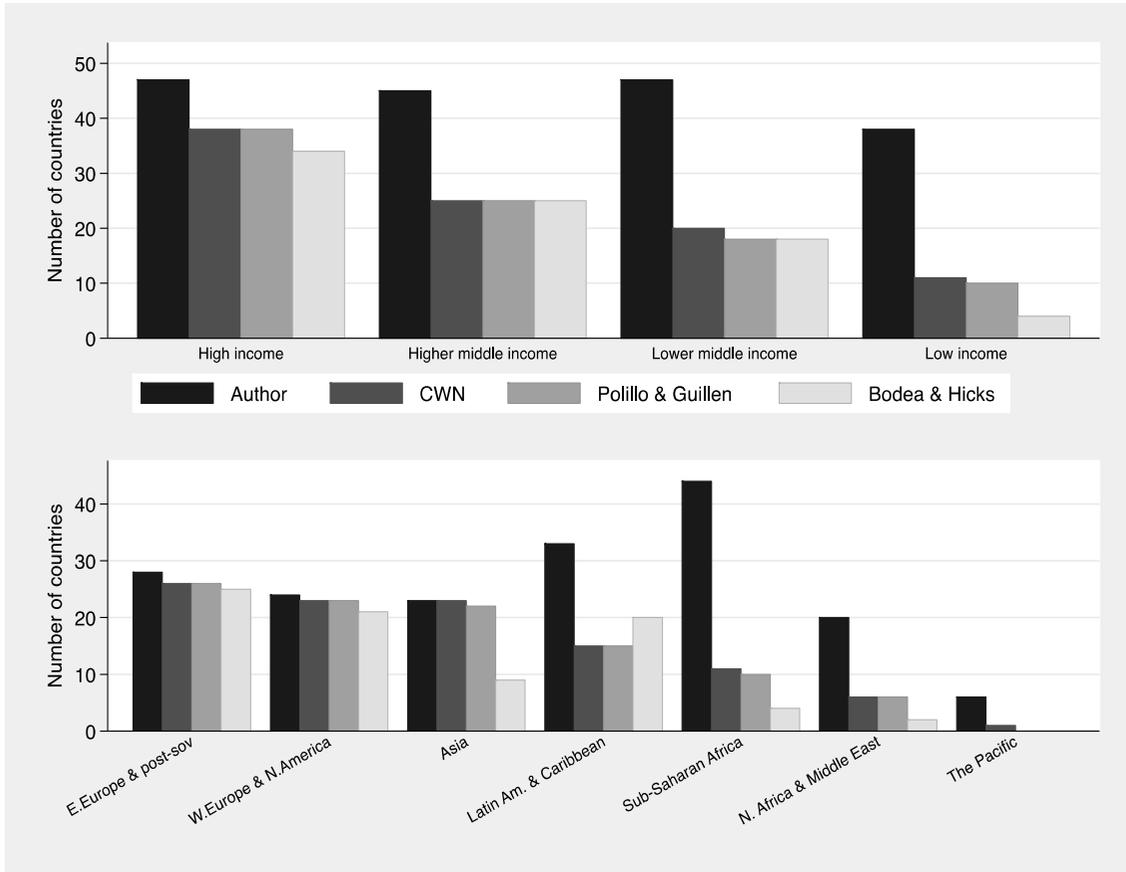
The broad sample is one of this dataset's most important attributes. 107 countries were coded for the full period. In subsequent years, new countries and countries whose legislation become available were added (see figure I).

FIGURE I. NUMBER OF COUNTRIES PER YEAR INCLUDED IN THE DIFFERENT DATASETS



This dataset not only includes a substantial number of countries previously omitted (see figure 1), but also presents a more accurate picture of regional differences. Previously available data are not representative world or regional samples, imposing limits to the generalizability of previous studies. Figure 2 illustrates how the new dataset more accurately represents important groups of countries. The top panel shows that the increased number of countries with CWN scores greatly improve the representation of middle and lower income countries. The bottom panel further shows countries in regions other than North America, Europe and Asia were seriously underrepresented.

FIGURE 2: COUNTRIES INCLUDED IN DIFFERENT DATASETS, BY INCOME GROUPS AND GEOGRAPHIC REGIONS



Frequent central bank reforms around the world, and in both directions

One of this dataset’s most important contributions is the identification a number of reforms previously ignored. This dataset identifies 5.6% of the 6,685 observations as experiencing reforms that affect CBI, a rate similar to Polillo and Guillen’s identification (5.8% of their sample), and higher than Bodea and Hicks’ (4.6%) and Daunfeldt et al’s (2.5%).¹² The mean number of reforms per country in this dataset during these 43 years is two, which contrasts with the other dataset’s country averages (1.3 in 39 years for Bodea and Hicks, and .6 in 12 years for Polillo and Guillen).¹³ The higher number of reforms in my dataset is not due to a broader conceptualization of “reform,” but

¹² Given that I am not using the full Daunfeldt et al.’s dataset, but information from their figures, I assume that the 132 countries are observed in all years (1980-2005), but I am not certain.

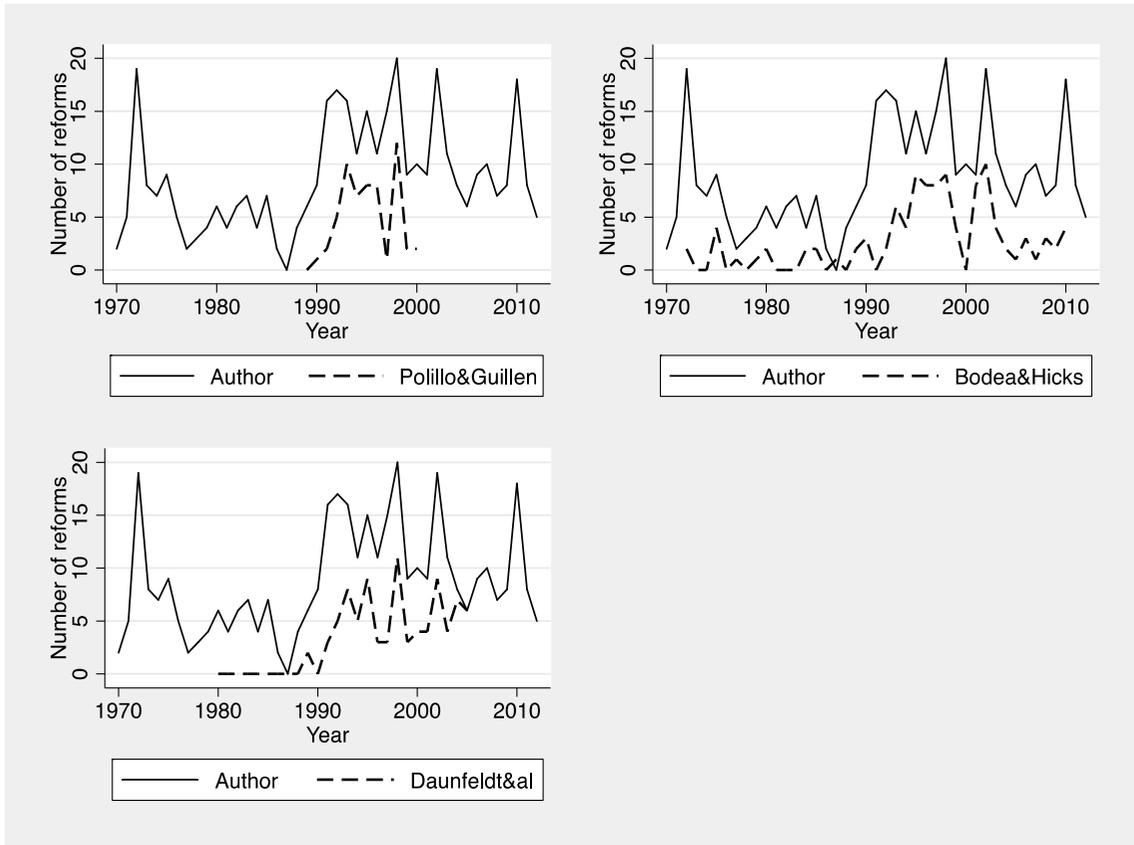
¹³ Appendix 2 shows the frequency of reforms per country and year.

apparently because I found legislation on reforms that previous researchers overlooked.

Another contribution of the dataset is raising questions about the conventional wisdom regarding when most CBI reforms happened. Scholars have argued that most reforms occurred in the 1990s (see Fernández-Albertos 2015), stressing “the fact that *during the forty years ending in 1989 there had hardly been reforms in [central bank] legislation*” (Cukierman 2008:724, emphasis added). Examining a more representative global casts doubt upon this: this dataset identifies 110 reforms between 1970 and 1989 (74 of them increase CBI). Figure 3 plots the number of worldwide central bank reforms per year in different datasets, and shows a somewhat different picture on the dynamics of central bank reform.¹⁴ Although these data should be read in the light of the number of countries included in different samples (see figure 2.1 in the appendix),¹⁵ figure 3 still shows a dynamic reform movement around the world in the 1970s and early 1980s, usually ignored in the literature.

¹⁴ Daunfeldt, et al. (2013) coded central bank reforms in a sample of 132 countries between 1980-2005. Their data is not public, so these data comes from their figure 1 (Daunfeldt, et al. 2013:431).

¹⁵ Figure 2.1 in the appendix plots the proportion of observations included in each sample that are coded as experiencing CBI reforms by year.

FIGURE 3: NUMBER OF REFORMS AFFECTING CBI PER YEAR. DIFFERENT DATASETS

On average, in the 1970s 5.1% of this dataset's sample experienced reforms affecting CBI. The percentage of observations coded as reforms is 3.2% for the 1980s, 7.9% for the 1990s, 5.4% for the 2000s, and 5.7% for the first three years of the 2010s.¹⁶ These data somewhat contrast with the common wisdom suggesting that there was a unique wave of central bank reforms in the 1990s: There was indeed a significant number of central bank reforms in that decade, contemporaneous with both the spread of arguments and policies supporting CBI and the end of the cold war (and consequent inclusion in the samples of numerous countries that were liberalizing their economies). However, when one considers a larger time period, this increased proportion of reforms is less dramatic than what other datasets suggest (see appendix 2, table 2.3), and last longer, until the 2000s.

This dataset thoroughly identifies not only numerous reforms, but also their direction (see figure 4). In particular, it identifies 55 reforms restricting CBI, a

¹⁶ Table 2.3 in the appendix compares these data with other sources.

possibility that has been practically ignored by the literature, possibly because it was considered a very rare event. Table 2 compares the number and direction of reforms identified by three datasets. I also code 37 instances in which reforms to different aspects of CBI do not affect the scores based on the CWN index, or the direction of different amendments offset each other (as in Slovenia 2007). In other ten cases, missing data on the regulation before the reform does not allow me to code with certitude the reform’s direction; therefore, direction is missing.

FIGURE 4: REFORMS AFFECTING CBI PER YEAR, BY DIRECTION

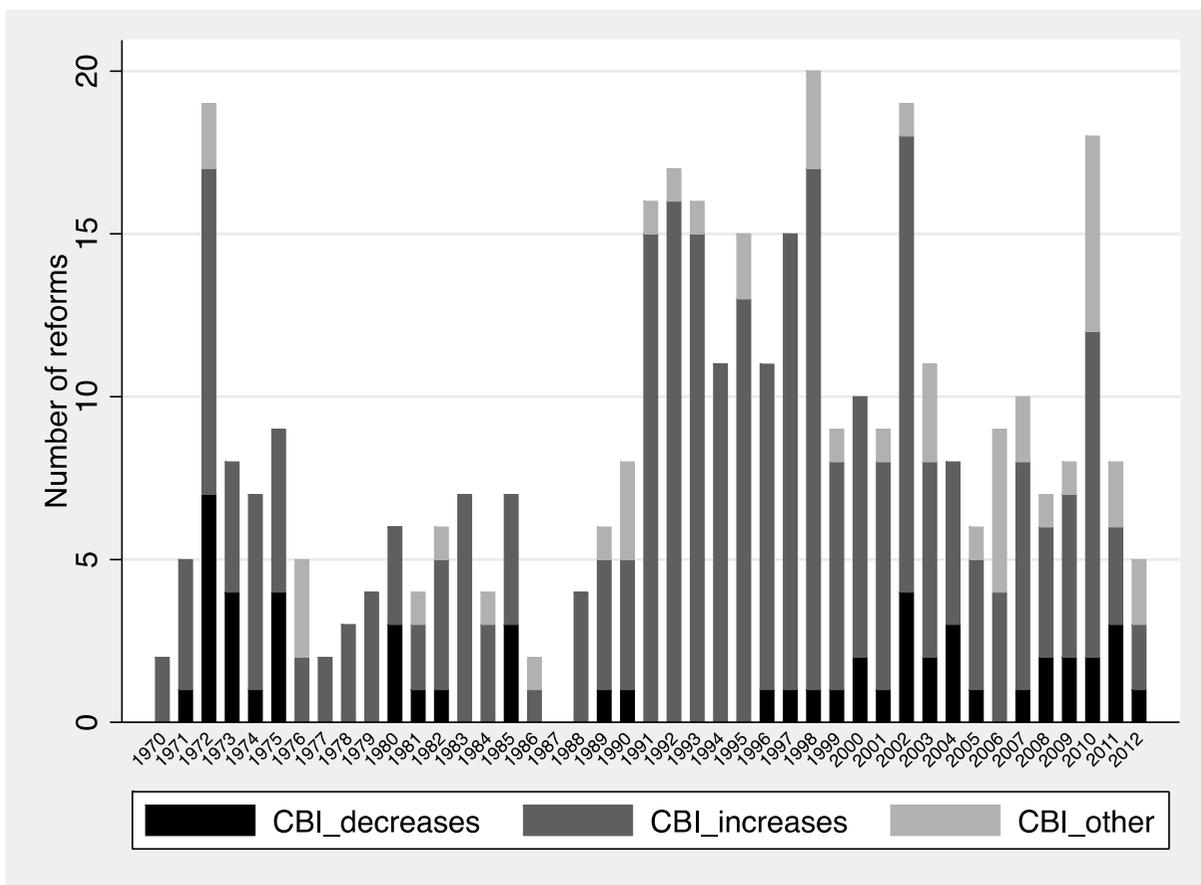


TABLE 2: CBI REFORMS, BY DIRECTION

	AUTHOR	POLILLO&GUILLEN	BODEA&HICKS
NUMBER OF COUNTRIES	181	91	81
PERIOD	1970-2012	1989-2000	1972-2008
OBSERVATIONS	6,685	1,002	2,433
NUMBER OF REFORMS			
TOTAL (%)	376 (100%)	58 (100%)	113 (100%)
REFORMS INCREASING CBI (%)	274 (73%)	57 (98%)	57 (84%)
REFORMS DECREASING CBI (%)	55 (15%)	1 (2%)	18 (16%)
NO DIRECTION CODED (%)	47 (12%)		

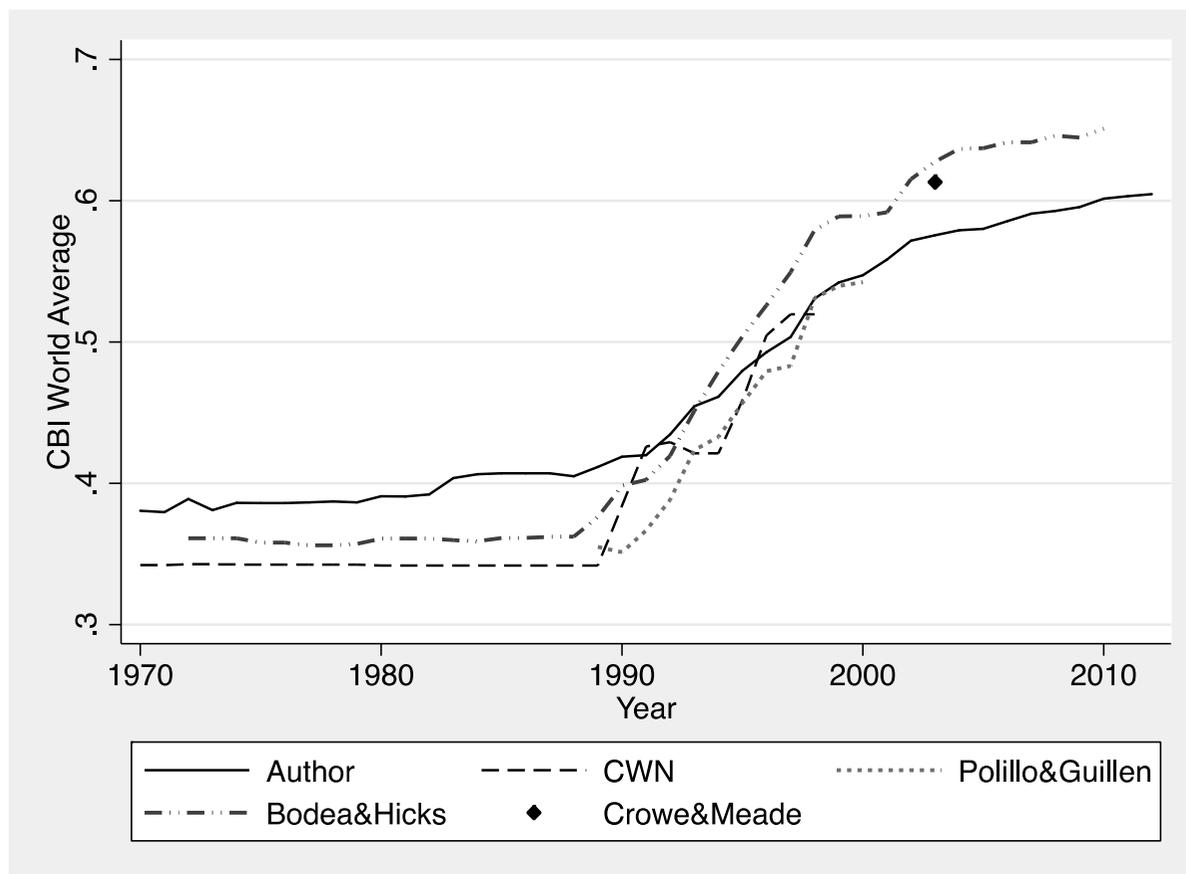
CBI in the world: A different picture?

The broader coverage of this dataset shows that the global dynamics towards increased CBI may have been overstated as an artifact of sample selection. This section suggests that this picture is mainly a product of the overrepresentation of higher-income countries in the samples, and the underrepresentation of important regions in the world.

The high correlation of my coding with other datasets suggests that coding criteria were consistent. However, sample selection has significant effects on the picture of CBI different datasets provide. The first difference refers to the worldwide levels of CBI (see figure 5). For example, it is a common practice to compare the CWN data world average for 1989 and Crowe and Meade's from 2003 (e.g., Crowe and Meade 2007, Fernández-Albertos 2015). This suggests 80% increase in the global level of CBI between 1989 and 2003. However, the global effect of central bank reforms seems less dramatic if it is computed on samples including more countries. Bodea and Hicks register a 67% increase, but this paper's dataset shows a more modest 40% increase in the world average CBI between 1989 and 2003.¹⁷

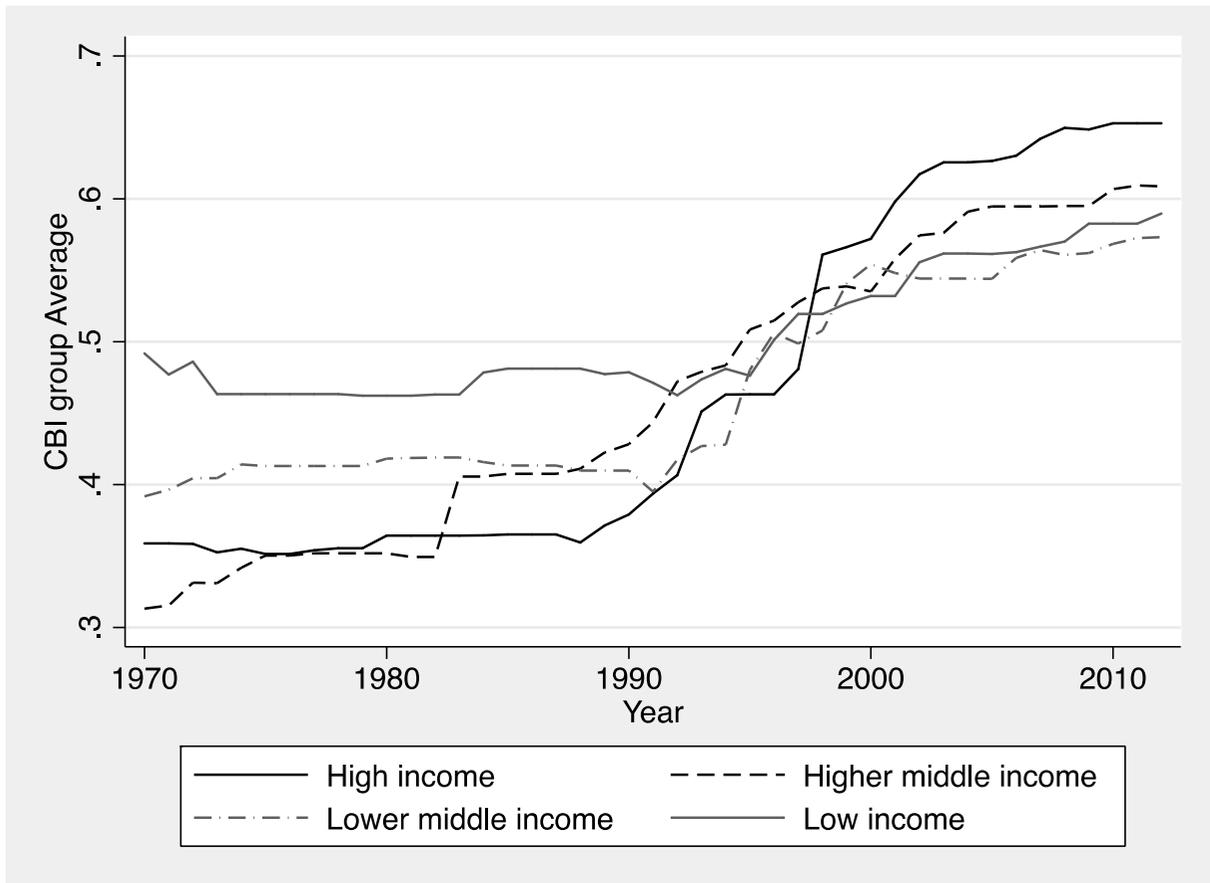
¹⁷ Between 1989 and 2000, Polillo and Guillen register a 53% increase in the world CBI average.

FIGURE 5. CBI WORLD AVERAGE. DIFFERENT DATASETS



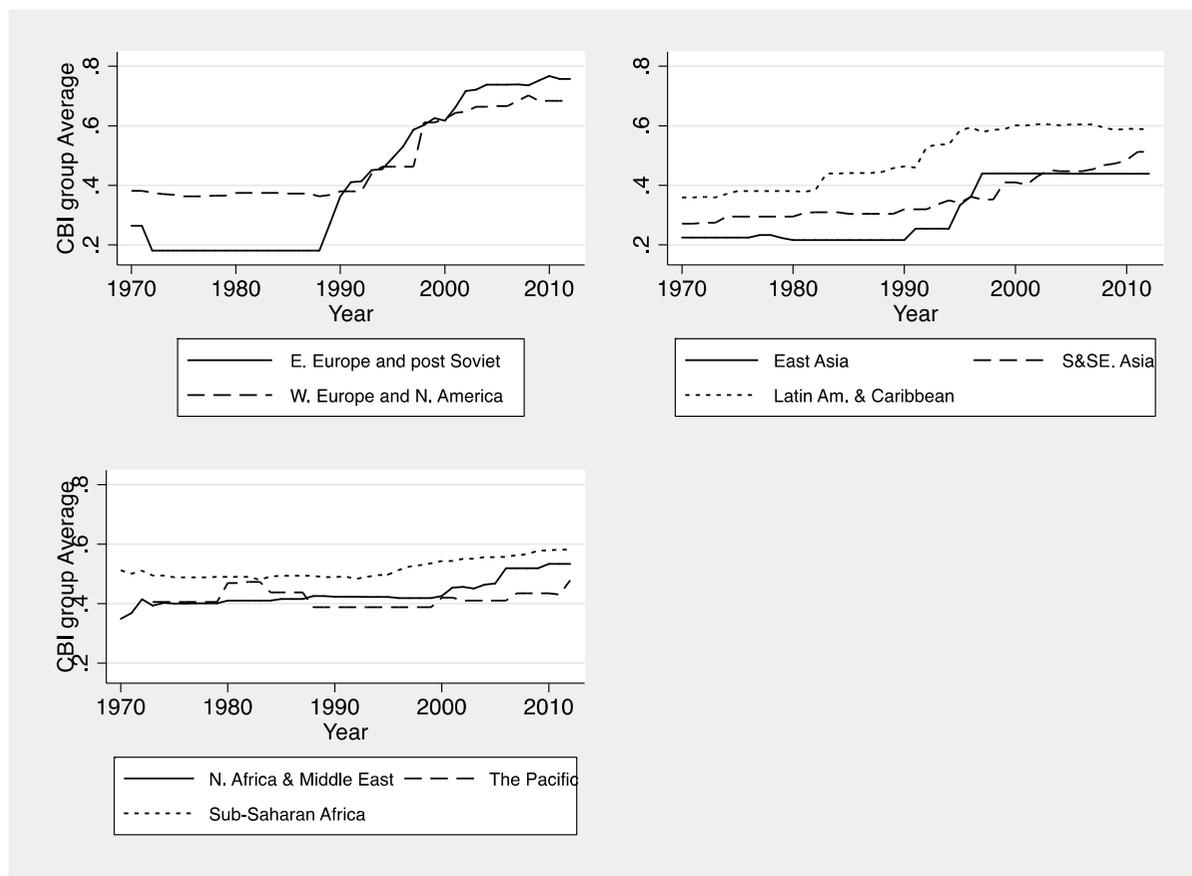
This dataset shows that this misleading picture was mainly driven by the central bank reforms in higher-income countries, which are overrepresented in other samples. Figure 6 shows that high income countries display a pattern that is very similar to the world averages shown in figure 6. However, lower-middle income and low-income countries had more stable levels of CBI through the period. This also contrasts with the assertion that “central banks in emerging market and developing economies have seen *an even more impressive shift* towards independence over the past two decades than their advanced-economy counterparts” (Crowe and Meade 2007:73, emphasis added). Although that is certainly the case for Eastern European and post-Soviet countries, it is not an accurate description of CBI in most developing countries (see figure 7).

FIGURE 6. CBI INCOME-GROUP AVERAGES



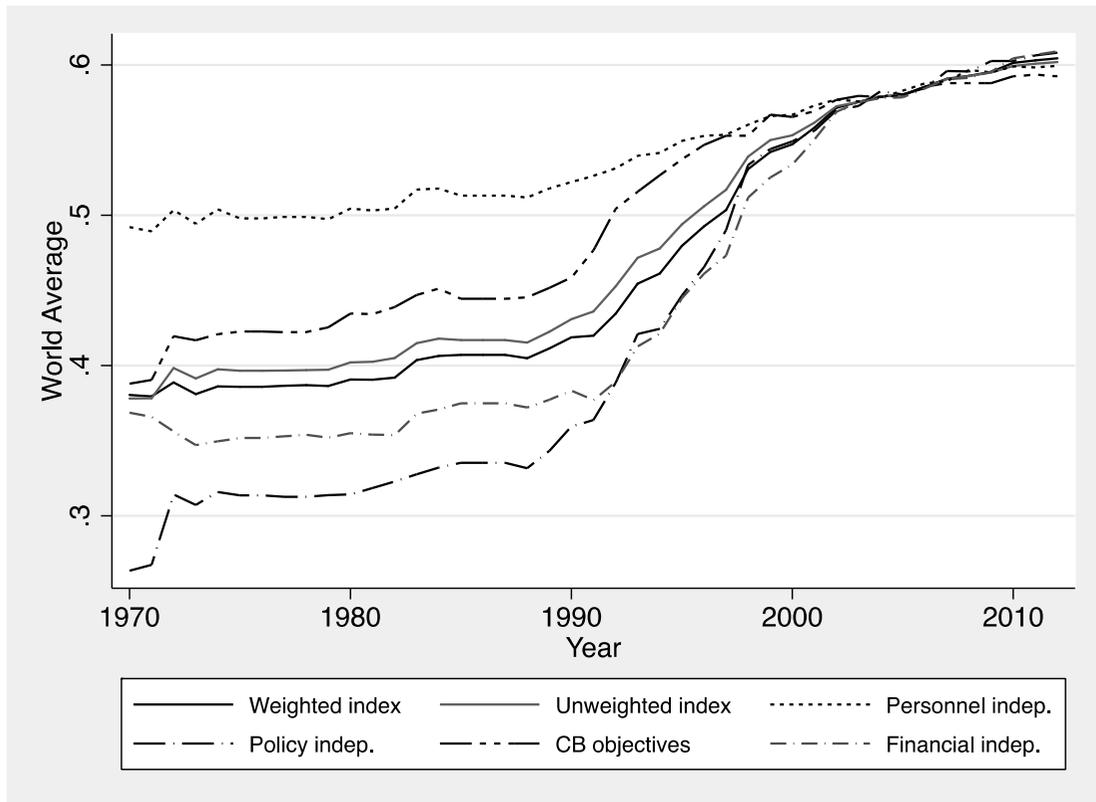
Global averages (and particularly, on smaller samples) also obscure important regional dynamics. During the period covered by this dataset the most dramatic increase in CBI occurred among post-communist countries in the 1990s until the mid-2000s, followed by Western European countries. In these countries, there are almost no CBI reversals. Latin American and Asian countries also increased their CBI, but gradually, through a much longer period. Also, there were seven reforms decreasing CBI during the 2000s in Latin American countries. Finally, the dynamics were very different in Africa and the Pacific: on average, these countries' CBI was comparable to the Western European and North American averages in the 1970s, and it has not changed substantially throughout the 43 years included in this sample. This picture suggests some limits to statements like “most central banks in today’s world enjoy substantially higher levels of [...] legal [...] independence that twenty years ago or earlier” (Cukierman 2008:723, emphasis added).

FIGURE 7. CBI REGIONAL AVERAGES



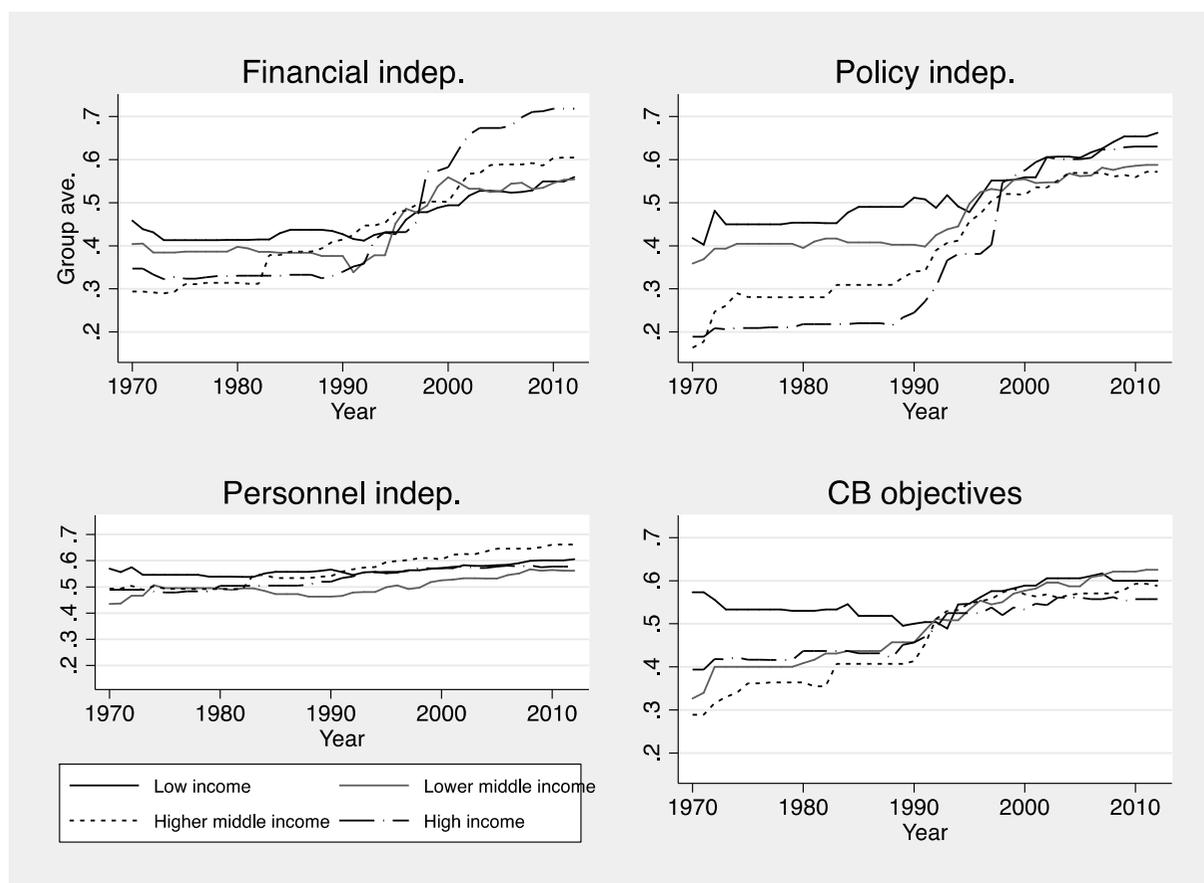
The components of CBI

One of the advantages of the use of the CWN criteria is the possibility of analyzing different components or dimensions of CBI. The analysis of the components of CBI shows interesting variance on the process of reforms affecting CBI through time. Figure 8 plots world averages of the weighted and unweight CWN composite indices, and of their four components (see supplementary materials for variables included in each component). This figure shows a general tendency to convergence among the four components of the CWN index. Furthermore, it plots both the weighted and unweighted (raw average) CWN indices. The data suggests that the weighting rules to combine the components do not alter significantly the index. Figure 9 plots the yearly average of the components, by income group.

FIGURE 8. CBI INDICES AND THEIR COMPONENTS. WORLD AVERAGES

Regarding the main components of the CWN measure, the CEO variables (related to the personnel independence) have been the most stable throughout the sample and subsamples. This is consistent with Crowe and Meade's (2008) account. Among the other three components, the ability of the government to use central bank credit to finance itself (financial independence) seems to have experienced the most dramatic changes through time. However, this result seems to better characterize reforms in higher-income countries. Central banks in lower-income countries gained relatively more independence in policy matters and from the redefinition of the bank's objectives. Finally, the variables reflecting central banks' policy independence show the largest variance depending on the income-groups (see upper-right panel in figure 9).

FIGURE 9. CBI COMPONENTS, INCOME GROUP AVERAGES



Naive tests: CBI, inflation, unemployment, and growth

Table 3 shows the results of regressing three variables (inflation, unemployment and GDP growth) on their lagged values and on CBI (with fixed effects). These models do not intend to test whether CBI has a causal effect on those variables, but to show the potentially important effects of sample selection (and in some cases, of measurement) on the association between CBI and variables of interest.¹⁸

When inflation is regressed on its own lagged values and CBI in the full sample, the coefficient is negative and highly statistically significant. However, when the same model is run on the CWN sample, the coefficient becomes statistically insignificant (as

¹⁸ The literature shows appropriate specifications to predict these variables that sometimes include CBI. It is beyond the scope of this paper to replicate these models, particularly because replication would imply collecting new data that may not be available for the full sample (and new data may question the comparability of results).

it happens when using the CWN measure). On the other two samples, this paper's measure of CBI is also statistically significant, but the size of the coefficient varies substantially. Contrasting statistical significance of the coefficients in model 4 and 5 suggests that differences in coding also play a role in these results

TABLE 3. ASSOCIATION BETWEEN CBI, INFLATION, UNEMPLOYMENT AND GROWTH. DIFFERENT DATASETS AND SAMPLES

MODEL	CBI MEASURE	DV: INFLATION		DV: UNEMPLOYMENT		DV: GDP GROWTH	
		COEFFICIENT	N	COEFFICIENT	N	COEFFICIENT	N
1	AUTHOR	-174.622 (-4.01)***	5672	-.328 (-1.66)*	3443	.587 (1.02)	5474
2	CWN	-292.014 (-1.03)	1470	-1.688 (-1.30)	176	3.696 (1.10)	1364
3	AUTHOR (ON MODEL 2'S SAMPLE)	-173.854 (-0.70)	1470	-1.154 (-0.99)	176	5.307 (2.01)**	1364
4	POLILLO & GUILLEN	-293.194 (-1.29)	985	-.684 (-1.47)	902	1.993 (1.60)	965
5	AUTHOR (ON MODEL 4'S SAMPLE)	-427.528 (-2.10)**	985	-.068 (-0.16)	902	2.698 (2.46)**	965
6	BODEA & HICKS	-241.445 (-3.80)***	2305	-.307 (-1.06)	1455	1.864 (3.22)***	2273
7	AUTHOR (ON MODEL 6'S SAMPLE)	-273.811 (-4.09)***	2305	-.226 (-0.77)	1455	1.669 (2.77)***	2273

Notes: DV: dependent variable. N: sample size. Coefficients after panel regression with fixed effects. Constant and lagged dependent variable omitted, t-values between parentheses.

The results of this exercise are more interesting for the other two dependent variables. The negative association between CBI and unemployment (although marginally significant) in the full sample absolutely disappears when the same model is run in any of the subsamples. (t -values < 1). Interestingly, the opposite happens when regressing GDP growth on its own lag and CBI: CBI's coefficient is far from achieving statistical significance in the full sample. However, CBI becomes significant at conventional levels in all the subsamples.

Conclusions

This article introduces an original dataset coding central bank reforms and CBI in 182 countries between 1970 and 2012. Although the coding was made in three independent waves and did not rely on previous available datasets, the correlation with previous data suggests consistent criteria when analyzing the legislation of interest. Nevertheless, the importance of this dataset derives from important differences with previous available data. First, this dataset has a substantially broader (fundamentally geographic, but also temporal) coverage that will allow scholars to examine important research questions in larger and more representative samples, or in different groups of countries. Descriptive data presented here shows that different samples offer different pictures of the worldwide dynamics of CBI and central bank reform. For example, this more expansive data's analysis raises questions about how unusual the 1990s were for CBI reforms, as well as how the reforms during those years contrast with previous decades. The data suggest that previous results might have been affected by the non-representative samples examined, generally focusing on developed countries and overrepresenting post-communist countries among the developing states. This suggests that there might be limits to the generalizability of some empirical results in the literature.

The second feature of this dataset is a finer-grained analysis of the legislation affecting CBI. A meticulous search of documents made it possible to identify numerous central bank reforms previously overlooked. The fact that those reforms both increase and decrease CBI opens new avenues for researching the determinants and consequences of monetary institutions. For example they suggest the possibility of developing a theory to explain CBI restrictions or, more generally, liberalizing reforms reversals.

Indices of *legal* CBI have been criticized because they may not accurately reflect actual independence from the government. Furthermore, other aspects regarding the design and actual operation of central banks, such as their transparency or accountability, can be equally or even more important than CBI for certain research questions. Nonetheless, *de jure* measures are suitable to explore the determinants and consequences of institutional choices. CBI is seldom a consequence of merely monetary logics, and it may proxy other domestic dynamics of interest for political scientists, such as executive powers, institutional hurdles for reform, difficulties for reform implementation, or diffusion of particular policies. The new dataset described here will permit researchers to address these important questions with more certitude than was possible before, harnessing in-depth data from a globally representative sample.

Appendix

APPENDIX I. CORRELATION MATRIX

	CBI AUTHOR	CBI CWN	CBI POLILLO&GUILLEN	CBI CROWE&MEADE	CBI BODEA&HICKS
CBI_AUTHOR	1.0000 (N=5853)				
CBI_CWN	0.923*** (N=1559)	1.0000 (N=1570)			
CBI_POLILLO&GUILLEN	0.859*** (N=992)	0.945*** (N=234)	1.0000 (N=1004)		
CBI_CROWE&MEADE	0.890*** (N=96)			1.0000 (N=96)	
CBI_BODEA&HICKS	0.883*** (N=2308)	0.918*** (N=1019)	0.800*** (N=7524)	0.821*** (N=57)	1.0000 (N=2316)

APPENDIX 2. ADDITIONAL DESCRIPTIVE DATA ON REFORMS

TABLE 2.1. FREQUENCY OF REFORMS BY COUNTRY

TOTAL REFORMS PER COUNTRY	FREQUENCY (COUNTRIES)	PERCENT	CUM.
0	15	8.29	8.29
1	51	28.18	36.46
2	48	26.52	62.98
3	43	23.76	86.74
4	21	11.60	98.34
5	2	1.10	99.45
6	1	0.55	100.00

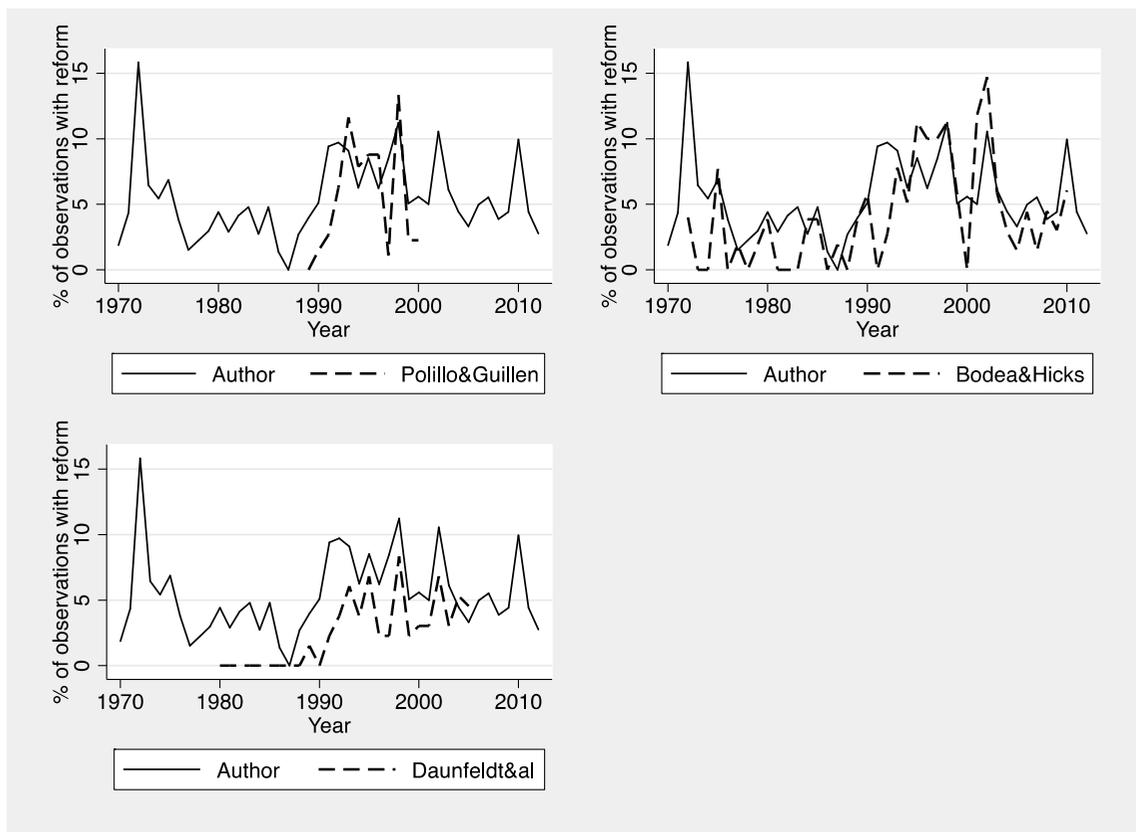
TABLE 2.2. FREQUENCY OF REFORMS BY YEAR

TOTAL REFORMS PER YEAR	FREQUENCY (YEARS)	PERCENT	CUM.
0	1	2.33	2.33
2	3	6.98	9.30
3	1	2.33	11.63
4	4	9.30	20.93
5	3	6.98	27.91
6	4	9.30	37.21
7	4	9.30	46.51
8	5	11.63	58.14
9	4	9.30	67.44
10	2	4.65	72.09
11	3	6.98	79.07
15	2	4.65	83.72
16	2	4.65	88.37
17	1	2.33	90.70
18	1	2.33	93.02
19	2	4.65	97.67
20	1	2.33	100.00

TABLE 2.3. AVERAGE PERCENTAGE OF OBSERVATIONS CODED AS REFORMS BY DECADE

DECADE	AUTHOR	POLILLO&GUILLEN	BODEA&HICKS	DAUNFELDT ET AL
1970-1979	5.13		1.94	
1980-1989	3.18		1.73	0.15
1990-1999	7.91	6.41	6.97	3.79
2000-2009	5.38	2.25	5.02	4.29
2010-2012	5.71		6.06	

FIGURE 2.1. PERCENTAGE OF OBSERVATIONS WITH REFORMS AFFECTING CBI PER YEAR. DIFFERENT DATASETS



APPENDIX 3. CWN CODING AND WEIGHTING RULES

The CWN CBI measure is based in the following rules to code 16 variables and to combine them into a single weighted index (Cukierman 1992, Cukierman, et al. 1992). Table I shows the variables, coding rules and weights.

**TABLE I: CBI COMPONENTS, VARIABLES, AND CODING CRITERIA.
WEIGHTS BETWEEN PARENTHESES**

COMPONENT I: **CENTRAL BANK CEO (0.20)**

VARIABLES (WEIGHTS)	CRITERIA (SCORE)
1. TERM OF OFFICE OF CEO (0.25)	- EQUAL OR MORE THAN 8 YEARS (1)
	- 6 YEARS OR MORE BUT LESS THAN 8 YEARS (0.75)
	- EQUAL TO 5 YEARS (0.50)
	- EQUAL TO 4 YEARS (0.25)
	- LESS THAN 4 YEARS (0)
2. WHO APPOINTS THE CEO (0.25)	- THE CENTRAL BANK BOARD (1)
	- COUNCIL COMPOSED BY EXECUTIVE AND LEGISLATIVE BRANCH AND CENTRAL BANK BOARD (0.75)
	- BY LEGISLATIVE BRANCH (0.50)
	- BY EXECUTIVE BRANCH (0.25)
	- BY ONE OR TWO MEMBERS OF EXECUTIVE BRANCH (0)
3. PROVISIONS FOR DISMISSAL OF CEO (0.25)	- NO PROVISION (1)
	- ONLY FOR NON-POLICY REASONS (E.G., INCAPABILITY, OR VIOLATION OF LAW) (0.83)
	- AT A DISCRETION OF CENTRAL BANK BOARD (0.67)
	- FOR POLICY REASONS AT LEGISLATIVE BRANCH'S DISCRETION (0.50)
	- AT LEGISLATIVE BRANCH'S DISCRETION (0.33)
	- FOR POLICY REASONS AT EXECUTIVE BRANCH'S DISCRETION (0.17)
- AT EXECUTIVE BRANCH'S DISCRETION (0)	
4. CEO ALLOWED TO HOLD ANOTHER OFFICE IN GOVERNMENT (0.25)	- PROHIBITED BY LAW (1)
	- NOT ALLOWED UNLESS AUTHORIZED BY EXECUTIVE BRANCH (0.5)
	- NO PROHIBITION FOR HOLDING ANOTHER OFFICE (0)

COMPONENT 2: CENTRAL BANK OBJECTIVES (0.15)

VARIABLES (WEIGHTS)	CRITERIA (SCORE)
5. CENTRAL BANK OBJECTIVES	- PRICE STABILITY IS THE ONLY OR MAJOR GOAL, AND IN CASE OF CONFLICT WITH GOVERNMENT, THE CENTRAL BANK HAS FINAL AUTHORITY (1)
	- PRICE STABILITY IS THE ONLY GOAL (0.8)
	- PRICE STABILITY ALONG WITH OTHER OBJECTIVES THAT DO NOT SEEM TO CONFLICT WITH THE FORMER (0.6)
	- PRICE STABILITY ALONG WITH OTHER OBJECTIVES OF POTENTIALLY CONFLICTING GOALS (E.G., FULL EMPLOYMENT) (0.4)
	- CENTRAL BANK CHARTER DOES NOT CONTAIN ANY OBJECTIVE (0.2)
	- SOME GOALS APPEAR IN THE CHARTER BUT PRICE STABILITY IS NOT ONE OF THEM (0)

COMPONENT 3: POLICY FORMULATION (0.15)

VARIABLES (WEIGHTS)	CRITERIA (SCORE)
6. WHO FORMULATES MONETARY POLICY (0.25)	- CENTRAL BANK HAS THE LEGAL AUTHORITY (1)
	- CENTRAL BANK PARTICIPATES TOGETHER WITH GOVERNMENT (0.67)
	- CENTRAL BANK IN AN ADVISORY CAPACITY (0.33)
	- GOVERNMENT ALONE FORMULATES MONETARY POLICY (0)
7. GOVERNMENT DIRECTIVES AND RESOLUTION OF CONFLICTS (0.50)	- CENTRAL BANK GIVEN FINAL AUTHORITY OVER ISSUES DEFINED IN THE LAW AS OBJECTIVES (1)
	- GOVERNMENT HAS FINAL AUTHORITY OVER ISSUES NOT CLEARLY DEFINED AS CENTRAL BANK GOALS (0.8)
	- FINAL DECISION UP TO A COUNCIL WHOSE MEMBERS ARE FROM THE CENTRAL BANK, EXECUTIVE BRANCH, AND LEGISLATIVE BRANCH (0.6)
	- LEGISLATIVE BRANCH HAS FINAL AUTHORITY (0.4)
	- EXECUTIVE BRANCH HAS FINAL AUTHORITY, BUT SUBJECT TO DUE PROCESS AND POSSIBLE PROTEST BY CENTRAL BANK (0.2)
	- EXECUTIVE BRANCH HAS UNCONDITIONAL AUTHORITY OVER POLICY (0)

COMPONENT 4: **CENTRAL BANK LENDING (0.50)**

VARIABLES (WEIGHTS)	CRITERIA (SCORE)
8. CENTRAL BANK GIVEN ACTIVE ROLE IN FORMULATION OF GOVERNMENT'S BUDGET (0.25)	- YES (1)
	- NO (0)
9. LIMITATIONS ON ADVANCES (0.30)	- ADVANCES TO GOVERNMENT PROHIBITED (1)
	- PERMITTED BUT SUBJECT TO LIMITS IN TERMS OF ABSOLUTE CASH AMOUNTS OR RELATIVE LIMITS (GOVERNMENT REVENUES) (0.67)
	- PERMITTED SUBJECT TO RELATIVELY ACCOMMODATIVE LIMITS (MORE THAN 15 PERCENT OF GOVERNMENT REVENUES) (0.33)
	- NO LEGAL LIMITATIONS ON ADVANCES. SUBJECT TO NEGOTIATIONS WITH GOVERNMENT (0)
10. LIMITATIONS ON SECURITIZED LENDING (0.20)	- THE SAME AS IN 9
11. WHO DECIDES CONTROL OF TERMS OF LENDING TO GOVERNMENT (0.20)	- CENTRAL BANK CONTROLS TERMS AND CONDITIONS (1)
	- TERMS OF LENDING SPECIFIED IN LAW, OR CENTRAL BANK GIVEN LEGAL AUTHORITY TO SET CONDITIONS (0.67)
	- LAW LEAVES DECISION TO NEGOTIATIONS BETWEEN THE CENTRAL BANK AND GOVERNMENT (0.33)
	- EXECUTIVE BRANCH ALONE DECIDES AND IMPOSES TO THE CENTRAL BANK (0)
12. BENEFICIARIES OF CENTRAL BANK LENDING (0.10)	- ONLY CENTRAL GOVERNMENT (1)
	- CENTRAL AND STATE GOVERNMENTS, AS WELL AS FURTHER POLITICAL SUBDIVISIONS (0.67)
	- ALSO PUBLIC ENTERPRISES CAN BORROW (0.33)
	- CENTRAL BANK CAN LEND TO ALL OF THE ABOVE AND TO THE PRIVATE SECTOR (0)
13. TYPE OF LIMITS WHEN THEY EXIST (0.05)	- AS AN ABSOLUTE CASH AMOUNT (1)
	- AS A PERCENTAGE OF CENTRAL BANK CAPITAL OR OTHER LIABILITIES (0.67)
	- AS A PERCENTAGE OF GOVERNMENT REVENUES (0.33)
	- AS A PERCENTAGE OF GOVERNMENT EXPENDITURE (0)
14. MATURITY OF LOANS (0.05)	- LIMITED TO A MAXIMUM OF 6 MONTHS (1)
	- LIMITED TO A MAXIMUM OF 1 YEAR (0.67)
	- LIMITED TO A MAXIMUM OF MORE THAN ONE YEAR (0.33)
	- NO LEGAL UPPER BOUNDS (0)
15. RESTRICTIONS ON INTEREST RATES (0.05)	- MUST BE AT MARKET RATE (1)
	- ON LOANS TO GOVERNMENT CAN NOT BE LOWER THAN A CERTAIN FLOOR (0.75)
	- INTEREST RATE ON CENTRAL BANK LOANS CAN NOT EXCEED A CERTAIN CEILING (0.50)
	- NO EXPLICIT LEGAL PROVISIONS REGARDING INTEREST RATE IN CENTRAL BANK LOANS (0.25)
	- NO INTEREST RATE CHARGE ON GOVERNMENT'S BORROWING FROM CENTRAL BANK (0)
16. PROHIBITION ON CENTRAL BANK LENDING IN PRIMARY MARKET TO GOVERNMENT (0.05)	- PROHIBITION FROM BUYING GOVERNMENT SECURITIES IN PRIMARY MARKET (1)
	- NO PROHIBITION (0)

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