

# The Legal Central Bank Independence and Macroeconomic Performance: An Empirical Study on Eighteen Developing Countries in the 1990s

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## Abstract

This article aims at improving the analysis of Cukierman ( 1992 ) on the role of central bank independence on economic performance of developing countries by recognizing the importance of legal enforcement of central bank law in terms of clarity of objective ( s ), accountability, transparency, coordination and contingency measures of the central bank. For this purpose, we construct a legal enforcement index. Our empirical study suggests that increasing the level of legal central bank independence is associated with the reduction in long-term average inflation rates. From short-term analysis, beyond central bank independence, legal enforcement is discovered as another significant independent factor that has implications on macroeconomic performance. In the short-term, while increasing central bank independence may cause tradeoffs on real growth and unemployment, promoting legal enforcement tends to lead only to benefits. Moreover, exchange rate regime also plays a significant role in influencing the nature of tradeoffs of central bank independence and benefits of legal enforcement on macroeconomic variables. Our main recommendation for developing countries where in the average inflation rates are not excessive is that the emphasis should be placed more on legal enforcement of central bank law than on legal central bank independence for a preferable short-term macroeconomic performance.

Keywords: central bank independence, legal enforcement index

## 1. Introduction

The issue of Central Bank Independence ( CBI )<sup>1)</sup> has received attention since mid 1980s, as a topic related to rule versus discretion in monetary policy implementation. During the 1990s many developing countries responded to the trend by amending their Central Bank laws ( CB laws ), allowing more autonomy in operations and policy implementation. However the role of CBI for developing countries is still in controversy.

At a glance, level of inflation rate and degree of legal CBI<sup>2)</sup> appear diverse across developing countries.<sup>3)</sup> This seems to support the findings of Cukierman ( 1992 ) that the legal CBI does not play a significant role in developing countries. However, the issue of the degree of central bank law compliance has not yet been properly treated. The high degree of legal independence may not provide

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additional benefits, but may increase costs to the central bank unless it is accompanied by a compatible degree of legal enforcement.<sup>43)</sup> The analysis of CBI should also reflect factors such as the clarity of the monetary objective ( s ) accountability, transparency, coordination, and contingency measures of central bank embedded in the CB law.<sup>53)</sup> So far, there is no empirical research that tries to quantify these elements and adapts them to the analysis of CBI. Moreover, as many central banks in developing countries are pursuing not only price stability but also other macroeconomic-oriented objective ( s ) the implications of CBI on macroeconomic variables deserve analysis.

This article presents an empirical study on the relationship between CBI and macroeconomic performance in eighteen developing countries. The emphasis is on the period of the 1990s, in which CB laws in those countries were amended towards more legal independence. The role of legal enforcement is recognized and quantified as a “legal enforcement index”.

The structure of the article is as follows. The next section reviews discussions on measuring the degree of CBI. Drawbacks of Cukierman’s legal CBI index are pointed out. The third section is an empirical study on the relationship between legal CBI and macroeconomic performance. It begins with the trend of legal CBI in developing countries in the 1990s, followed by a comparison of relative degree of legal enforcement among those countries. The remainder of the section is a regression analysis that aims at explaining the roles of legal enforcement and exchange rate regime in the relationship between legal CBI and macroeconomic performance. The last section gives the conclusions and final remarks.

## 2. Measuring Central Bank Independence

### 2.1 General perception on central bank independence

CBI, in most monetary literature, is classified into “goal independence” and “instrument independence”. The former implies the freedom of the central bank to independently select which monetary objective ( s ) to pursue. The latter refers to the freedom to select and to implement monetary policy and instruments to achieve certain assigned objective ( s ) To restrict the central bank from selecting goal ( s ) which is ( are ) contradictory to national interests, there tends to be a consensus that the central bank should not have goal independence. The discussion in this article, therefore, focuses only on the instrument independence and treats the nature of goal independence as given.

The general arguments for CBI associate with the importance of price stability, which usually requires a long time horizon to be achieved. When the price is relatively stable or predictable, both public and private sectors can plan for development and investment properly within the available set of information and other constraints. If politicians control the monetary policy makers there is a tendency that the central bank loses the ability to pursue its long-term objective ( s ) This is because the political turnover tends to be higher than that of monetary board. New governments may cause

changes or delays in the long-term objective ( s ) of the central bank. A general perception, therefore, is that to maintain monetary stability and predictability, the central bank should be free from political influences that tend to make a deviation for short-term political purposes. The CBI, thus, can be viewed as a mechanism that helps to ensure undisturbing process to achieve the central bank objective ( s ) for instance, when there is new election. The degree of CBI generally relates to the extent to which the central bank can have freedom in pursuing the objective of price stability.

## 2.2 Previous empirical studies on the degree of legal central bank independence

Now we turn to the measurement of the CBI. Using an index provides a convenient source of comparability. Most pioneering works construct the CBI index based on legal attributes. Although Cukierman ( 1992 )'s empirical evidence supports the argument against the reliability of legal CBI as an indicator for the actual CBI, the index provides stability and comparability. In practice, even though cultural and personnel factors are also significant determinants of goal achievement; they are more dynamic than legislation. These factors can be controlled by legislation. For instance, the law can define the qualifications of the executive staff, and rules for conducting the monetary policy to ensure the minimum quality of policy formulation without political bias. Moreover, it is difficult to quantify those subjective factors. Even in a well-designed questionnaire, subjectivity and bias in classification will tend to be relatively higher than the direct inference from CB law. It is also difficult to detect the bias in the case of questionnaires, where as the CB law provides a better reference for future reexamination. For these reasons, it is justified to quantify the actual CBI based on legal attributes, i.e. the CB law.

The next problem is how to derive a legal CBI index that well reflects the actual CBI. Difficulties arise in selecting and scoring the variables as well as in aggregating them into a composite index. It is always difficult to avoid subjectivity and arbitrariness in the methodological framework.

In the review of Schaling ( 1995, ch.3 ) the legal CBI indices in the pioneering works can be classified into four dimensions: ( 1 ) the appointment of the monetary board of the central bank; ( 2 ) the autonomy of the central bank from the government in the formulation of monetary policy; ( 3 ) the policy goals of the central bank; and ( 4 ) the financial and budgetary obligations of central bank to the government. The degree of CBI in each dimension is determined further by detailed criteria. Schaling ( 1995, ch.3 ) points out three main criticisms on those prior studies. First, some criteria are too extreme and do not exist in reality. For example, no CB law allows full independence in appointing the monetary board. Second, all dimensions of the CBI are treated equally. Third, the impacts of institutional changes such as exchange rate regimes on the effectiveness of monetary policy implementation are totally ignored.

Cukierman ( 1992 ) provides an empirical study covering a larger number of samples ( 70 countries ) including developing countries ( 39 countries ) with a longer time span ( from the 1950s to

The Legal Central Bank Independence and Macroeconomic Performance: An Empirical Study on Eighteen Developing Countries in the 1990s (the 1980s) He classifies 16 legal characteristics or “variables” into 4 groups similar to prior studies. To support the presentation in Table 2, it is worth listing the definitions and the abbreviations of all groups and variables.<sup>63</sup> The first group, named CEO, includes 4 variables concerning the chief executive officer: term of office (Too), the appointment authority (App), provisions for dismissal (Diss), and permission to hold another of office (Off). The second group examines independence in policy formulations (PF). Specifically, the variables concern who formulates the monetary policy (Monpol), who has the final authority to resolve conflict in policy formulations (Conf), and whether the central bank is given an active role in formulating the government budget (Adv). How the objective of price stability is stated as the final objective of the central bank in the CB law (OBJT) is the third group with only one variable (Obj). The fourth group focuses on the limits of financial and budgetary obligations of the central bank to the government (LL). This group comprises 8 variables describing the prohibitions on direct advances (Lla) and securitized lending (Lls), decision maker of terms of lending (Ldec), width of circle of potential borrows (Lwidth), type of limit (Ltype), maturity of loans (Lmat), interest rate (Lint), and prohibition on lending in primary market (Lprm). Within the group, all variables are weighted equally. When a certain variable is not available, the weights are adjusted proportionally. Among the groups, Cukierman (1992) assigns different weights to reflect his perception on relative significance of each dimension. The points assigned to each criterion under a variable range from 0 to 1, indicating the lowest to the highest degree of legal independence. The value of the overall legal CBI index, therefore, ranges from 0 to 1.

In industrialized countries, empirical studies that try to quantify the degree of legal CBI and see how the index associates with inflation and other economic variables emerged in the late 1980s.<sup>73</sup> Schaling (1995, ch.3) performs a comparative study on the indices of legal CBI in those pioneering works. A common conclusion of those empirical studies is that the countries with higher CBI tend to have lower levels of inflation rate. Cukierman’s index also postulates this argument. Alesina and Summers (1993) investigate the relationship between the legal CBI and macroeconomic performance in industrialized countries and find no significant relationship. This implies that the legal CBI cannot be a good mechanism to help promote economic development in the cases of industrialized countries.

The empirical study of the legal CBI in developing countries is limited. Cukierman (1992) and Cukierman, Webb, and Neyapti (1992) the pioneering works, do not find substantial relationships and claim that in developing countries the CBI index based on legal attributes is not a good proxy for actual CBI. Cukierman (1992: 453-454) asserts that the degree of compliance to the law in developing countries is relatively lower than in industrialized countries. Although the CB laws in developing countries are greatly influenced by industrialized countries, the ability to attain price stability is different. This is possibly due to the weaker legal enforcement that allows room for discretion and political intervention. The Indonesian central bank, the Bank Indonesia, became legally independent in May 17, 1999 in pursuing price stability. However, as claimed by Yokoi-Arai (2001) the Bank of

Indonesia fails to realize the benefits of the independence because it lacks an accountability and rule based system to avoid political influence and corruption.<sup>8)</sup>

### 2.3 Drawbacks of Cukierman's CBI index and analysis

Although in Cukierman ( 1992 ) the CBI index is deliberately constructed to handle some drawbacks of prior studies, the index still does not prove to be a good proxy of the actual CBI in developing countries. Augmentation may be necessary.

Regarding Cukierman ( 1992 )'s framework of analysis, Anyadike-Danes ( 1995 ) points out that the study ignores the role of exchange rate regime on the relationship between CBI and inflation. He claims that the relationship is relatively the weakest for the group of countries with pegged exchange rate regimes. Another drawback we found is the ignorance of the fact that some developing countries experienced crises and hyperinflation. The absolute value of inflation at a point in time may be less meaningful than its changes across the time. Moreover, in most developing countries the central bank is designed to accommodate macroeconomic development. As in the analysis by Alesina and Summers ( 1993 ) relationships between the degree of CBI and the other macroeconomic variables such as economic growth and employment should also be analyzed.

### 2.4 Theoretical Framework for the Legal Enforcement Index

According to Lastra and Miller ( 2001: 32 ) independent central bank means "a particular kind of institution that is independent in some respects, but highly constrained in others". Simply granting autonomy and authority does not guarantee effectiveness. To ensure that the central bank would perform in such a way as to attain its assigned duties in the public interest, some aspects of its operation should be controlled. For instance, the degree of CBI should be accompanied by compatible level of accountability and transparency. While these legal-enforcing mechanisms may be well embedded in the CB law of industrialized countries, they are still insufficient in the case of developing countries. Considering the nature of a small-open developing country, in which the high degree of both trade and international financial integration causes the country to be more vulnerable to instabilities, imprudent amendment to the CB law toward a higher degree of CBI may not bring benefits but rather costs to the economy. Recognizing the crucial role of legal enforcement in the effectiveness of the CBI, we consider it as a source of modification to the analysis of Cukierman ( 1992 )

Next is the attempt to identify legal-enforcing elements that are embedded in the CB law and potentially affect the degree of legal CBI. After comparing and contrasting the clauses in the CB laws of several developing countries as well as reviewing the literature in both monetary economic and law studies, we propose five dimensions of legal enforcement.

For an independent bank to pursue its monetary objective ( s ) successfully, the first and perhaps the most important factor is the clarity of the assigned objective ( s )<sup>9)</sup> In this place, multiple

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objectives rather than only price stability are acceptable as long as the central bank can have specific variable ( s ) in specifying the loss function.<sup>103</sup> Without clear and specific objective ( s ), the independence becomes unnecessary or ineffective as the loss function is subject to change. Ideally, clarity is the highest if the variable of the objective, for example level of price, is clearly stated in terms of specific number. To maintain clarity, in addition to having clear objective variable ( s ) a time limit for the proposal of the specific objective by the responsible party should be clearly stated.

The next two factors that are widely discussed among economists and lawyers are accountability and transparency of the monetary board. Both factors help to ensure that the monetary policy makers have to perform their best within delegated authority or be subject to punishment. The accountability and transparency should be promoted in such ways that the society can widely understand, openly discuss and evaluate the policy. This follows the suggestion of Berg and Lindberg ( 2001 ) on how to achieve credibility of the monetary policy and support from the public. Accountability refers to the obligations of the central bank to explain itself to the public ( Blinder 1998: 69 ) The legal requirements on frequency and formal records of board meetings are examples of obligations to ensure accountability. Moreover, a representative of chairman to assume his duties and responsibilities in a board meeting should be assigned by the chairman himself prior to his absence. This is to avoid the misrepresentation of his will. In addition, to facilitate realization of the long-term objective ( s ) the directors of the board should be reappointable.

Transparency is high when the possibility of collusion among the directors of the board is minimized. The auditor should not be appointed by the board and should not be reappointable. The board meeting should allow witnesses from the public to listen. Details of discussions should be well recorded and substantial parts should be revealed to the public for public criticism. Moreover, overlapping terms of the directors can also help avoid collusion.

The other two factors that are relatively less discussed in monetary literature are the coordination and contingency measures. In law literature, both features are highly recognized. Coordination, in this context, focuses on the composition of the monetary board of an independent central bank. It implies the allocation of votes, which has implications for the future policy action ( Berg and Lindberg 2001: 54-55 ) To ensure the best policy-making that meets the interests of the society, the board should be well balanced, comprising qualified representatives from different agencies. The degree of balanced coordination is assumed to be high when the law clearly states the fixed agencies from which directors of the board are selected. Without such regulation, the problem of inflationary bias may arise from imbalanced coordination.

The last factor is the contingency measures to remedy extraordinary and sudden instability. The onset of a crisis is a good example. Stating the special authority and safeguard measures may help avoid social loss better than otherwise. The recognition of contingency measures is high when the law states specific benchmarks beyond which the central bank must to urgently report and be granted

special authority to make appropriate corrections prior to the approval.

To compare the degree of legal enforcement among different countries, the five dimensions of legal enforcement are quantified. In summary, those five dimensions are:

1. Clarity of monetary objective ( s ) CLO;
2. Accountability of the CB board in implementing monetary policy, ACC;
3. Transparency of conducting monetary policy, TRAN;
4. Balanced coordination among the directors in the CB board, COOR; and
5. Contingency measures against instability, CONT.

Table 1 Legal Enforcement Variables and their scoring

Group	Variable and Definition	Levels and meanings	Point	
CLO	Clo How clear the objective is?	1. Specific objective variable(s) with time limit for target proposal	1	
		2. Specific objective variable(s) without time limit for target proposal	0.50	
		3. No specification	0	
ACC	Ofm How often the board meetings are?	1. At least once a week	1	
		2. At least once a month	0.66	
		3. Less often than once a month	0.33	
		4. No specification	0	
	Pres How do directors present their responsibility on decision making?	1. Formal record of meeting certified by directors and minutes of each board meeting published	1	
		2. Formal record of meeting certified by directors but no requirement regarding minutes	0.66	
		3. Only formal record without requirement on certification	0.33	
		4. No specification	0	
	Miss What if the chairman misses the board meeting?	1. Only assigned person can assume duties and responsibilities of chairman	1	
		2. Selected director in that meeting can assume duties and responsibilities of chairman	0.50	
		3. No specification	0	
	Rap	Is board reappointable?	1. Always reappointable	1
2. Reappointable not more than certain time limit			0.75	
3. Reappointable or not depends on type of director			0.50	
4. Not reappointable at all			0.25	
5. No specification			0	
TRAN	Aud Is auditor selected by the CB board?	1. No, and not reappointable	1	
		2. No, and reappointable	0.75	
		3. Yes, and not reappointable	0.50	
		4. Yes, and reappointable	0.25	
		5. No specification	0	
	Opn	Is board meeting open for public?	1. Open for public without exception	1
			2. Open for public with some exception	0.75
			3. Some outsider may be invited on discretion of board	0.50
			4. Only listed executives can attend	0.25
			5. No specification	0

Dmt	How are discussions in board meeting handled?	1. All discussions recorded and revealed to public e.g. in quarterly bank policy review 2. All discussions recorded but not all revealed to public e.g. only the conclusion revealed 3. All discussions recorded but not revealed to public at all 4. No specification	1 0.66 0.33 0
Tol	Are terms of directors overlapping or exactly the same?	1. Strictly overlapping by different length of term for different director 2. Overlapping possible when replace new director 3. Exactly the same 4. No specification	1 0.66 0.33 0
COOR	Bco Is combination of board balanced?	1. Representatives from different fixed agencies 2. Representatives from different unfixed agencies 3. No specification	1 0.50 0
CONT	Minst Is there meaning of instability?	1. Specified in terms of specific number or rate of some economic variables 2. Specified in terms of descriptive conditions 3. No specification	1 0.50 0
Irmt	How to open irregular board meeting?	1. When a director of board or chairman submit a proposal 2. When two directors of board or chairman submit a proposal 3. When more than two directors of board or chairman submit a proposal 4. When only chairman calls for 5. No specification	1 0.75 0.50 0.25 0
Tinst	When to report instability to the government?	1. As soon as instability realized or after the board's irregular meeting 2. After the board's regular meeting 3. In other occasion which is later than the above 4. No specific requirement	1 0.66 0.33 0
Rinst	How to response to instability?	1. Special power granted to governor or board to implement some remedy 2. No specification	1 0

Source : Proposed and constructed by author.

Table 1 shows the detailed criteria for classification and evaluation of each variable. The numerical score indicates the degree of legal enforcement of the respective variable. For instance, in the first group, the degree of clarity is high when the CB law states the specific objective variable with specific target or time limit to submit the proposal. On the other hand, the general statement provides unclear objectives to pursue. In such case, it is assigned value zero. This also applies to other variables when there is no specification, instead of assigning "Not Available", NA. This is justified because when the law does not state specifically the actions or rules to be taken it implies the discretionary decision-making and allows political influence. The degree of legal enforcement is considered the lowest.

It is worth recalling that the above five dimensions of legal enforcement do not, by themselves, directly indicate the degree of CBI. Rather, they are mechanisms to ensure the minimum favorable

performance of the monetary board in formulating the monetary policy regardless of changes in environment. In other words, the CB laws for dependent banks should also contain those legal-enforcing mechanisms. Instead of including legal enforcement as an additional group of variables for measuring the legal CBI, we propose to aggregate the five dimensions into an aggregate index<sup>11</sup>, named “legal enforcement ( LNF ) index”.

### 3. The Empirical Study

This section presents the empirical study in which the legal CBI index is used as proxy variable for the actual CBI in examining its relationship with macroeconomic variables in developing countries. Eighteen developing countries, based on the list of countries in Cukierman ( 1992 ) are selected with main criteria of: availability of English version of CB law amended before 1999; availability of necessary macroeconomic indicators; being a democratic country; and not being an EU member. The fact of diverse economic background among developing countries, the role of exchange rate regime and the significance of legal enforcement are recognized.

#### 3.1 Trends in Central Bank Independence in Developing Countries

For comparison, we calculate Cukierman’s CBI index for the 1990s. Table 2 illustrates the differences in the degree of legal CBI among developing countries. From the 1980s to the 1990s most of the selected developing countries have moved toward higher CBI, except for India, Pakistan, South Africa and Thailand, which maintained relatively stable levels of CBI. Compared with the study of Cukierman ( 1992 ) the ranking of degrees of the CBI index has changed substantially. The country that has the highest increase in the level of CBI index is Argentina, followed by the Philippines, Korea, Botswana, Chile, and Uganda, respectively. Interestingly, a common characteristic of these countries is that they experienced financial crises. In the 1990s, except for Uganda, these countries could achieve average annual inflation rates of less than half of those of the 1980s.

Table 2 SCoring of Legal Central Bank Independence Index

Group Wg.	Var. Wv.	CEO 0.20				PF 0.15			OBJT 0.15	LL1 0.15	LL2 0.10	LL3 0.10	LL4 0.05	LL5 0.10				CBI Index		Avg. Yearly Inflation %
		Too	App	Diss	Off	Monpol	Conf	Adv	Obj	Lia	Lis	Ldec	Lwidth	Ltype	Lmat	Lint	Lprm	Weighted	Unweighted	
		0.25	0.25	0.25	0.25	0.25	0.50	0.25	1.00	1.00	1.00	1.00	1.00	0.25	0.25	0.25	0.25			
Country	Period																			
1 Argentina	1980-1989	0.25	0.25	0.83	1.00	0.33	0.00	0.00	0.40	0.33	0.33	0.33	1.00	0.33	1.00	0.50	0.00	0.40	0.44	566
	1995-1999	0.75	0.75	0.83	1.00	1.00	1.00	0.00	0.80	1.00	0.66	0.66	1.00	0.66	0.00	1.00	1.00	0.80	0.80	1
2 Botswana	1980-1989	0.50	0.00	0.83	0.50	NA	0.00	0.00	0.20	0.33	0.66	0.33	0.66	0.33	0.33	0.25	0.00	0.33	0.36	11
	1997-1999	0.50	0.50	0.83	0.50	0.66	0.80	0.00	0.60	0.66	NA	0.33	0.66	0.33	1.00	0.25	0.00	0.55	0.54	7
3 Chile	1980-1989	0.50	0.00	0.83	0.50	0.66	0.20	0.00	0.80	0.33	0.33	0.66	1.00	NA	0.00	0.25	0.00	0.46	0.49	21
	1990-1999	0.50	0.50	0.83	0.50	0.66	0.20	0.00	0.80	1.00	1.00	NA	1.00	NA	0.00	0.25	0.00	0.65	0.68	12
4 Egypt	1980-1989	0.50	0.50	1.00	0.00	0.33	0.00	0.00	0.60	0.66	0.66	0.33	1.00	0.66	0.66	0.25	0.00	0.49	0.53	17
	1993-1999	0.25	0.75	1.00	0.00	1.00	1.00	0.00	0.60	0.66	0.66	0.33	1.00	0.33	0.66	0.25	0.00	0.58	0.60	8
5 India	1980-1989	0.50	0.25	0.83	0.50	NA	0.00	0.00	0.40	0.33	0.00	0.66	0.33	1.00	0.33	0.25	0.00	0.34	0.33	9
	1997-1999	0.50	0.25	0.50	0.50	0.33	0.00	0.00	0.40	0.33	0.00	0.66	0.33	0.66	0.33	0.25	0.00	0.32	0.32	8
6 Kenya	1980-1989	0.25	0.00	0.83	0.50	NA	0.20	0.00	0.40	0.66	0.66	0.33	0.33	1.00	0.66	0.75	0.00	0.43	0.44	12
	1995-1999	0.25	0.50	0.83	0.50	0.33	0.20	0.00	0.60	0.66	0.66	0.66	1.00	0.33	0.66	1.00	0.00	0.55	0.60	6
7 Korea	1980-1989	0.25	0.25	0.83	0.50	0.33	NA	0.00	0.60	0.00	0.00	0.33	0.00	NA	0.66	0.25	0.00	0.27	0.23	8
	1998-1999	0.25	0.25	0.83	0.50	1.00	NA	0.00	0.80	0.33	0.00	1.00	0.00	NA	0.66	0.25	0.00	0.47	0.42	4
8 Mexico	1980-1989	NA	1.00	0.83	1.00	0.66	0.20	0.00	0.00	0.00	0.00	0.33	1.00	NA	0.66	0.25	0.00	0.34	0.35	69
	1994-1999	0.75	0.50	0.83	1.00	0.66	0.20	0.00	0.60	0.33	0.00	0.33	1.00	NA	1.00	0.25	0.00	0.46	0.46	22
9 Malaysia	1980-1989	0.50	0.00	0.83	0.00	0.00	0.20	0.00	0.60	0.33	NA	0.66	0.00	0.33	0.66	0.25	0.00	0.35	0.33	4
	1994-1999	0.50	0.50	0.83	0.50	0.33	0.20	0.00	0.60	0.33	NA	0.66	0.00	0.33	0.66	0.25	0.00	0.42	0.38	4
10 Pakistan	1980-1989	0.50	0.25	0.83	0.50	0.00	0.00	0.00	0.40	0.00	0.00	0.00	0.33	NA	0.66	0.25	0.00	0.21	0.19	7
	1990-1999	0.00	0.25	0.83	0.50	0.00	0.00	0.00	0.40	0.00	0.00	0.00	0.33	0.66	1.00	0.25	0.00	0.20	0.20	10
11 Peru	1980-1989	0.00	1.00	0.83	1.00	0.66	0.20	0.00	0.40	0.00	0.66	0.66	0.33	0.33	1.00	0.25	0.00	0.43	0.43	481
	1993-1999	0.50	0.50	0.83	1.00	1.00	0.80	0.00	0.00	1.00	1.00	0.66	1.00	NA	NA	NA	0.00	0.61	0.63	16
12 Philippines	1980-1989	0.75	0.00	0.83	0.50	0.66	0.20	0.00	1.00	0.33	0.00	0.33	0.66	0.33	0.33	0.25	0.00	0.43	0.42	14
	1993-1999	0.75	0.00	0.83	0.50	0.66	1.00	0.00	0.60	0.66	1.00	0.66	0.66	0.33	1.00	0.25	0.00	0.63	0.65	8
13 Poland	1980-1989	0.50	0.25	0.00	0.00	0.66	0.00	0.00	0.00	0.00	0.00	0.33	0.00	NA	0.00	0.25	0.00	0.10	0.10	53
	1998-1999	0.75	0.50	0.83	0.00	0.66	0.00	0.00	0.60	0.00	0.00	0.33	NA	NA	0.00	0.25	0.00	0.27	0.24	10
14 Romania	1980-1989	NA	0.25	NA	0.00	1.00	0.80	0.00	0.20	NA	NA	0.66	0.00	NA	0.00	0.25	0.00	0.30	0.29	4
	1998-1999	0.75	0.25	0.83	0.00	1.00	0.80	1.00	0.60	0.66	NA	NA	1.00	0.33	1.00	1.00	0.00	0.65	0.70	52
15 South Africa	1980-1989	0.50	0.00	0.83	0.50	NA	NA	0.00	0.20	0.00	0.00	0.33	1.00	NA	1.00	0.25	0.00	0.25	0.30	15
	1997-1999	0.50	0.50	0.83	0.50	1.00	0.80	0.00	0.80	0.00	0.00	0.33	0.00	NA	0.00	0.25	0.00	0.38	0.31	7
16 Thailand	1980-1989	0.25	0.50	0.00	0.00	0.00	0.20	0.00	0.60	0.33	0.00	0.33	0.33	0.00	0.66	0.25	0.00	0.26	0.26	6
	1990-1999	0.25	0.50	0.00	0.00	0.00	0.20	0.00	0.60	0.33	0.00	0.33	0.33	0.00	0.66	0.25	0.00	0.26	0.26	5
17 Uganda	1980-1989	0.50	0.50	0.83	0.50	0.00	0.20	0.00	0.40	0.33	NA	0.33	0.33	0.33	1.00	0.75	0.00	0.38	0.37	111
	1993-1999	0.50	0.50	0.83	0.50	1.00	1.00	0.00	0.40	0.66	NA	0.33	0.33	0.66	1.00	1.00	0.00	0.56	0.53	6
18 Zambia	1980-1989	0.50	0.25	0.83	0.50	0.33	0.20	0.00	0.40	0.33	0.33	0.00	0.33	0.33	0.33	0.75	0.00	0.33	0.31	69
	1997-1999	0.50	0.50	0.83	0.50	0.33	0.20	0.00	0.60	0.66	0.66	0.00	NA	0.33	0.00	0.25	0.00	0.44	0.40	25

Note : Wg., Var. and Wv. refer to weight of the group, variable, and weight of the variable, respectively. Definitions of variables appear in 2.2. The calculation follows Cukierman ( 1992 ) Ch.19. Inflation rate is the annual change in Consumer Price Index, of which 1995 is the base year. Score assignment for the 1980s follows Appendix A of Cukierman ( 1992 ) With the same criteria, the author assigns scores and calculates CBI index for the 1990s.

Source of Basic Data : Appendix A of Cukierman ( 1992 ) and direct inference from the CB law of respective country for variable scoring. *World Development Indicator 2001* CD-ROM for the inflation rate.

To examine the relationship between the level of CBI and long-term inflation, simple regression technique is employed. To avoid heteroskedasticity of error we follow Cukierman, Webb, and Neyapti ( 1992 ) in transforming the inflation variable by dividing the inflation rate by one plus the rate. The transformed inflation rate ( TranInf ) is regressed on CBI index. The result is shown as follows:

$$\text{TranInf} = 0.191 - 0.042 \text{ CBI} \quad (1)$$

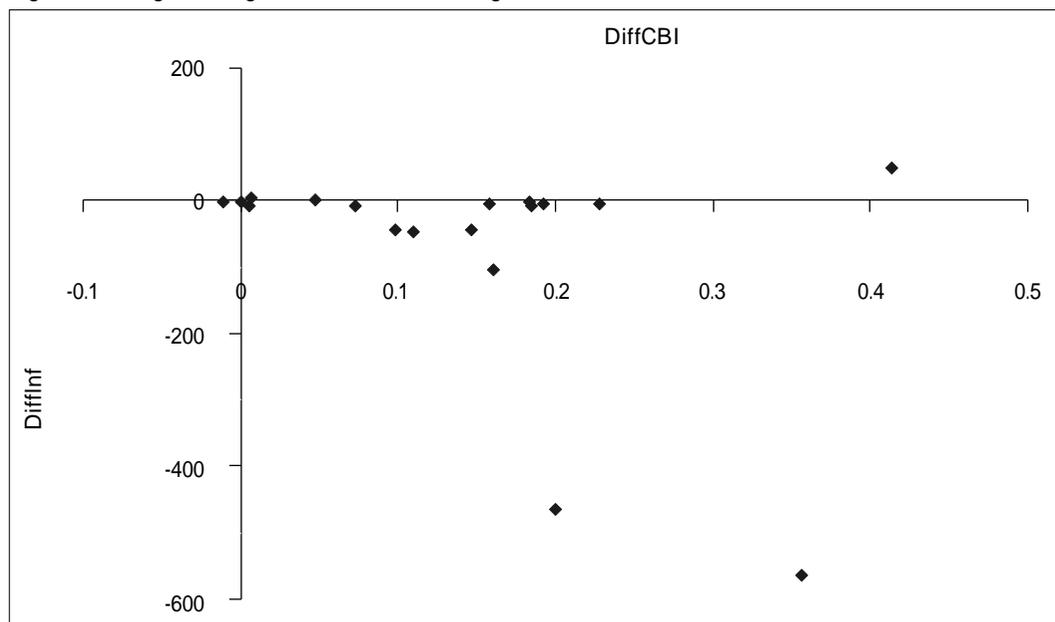
$$t\text{-statistic} \quad (1.983) \quad (-0.193)$$

$$R^2 = 0.001 \quad F\text{-statistic} = 0.037 \quad n = 36$$

The result from equation ( 1 ) supports the findings in Cukierman ( 1992 ) of no statistically

significant relationship between the two variables. However, the fact that some, not all, of these developing countries have experienced crises should not be ignored. The economic shocks may cause hyperinflation. In such a case, even for a capable independent central bank, it may take several years to control the inflation. From Figure 1, it is obvious that from the 1980s to the 1990s the average annual inflation rates decreased dramatically in the countries that increased their levels of CBI.

Figure 1 Changes in Legal CBI Index and Average Inflation Rates between the 1980s and the 1990s



Note : DiffInf refers to change in average annual inflation rates DiffCBI refers to change in level of unweighted legal CBI indices in Table 2.

We propose the examination of relationships between the change in the level of CBI index( DiffCBI ) and the change in average annual inflation rate between the two decades ( DiffInf ) The result of simple regression is shown as follows:

$$\begin{aligned} \text{DiffInf} &= 10.474 - 569.647\text{DiffCBI} && (2) \\ \text{t-statistic} & && (0.178) \quad (-1.768)^* \\ R^2 &= 0.163 && \text{F-statistic} = 3.125^* \quad n = 18 \end{aligned}$$

The result from equation ( 2 ) indicates the statistical significance, at 10 percent level, of the negative relationship between the DiffCBI and DiffInf.<sup>12)</sup> If the relationship is true, we can conclude that, for developing countries, improving the degree of CBI would help to improve the ability of the central bank in reducing inflation rates in the long run. Incremental change in value of the CBI index across the time, rather than its absolute term at a point in time, is a better variable in examining the

The Legal Central Bank Independence and Macroeconomic Performance: An Empirical Study on Eighteen Developing Countries in the 1990s relationships between levels of CBI and inflation rates in developing countries.

### 3.2 Relative Degree of Legal Enforcement

So far, there is no study on the relative significance among the dimensions of legal enforcement embedded in the CB law. In aggregating the five dimensions of the legal enforcement into the LNF index we assign equal weight to individual dimensions and variables to avoid personal subjectivity.

Table 3 Coding of Legal Enforcement Variables of Present CB Law

Group Wg.	Var. Wv.	ACC					TRAN				COOR				LNF		
		CLO 0.20	ACC 0.20	Ofm 0.25	Pres 0.25	Miss 0.25	Rap 0.25	Aud 0.25	Opn 0.25	Dmt 0.25	Tol 0.25	Bco 0.20	Minst 0.25	Irmt 0.25		Tinst 0.25	Rinst 0.25
Country	Amendment																
1 Argentina	Apr. 1995	0.00	0.66	0.00	1.00	1.00	0.75	0.25	0.00	0.66	0.00	0.00	0.00	1.00	0.00	1.00	0.32
2 Botswana	Dec. 1996	0.00	0.33	0.00	1.00	1.00	0.25	0.00	0.00	0.33	0.00	0.00	0.00	0.00	1.00	1.00	0.20
3 Chile	Jan. 1990	0.00	1.00	0.00	0.00	1.00	0.00	0.25	0.33	1.00	0.00	1.00	0.75	0.00	1.00	0.00	0.32
4 Egypt	Jun. 1998	0.00	0.66	0.00	1.00	1.00	0.00	0.00	0.66	0.00	1.00	0.50	0.50	0.00	1.00	0.00	0.47
5 India	Jan. 1997	0.00	0.33	0.00	1.00	1.00	0.75	0.00	0.00	1.00	1.00	0.00	0.50	0.00	0.00	0.00	0.43
6 Kenya	1995	0.50	0.33	0.00	1.00	0.75	0.00	0.00	0.00	1.00	0.00	0.00	0.50	0.00	0.00	0.00	0.28
7 Korea	Dec. 1997	1.00	0.66	1.00	1.00	0.50	0.75	0.50	1.00	1.00	0.50	0.50	0.75	1.00	1.00	1.00	0.78
8 Mexico	Apr. 1994	0.50	0.00	0.00	1.00	1.00	0.75	0.25	0.00	1.00	0.00	0.00	0.50	0.00	0.00	0.00	0.33
9 Malaysia	1994	0.00	0.66	0.00	1.00	1.00	0.00	0.00	0.33	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20
10 Pakistan	May 1948	0.50	0.00	0.00	1.00	0.75	0.25	0.75	0.00	1.00	1.00	0.00	0.00	0.66	1.00	0.57	0.57
11 Peru	Jan. 1993	0.00	0.66	0.00	1.00	0.25	0.50	0.00	0.00	0.33	0.00	0.00	0.75	0.00	0.00	0.00	0.17
12 Philippines	Jun. 1993	0.50	1.00	0.33	0.50	0.75	0.75	0.25	0.66	1.00	0.50	1.00	0.75	1.00	1.00	1.00	0.65
13 Poland	Jan. 1998	0.00	0.66	0.00	1.00	0.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12
14 Romania	May 1998	0.00	0.00	0.00	1.00	1.00	0.75	0.00	0.66	0.33	0.00	0.00	0.00	0.00	1.00	1.00	0.24
15 South Africa	Mar. 1997	0.00	0.00	0.00	1.00	1.00	0.75	0.00	0.00	1.00	1.00	0.00	0.50	0.00	0.00	0.00	0.41
16 Thailand	Dec. 1942	0.00	0.66	0.00	0.00	0.75	0.25	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.10
17 Uganda	May 1993	0.00	0.33	0.00	1.00	1.00	0.00	0.50	0.66	1.00	0.00	0.00	0.75	0.00	0.00	0.00	0.26
18 Zambia	Dec. 1996	0.00	0.33	0.00	0.50	1.00	0.25	0.50	0.66	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.19

Note : Wg., Var. and Wv. refer to weight of the group, variable and weight of the variable respectively. Definitions follow Table 1.

Source of Basic Data : Direct inference from the CB law of respective country.

Table 3 reports the numerical scoring of legal enforcement variables inferable from the CB law of each country. The Bank of Korea has the highest degree of the overall legal enforcement, especially the highest in the areas of clarity of objective and transparency. The Bangko Sentral ng Pilipinas of the Philippines is designed to be highly independent with a relatively high degree of accountability and very on time in providing remedies when instability arises. The Central Bank of Egypt is another case of high degree of both CBI and legal enforcement. The Reserve Bank of India and the State Bank of Pakistan are relatively less independent but highly enforced by the CB laws. On the contrary, the Central Bank of the Argentine Republic, the National Bank of Romania, the Central Bank of Kenya, the Central Bank of Chile, the Bank of Uganda and the Central Reserve Bank of Peru have relatively high degree of CBI with relatively low degree of legal enforcement. The remaining central banks are those with less independence and with only light enforcement of CB laws. Legal enforcement is the lowest in the case of the Bank of Thailand. The CB law governing the Bank of Thailand is clearly

outdated. In general, there is no statistically significant correlation between the CBI and LNF indices in these developing countries. The value of correlation coefficient is - 0.00537.

### 3.3 Implication on Macroeconomic Performance

This subsection follows the analysis of Alesina and Summers ( 1993 ) that compares the legal CBI index with means and variances of macroeconomic variables. We verify the analysis by employing regression analysis, introducing LNF index into discussion and examining the significance of exchange rate regime.

Regarding the macroeconomic variables, Alesina and Summers ( 1993 ) suggest to use the means and variances of annual values of inflation, real GNP growth, real per capita GNP growth, unemployment rate and real interest rate. To reflect the function of a central bank as the manipulator ( for fixed exchange rate regime ) or monitor ( for floating exchange rate regime ) rate of change in exchange rate becomes an additional variable. To compensate for short time span, quarterly data is utilized to increase number of observation. Because the quarterly data for the real per capita GNP growth is not available, the variable is dropped from this analysis.

The proxy for the CBI is Cukierman ( 1992 )'s legal independence index. Since the study of Cukierman ( 1992 ) already contains the indices of all selected developing countries since the 1950s to the 1980s, it becomes a useful source of reference for future reinvestigation.

From the findings in industrialized countries, the direction of relationships between CBI and inflation is expected to be negative. Once a central bank becomes more independent, other objectives such as growth and employment may be less emphasized. Therefore, increase in CBI may affect growth and employment negatively. Directions of relationships between CBI and interest rates as well as changes in exchange rates are still in controversy. Difference in exchange rate regimes is expected to give implications on degrees of relationships or types of variables. At the same levels of CBI, central banks under floating exchange rate regimes are expected to have more freedom in pursuing its objective than under non-floating exchange rate regimes.

How to introduce the LNF index into the analysis is a crucial issue. One way is to multiply it to the existing legal CBI index. The product can be named an "augmented-CBI ( ACBI ) index". Another way is to treat the LNF index as another independent variable. Since this is the pioneer work on this issue, we perform both ways and compare the statistical significance.

Table 4 presents the means and variances of five macroeconomic variables of each economy against respective values of CBI, LNF and the ABCI indices. The countries are divided into two groups of non-floating and floating exchange rate regimes to reflect possible implications of exchange rate regimes. Within each group the ranking is done on the value of ACBI index.

The next effort is to perform the regression analysis. Recognizing the problem of heteroskedasticity of error, we also create series of transformed average inflation rate, variance of inflation rate, variance

Table 4 Legal Central Bank Independence, Legal Enkorement, and Macroeconomic Variables in the 1990s

Country No.	Philippines	Argentina	Romania	Kenya	Mexico	Botswana	Malaysia	Thailand	Korea	Egypt	Chile	Uganda	India	South Africa	Peru	Pakistan	Zambia	Poland	
Last Data from	1993	1995	1998	1995	1994	1994	1994	1994	1994	1998	1994	1993	1993	1997	1993	1993	1994	1994	
A amendment to	1993	1994	1994	1994	1994	1994	1994	1994	1994	1994	1994	1994	1994	1994	1994	1994	1994	1994	
Exchange Rate Regime	C	FP	C	C	C	BP	C	C	IF	MF	MF	IF	IF	IF	IF	MF	IF	MF	
CBI Index	0.65	0.80	0.70	0.60	0.46	0.54	0.38	0.26	0.42	0.60	0.68	0.53	0.32	0.31	0.63	0.20	0.40	0.24	
Legal Enkorement Index	0.65	0.32	0.24	0.28	0.33	0.20	0.20	0.10	0.78	0.47	0.32	0.26	0.43	0.41	0.17	0.57	0.19	0.12	
A augmented-CBI Index	0.42	0.25	0.17	0.17	0.15	0.11	0.08	0.03	0.33	0.28	0.21	0.14	0.14	0.13	0.11	0.11	0.08	0.03	
Inflation (base year = 1995)																			
Average (%)	7.88	0.55	46.28	6.06	22.35	7.48	3.91	4.98	4.17	3.45	10.73	6.19	8.42	6.67	16.49	9.73	36.44	9.54	
Variance	3.78	1.97	46.32	27.97	146.80	0.95	5.01	5.07	13.61	0.49	41.85	18.01	23.98	5.94	231.98	8.62	NA	8.42	
Real GDP Growth Rate																			
Average (%)	8.30	2.30	-3.20	2.71	3.18	4.00	3.94	3.92	3.14	5.70	7.61	6.88	6.06	1.48	5.21	4.00	1.29	4.45	
Variance	5.51	30.85	NA	NA	25.20	NA	15.09	30.71	82.37	NA	13.02	4.54	1.57	0.89	28.04	NA	NA	NA	
Unemployment Rate																			
Average (%)	9.40	15.45	10.58	NA	3.00	NA	3.42	3.07	6.57	8.05	6.67	NA	NA	NA	8.04	5.21	NA	11.00	
Variance	2.08	NA	1.37	NA	NA	NA	0.54	2.23	1.52	NA	2.95	NA	NA	NA	NA	NA	NA	1.29	
Real Interest Rate																			
Average (%)	4.59	6.25	22.02	13.82	5.03	5.15	1.49	5.30	6.59	5.38	5.31	4.42	0.79	8.12	4.38	2.06	-6.26	6.58	
Variance	5.42	2.32	422.96	25.65	101.08	1.37	5.94	2.72	3.72	0.54	29.23	28.44	22.26	3.17	215.97	14.52	265.72	1.95	
Change in Exchange Rate																			
Average (%)	1.77	0.00	13.01	2.87	5.55	2.20	2.15	1.23	1.29	0.05	1.62	0.92	1.66	-2.54	2.85	2.36	7.44	2.39	
Variance	37.02	0.00	81.48	32.93	193.45	29.47	48.31	46.70	267.38	0.01	8.42	16.67	3.98	263.07	8.84	8.67	32.11	22.15	
Number of Observations	26	19	6	20	23	12	24	40	8	6	40	26	12	11	28	40	12	8	

Note : Classification of exchange rate regimes follows *The International Financial Statistics* ( IFS ) several issues.

C, MF, IF, FP and BP refer to combined, managed floating, independently floating, fixed pegged and basket pegged exchange rate regimes, respectively.

An NA entry for variance implies unavailability of quarterly data and annual data is utilized in calculating average rate.

Source of Basic Data : IFS 2001 CD-ROM and *World Development Indicator* 2001 CD-ROM

of real interest rate, and variance of change in exchange rates in similar manner as in equation ( 1 ) In total, there are 14 dependent variables concerning macroeconomic performance. Independent variables are CBI, LNF and ABCI indices. We conduct 4 sets of regressions. Under each set, we run simple regressions of individual dependent variables on CBI, LNF and ABCI indices separately; as well as multiple regressions of the same dependent variables on the decomposition of ACBI index into CBI and LNF indices. The first set presents the case of whole samples without considering the possible influence of exchange rate regime. The exchange rate regime is taken into consideration in the second set in the form of an intercept-dummy variable. The analysis is verified by classifying the samples into subgroups of non-floating and floating regimes, and then the third and fourth sets are performed. Only statistically significant relations are presented in Table 5.

Under the first set when we ignore the possible influence of exchange rate regime, statistically significant relationships are equations ( 3 ) to ( 5 ) The results of equations ( 3 ) and ( 4 ) suggest that CBI and LNF indices have different implications on macroeconomic performance of developing economies. While CBI index has a positive relationship with average unemployment ( AvgUnemp ) at 5 percent level; LNF index rather has a positive influence on variation of change in exchange rate ( VarDep ) at 10 percent level. ACBI, which is the product of CBI and LNF, does not seem significant. After decomposing the ACBI into CBI and LNF and running multiple regression, we still cannot attain any robust equation. Equation ( 5 ) is the only one in which an independent variable is statistically significant. The result of equation ( 5 ) pertains to the conclusion that CBI and LNF indices should be treated separately. Moreover, it indicates the positive partial relationship between LNF and the variance of change in exchange rate ( VarDep ) at 10 percent level.

We construct an intercept-dummy variable, DFloat, to reflect the difference in exchange rate regimes among the selected countries. DFloat is coded 1 when a respective country adopts floating exchange rate regime and 0 for otherwise. The second set of regressions is performed. However, we could not find any robust relation when DFloat is included. The results of equations ( 6 ) to ( 8 ) conform to the conclusions in the first set. However, including DFloat worsens the robustness of the equations, resulting in insignificant F-statistics. On one hand, this implies that the exchange rate regime may not play any significant role in jointly explaining the macroeconomic variables with either CBI or LNF indices. On the other hand, imposing an intercept-dummy variable may not allow appropriate reflection of the relationship. To clarify this, we divide the selected countries into subgroups of non-floating and floating exchange rate regimes, then, perform sets 3 and 4 of regression analysis. Some robust equations are found in both sets.

The results of equations ( 9 ) to ( 11 ) are of set 3 in which the samples are the countries with non-floating exchange rate regime. The first conclusion drawn from equations ( 9 ) and ( 11 ) is that CBI index plays a significant role in positively influencing average unemployment rate. In addition, from equation ( 10 ), interestingly, CBI and LNF indices jointly influence the average real GDP growth

Table 5 Summary of statistically significant relationships

Set 1: Whole Samples with Ignorance of Difference in Exchange Rate Regimes				
AvgUnemp	=	2.099 + 10.849CBI	R <sup>2</sup>	= 0.342 ( 3 )
n = 12		( 0.822 ) ( 2.281 )**	F-statistic	= 5.202**
VarDep	=	-2.301 + 190.633LNF	R <sup>2</sup>	= 0.163 ( 4 )
n = 18		( -0.056 ) ( 1.767 )*	F-statistic	= 3.122*
VarDep	=	53.836 - 115.531CBI + 190.036LNF	R <sup>2</sup>	= 0.219 ( 5 )
n = 18		( 0.794 ) ( -1.034 ) ( 1.765 )*	F-statistic	= 2.102
Set 2: Whole Samples with Intercept Dummy of Exchange Rate Regime				
AvgUnemp	=	1.311 + 11.404CBI + 1.020DFloat	R <sup>2</sup>	= 0.362 ( 6 )
n = 12		( 0.430 ) ( 2.258 )** ( 0.526 )	F-statistic	= 2.551
AvgUnemp	=	1.627 + 11.579CBI - 1.371LNF + 1.178DFloat	R <sup>2</sup>	= 0.368 ( 7 )
n = 12		( 0.475 ) ( 2.155 )* ( -0.269 ) ( 0.553 )	F-statistic	= 1.549
VarDep	=	78.519 - 145.423CBI + 210.966LNF - 30.917DFloat	R <sup>2</sup>	= 0.247 ( 8 )
n = 18		( 1.019 ) ( -1.201 ) ( 1.862 )* ( -0.717 )	F-statistic	= 1.527
Set 3: Subgroup of Non-Floating Exchange Rate Regime				
AvgUnemp	=	-5.158 + 23.348CBI	R <sup>2</sup>	= 0.874 ( 9 )
n = 6		( -2.033 ) ( 5.278 )**	F-statistic	= 27.857***
AvgRgdpG	=	5.187 - 13.113CBI + 18.129LNF	R <sup>2</sup>	= 0.643 ( 10 )
n = 8		( 1.880 ) ( -2.327 )* ( 2.827 )**	F-statistic	= 4.493*
AvgUnemp	=	-4.904 + 25.851CBI - 5.371LNF	R <sup>2</sup>	= 0.899 ( 11 )
n = 6		( -1.851 ) ( 4.729 )** ( -0.844 )	F-statistic	= 13.284**
Set 4: Subgroup of Floating Exchange Rate Regime				
VarRgdpG	=	-34.174 + 318.628ACBI	R <sup>2</sup>	= 0.705 ( 12 )
n = 6		( -1.736 ) ( 3.093 )**	F-statistic	= 9.567**
VarRgdpG	=	-97.995 + 121.893CBI + 154.790LNF	R <sup>2</sup>	= 0.789 ( 13 )
n = 6		( -2.271 ) ( 1.955 ) ( 3.342 )**	F-statistic	= 5.613*
VarUnemp	=	0.369 + 4.183CBI - 0.777LNF	R <sup>2</sup>	= 1 ( 14 )
n = 3		( )*** ( )*** ( )***	F-statistic	= ***

Note : Values in parentheses below each equation represent t-statistics. \*, \*\* and \*\*\* refer to rejection of null-hypothesis at 10%, 5%, and 1% level, respectively. Dependent variables: AvgUnemp, VarDep, AvgRgdpG, VarRgdpG and VarUnemp denote average unemployment rate, variance of change in exchange rate, average real GDP growth rate, variance of real GDP growth rate and variance of unemployment rate, respectively. Independent variables: CBI, LNF and ACBI denote legal central bank index, legal enforcement index and augmented-central bank index, respectively. Dummy variable, DFloat, is coded 1 for the country that adopts floating exchange rate regime and 0 for otherwise.

( AvgRgdpG ) Specifically, CBI index has a negative relationship with the AvgRgdpG at 10 percent level, while LNF index has a positive relationship at 5 percent level.

The last set is for the subgroup of countries adopting floating exchange rate regime. The results of equations ( 12 ) to ( 14 ) show that when a country adopts floating exchange rate regime, the influences of CBI and LNF indexes, if they do exist, tend to be on the variations of the real GDP

growth rate (  $\text{VarRgdpG}$  ) and of unemployment rate (  $\text{VarUnemp}$  ) From equations ( 12 ) and ( 13 ) it is clear that  $\text{VarRgdpG}$  is positively influenced by ACBI index, of which LNF index may be the main factor. The different results in sets 3 and 4 support the hypothesis that the exchange rate regime may have an influence on the implication of either CBI or LNF on the developing macroeconomy. However, it should be noted that the result in equation ( 14 ) is less reliable because of few observations. The perfect coefficient of determination,  $R^2$ , is coincidentally derived.

#### 4. Conclusions and Final Remarks

This article reexamines the findings of Cukierman ( 1992 ) that claims that the legal CBI does not play a significant role in developing countries. After assessing the content of the CB laws of many developing countries, we propose the construction of legal enforcement index as a way to modify the analysis of Cukierman ( 1992 )

The empirical study, which focuses on the current CB law of eighteen developing countries, is conducted on both long-term and short-term bases. By comparing the average annual interest rates of difference eras, we found that the countries that have increased degree of legal CBI were able to dramatically reduce long-term level of inflation. This contradicts the findings of Cukierman ( 1992 ) As the economic backgrounds of developing countries are quite diverse, the cross-country analysis should apply the changes in values across time, rather than using absolute value at a given point in time. For the short-term analysis, the investigation is done on quarterly data for the 1990s. The first finding is that CBI and legal enforcement should be treated as different factors influencing the macroeconomy of developing countries. This could be explained by the fact that levels of CBI and legal enforcement are not correlated in developing countries. The second finding is that the exchange rate regime plays a significant role in influencing the nature of the implications of CBI and LNF on macroeconomic variables. For the countries that do not pursue floating exchange rate regime, higher level of CBI tends to be associated with higher average unemployment rate. Moreover, it has a negative relationship with average growth rate of real GDP. The central bank in such an economy normally plays a significant role in achieving macroeconomic objectives. Increase in CBI means devoting its responsibility more on only price stability which normally takes long time horizon. This may affect the performances of the economy negatively in short-run. For these economies, increasing the level of legal enforcement may contribute to growth and reduce unemployment. The situation is different for countries that pursue floating exchange rate regime. The variances, not the average level, of both variables are affected. The increase in level of ACBI tends to cause more fluctuation in the growth rate of real GDP, with special influence from the increase in level of legal enforcement. Moreover, the levels of CBI and legal enforcement have opposite directions of influence on the variance of unemployment rate. While the former tends to increase, the latter tends to decrease the rate. Despite the different phenomenon in both groups of countries, the common conclusion is that, for short-term

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basis, the levels of CBI, LNF and ACBI have no implication on either inflation rate or change in exchange rate.

The empirical study suggests that increasing the level of CBI may help reduce the long-term average inflation rate. However, for countries that adopt non-floating exchange rate regimes, there may arise tradeoffs on the average rates of real growth and unemployment in the short-term. Such tradeoffs tend to happen on their variations in the case of floating exchange rate regimes. On the other hand, increase in LNF tends to contribute to real growth and decrease unemployment. The general implication is that while increasing CBI may affect macroeconomic performance, promoting LNF tends to lead only to merits. For a country in which average inflation rate is not excessive, it is recommended to place more emphasis on legal enforcement aspects in the CB law than on legal central bank independence.

To postulate the distinctive characteristics of developing countries and role of the legal enforcement embedded in the CB laws, similar efforts should be further developed to cover more observations on both developing and industrialized countries. Beyond the degree of the CBI and legal enforcement, for the practical effectiveness of the legal framework in supporting macroeconomic performance, comprehensive economic and legal competence should be integrated.

## Notes

- 1) In this article, the CBI refers to the autonomy of the central bank from the government to pursue its assigned objective ( s )
- 2) The legal CBI refers to the CBI implicitly or explicitly inferable from the CB law.
- 3) See Mahadeva and Sterne ( 2000 )
- 4) This assumes that unfavorable results of actions that deviate from the CB law are subject to punishment.
- 5) Although, in practice, cultural and personnel factors are also significance determinants of goal achievement, this article focuses only on the legal central bank independence.
- 6) Original classifications and abbreviations are available in Table 19.1 of Cukierman ( 1992: 373-376 )
- 7) See complete list of empirical studies in industrialized countries in Schaling ( 1995: 71 )
- 8) However, because the CB law has just been amended in 1999 we do not include Indonesia in our analysis.
- 9) This follows the assumption that the bank is not goal but instrument independent.
- 10) Loss function refers to the function indicating the deviation of actual value of certain variable ( s ) from the target ( s )
- 11) Although constructing the index may look too lengthy and complicated, the process provides a better source of reference for futher extention than a simple ranking method does.
- 12) It should be noted that the DiffInf is derived from average inflation rate in the 1990s minus that of 1980s. The result of transformed DiffInf is not presented as it dose not improve the estimation efficiency.

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