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# Inequality and Institutions

by

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## Abstract*

This paper presents theory and evidence on the relationship between inequality and institutional quality. We propose a model in which the two dynamically reinforce each other and set out to test this relationship with a broad array of institutional measures. We establish double causality between better institutional quality and a more equal distribution of income, but also demonstrate that the link from the latter dominates the former. These results are shown to be robust to various specifications and different data sources that cover various time-spans.

**JEL Classification:** O15, O17, D70

**Key Words:** Institutions, Inequality, Governance, Causality

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## 1. Introduction

While strong institutions are commonly considered key to economic success, countries differ widely in institutional quality. Consider, for example, the most recent report by Transparency International, an organization whose studies on corruption levels are typically published in the popular press around the world. The report ranks countries such as Finland, Iceland, Denmark and New Zealand as those with the lowest levels of corruption, with a "cleanliness" score of 9.5 out of 10 points. On the other hand, countries such as Bangladesh, Nigeria and Haiti are ranked at the highest levels of corruption, with typical scores of less than 1.5 points.[1] Moreover, this ranking tends to be fairly stable across time.[2]

An emerging literature has generated analytical models where economic conditions affect institutional quality. In particular, some recent work, such as Hoff and Stiglitz (2004) and Sonin (2003), suggests that an equal distribution of income is a more fertile ground for good institutions.[3] Whereas the former presents a static framework of institutional subversion, this paper is more closely related to Sonin (2003), whose dynamic model suggests an institutional vehicle for the adverse effect of inequality on growth whereby low-quality institutions are associated with wasteful redistribution toward the rich.[4] While similar, the mechanism proposed here identifies the intensity of rent seeking from a public asset—such as technological knowledge or a natural resource—as a source of low institutional quality.

Countries with poor institutions are also likely to have high inequality, a pattern that emerges by eyeballing contemporary data. For example, the cross-country data discussed in greater detail below clearly shows the close link between the two. The correlation between income share of the middle-income quintile and various measures of institutional quality is in the range of 0.30 and 0.44, and the highest correlation is with the rule-of-law measure. Similarly, the correlation between many measures of institutional quality and the Gini coefficient, a broadly

[1] As illustrated by the examples above, the higher the score, the less corruption in the country. See http://www.transparency.org/cpi/2003/cpi2003.en.html

[2] See *http://www.transparency.org/cpi* for the data covering 1993-2003. Note, however, that country coverage in early years was quite incomplete. Other existing data sources commonly used in empirical studies also show this same relatively stable pattern; see the empirical section below.

[3] See also Glaeser, Scheinkman and Shleifer (2003) for a more micro-based model and Gradstein (2004), where democracy is viewed as a commitment device to ensure high-quality institutions.

[4] Recent research documents the importance of institutions for performance, invariably finding that the rule of law, political stability, and respect for property rights enhance economic growth. See, for example, Easterly (2001, 2002) Easterly and Levine (1997), Hall and Jones (1999), Knack and Keefer (1995), Mauro (1995), and Rodrik, Subramanian and Trebbi (2002).

used measure of income inequality, ranges between 0.40 and 0.44, depending on the aggregate institutional measure employed. It is by no means clear, however, what the dynamics between these two variables are and, consequently, what is the resulting causal relationship between them. Some studies, such as Easterly (2001) and Keefer and Knack (2002), empirically indicate that social polarization negatively affects institutional quality and thereby slows growth. Easterly (2002) provides further support for these results, carefully instrumenting for the likely endogeneity of the effect of inequality on growth and identifying institutional quality as an important channel through which this effect is manifested. This suggests that the prevalence of the rule of law and the degree of enforcement of property rights in an economy, while conducive to its performance, are themselves endogenous, being determined, among other things, by political and economic conditions.

That the interaction of political and income inequality may play a part in blocking the adoption of good institutions is illustrated by the recent episode of Russia in transition. In the aftermath of the mass privatization in the early 1990s, a small group of entrepreneurs gained access to political power. They used this power to promote their own interests, constantly subverting the emergence of institutions committed to the protection of smaller shareholders and businesses. Likewise, in several Latin American countries the interests of ruling elites, the military, and large businesses often converged at the expense of smaller business interests, giving rise to a significant informal sector. Realizing that entry to the formal sector is likely to be costly, whereas its benefits are uncertain at best, many smaller and medium-size entrepreneurs gave up even contemplating the idea. The above is consistent with the recent work by Engerman and Sokoloff (1997, 2002). They contrast the colonial experiences in the Americas by arguing that the different initial differences in income inequality and political participation between North America and other colonies of the New World affected settlement patterns in different manners. While starting at about a similar level of development, North American colonies came to be dominated by the influx of immigrants who imported their own institutions, whereas the rest of the New World established extractive colonial institutions, with a rigid hierarchical structure. Engerman, Mariscal and Sokoloff (1998) go further and argue that these differences led to a diverse path of human capital accumulation, with North American colonies leading the way in promoting universal and free primary and subsequently secondary public schooling.

In this paper, we explore the possible double relationship between income inequality and institutional quality. Specifically, it is suggested that, while income inequality may cause subversion of institutions by the politically powerful rich elite, the reverse holds as well, namely, that poor institutional quality results in a higher degree of inequality. This double causality relationship is exhibited in a simple dynamic model and is then tested in a cross-country panel framework. The model shows that when the political bias in favor of the rich is large, income inequality and poor institutional quality may reinforce each other, indicating double feedback between the two. Thus, we formally demonstrate a mechanism through which inequality and institutions reinforce each other. The empirical evidence provides support for these hypothesized relationships by using a panel of countries and a broad array of institutional measures commonly employed in the literature. We use an innovative panel *VAR* technique that, as predicted by the model, allows measuring the statistical impact, if any, of each variable on the other. In particular, with this method we are able to measure the contribution of the three different relationships that are explored: Granger causality from institutions to inequality, Granger causality from inequality to institutions, and instantaneous causality between institutions and inequality. This approach is consistent with a recent wave of empirical research that uses panel data in causality tests, primarily in the context of economic growth.[5] It provides a complement to more standard instrumental variables techniques, in particular as the development of very recent GMM-IV techniques have somewhat blurred the line between purely statistical precedence techniques that use internal instruments and methods that control for endogeneity.[6]

The plan of the paper is as follows. The next section discusses two motivating examples, Russia in transition and Bolivia's informal sector. Section 3 presents and Section 4 solves a simple model, which exhibits double causality between income inequality and institutional quality. Section 5 then contains the description of the empirical strategy; Section 6 presents the data, and Section 7 contains the empirical analysis. Section 8 concludes with brief remarks.

[5] See, e.g., Chong and Calderón (2000a) for the relationship between institutions and economic growth; Calderón and Liu (2003), Levine, Loayza and Beck (2000) and Beck, Levine and Loayza (2000) for the relationship between financial development and economic growth.

[6] See Arellano and Bover (1995). An application of causality using such a GMM-IV technique is Levine, Loayza and Beck (2000).

## 2. Two Motivating Examples

### *2.1. Russia in Transition*

While Russia's transition began with Mikhail Gorbachev's dramatic introduction of the new policy of "perestroika" in the late 1980s, the decisive economic transformation was pursued by Boris Yeltsin's reform-minded government, headed by Yegor Gaidar, in the early 1990s. The initial stage encompassed price liberalization, followed by a mass privatization program from 1992 to 1994. The outcome of the latter was the transfer of asset ownership by the state, so that by the mid-1990s a majority of assets, almost 70 percent, were private property.[7] The voucher privatization quickly led to a skewed concentration of ownership. Furthermore, in an attempt to raise revenues many state-owned natural resource firms were sold to large private investors in the mid-1990s.

These processes were accompanied by growing inequality, increasing poverty, and mounting social burden. By some accounts, the Gini coefficient of wage inequality almost doubled in Russia during the transition, from about 0.26 in 1989 to almost 0.50 in 1995; non-wage income, while relatively less important, also contributed to rising inequality. At the same time, the ingredients of the social safety net—pensions, health care system, public education—all suffered a major blow from diminished tax revenues. The implication is that, in welfare terms, the increase in inequality was likely to be understated by the income inequality figures (see Milanovic, 1998). The formation of large Financial Industrial Groups, conglomerates spanning across a wide range of sectors, which began in 1993, contributed to the high concentration in industry and in the financial sector, while denying most of the population access to national wealth.

Another important feature of the transition process was the emergence of the link between monied interests and political decision-making.[8] The privatization program of the early 1990s, which was pursued under a weak legal system and weak corporate governance, led to a very unequal distribution of stakes in vital industries, such as in the energy and the metallurgy sectors. In the course of this process, characterized as "winner-takes-all" (Hellman, 1998), small investors' interests were not represented and small shareholders' objectives were neglected. The end result was domination of the arena by a small group of tycoons, the oligarchs. Their sphere of influence quickly expanded to areas deemed crucial for their economic interests, such as the media and

[7] See Goldman (2003) for a more detailed account.

[8] This, of course, has a long historical pedigree. High concentration of industry along with political privileges of the rich industrialists were typical of the late period of the tsarist regime (see Pipes, 1995). Likewise, links between industry managers and economic decision-making through the Communist party were prevalent in the Soviet Union.

politics. The oligarchs acquired press ownership, as well as control of other media outlets, among them leading TV stations. The oligarchs additionally became public figures, playing a role in political parties and the representation process, either directly or through close associates. Many of the oligarchs regularly participated in all kinds of commissions and committees, such as the Government Committee on Economic Reform, or the Committee for Banks and Finance.[9] By 1998 the political clout of financial interests had become dominant, which allowed the oligarchs to block undesirable legislation and policies. When the newly proclaimed Kirienko government tried to force the big groups to pay their tax debts as well as to initiate corporate governance reforms, these steps triggered a media campaign against the government and an initiative by the Duma opposition.[10] Eventually, the entire reformist government had to resign. As noted by an influential commentator:

> The Russian rulers that control the Russian state have neither the will nor capacity to meet the demands of their citizens. And why?—Because the state does not represent the interests of the society as a whole, but rather is deeply penetrated by Russia's emerging capitalist class. In a sense, the state has been privatized by these nouveaux riches and thereby operates in the interests of its new owners rather than society at large (McFaul, 2002).

Concomitantly to these economic and political developments, corruption in Russia was rampant. Both Transparency International and the World Bank, which assess perception of corruption, state capture, and administrative inefficiencies around the world, invariably rank Russia unfavorably. More significantly, Hellman and Kaufman (2002) provide firm-level survey data on transition economies, which relates inequality of influence to perceived performance of public institutions. The results are stark. Inequality, here defined as crony bias at the firm and country level, is strongly correlated with weak performance by public institutions, tilting the enforcement of property rights in favor of large influential firms. Moreover, inequality is associated with lower willingness to use courts to resolve business disputes, lower levels of tax compliance, and higher

[9] Thus, one major oligarch, Potanin, temporarily held the position of first vice prime minister, another, Boris Berezovsky held a post in the national defense council, and Petr Aven, a high official of the Alfa Group, held the post of minister for foreign trade in the Gaidar government; conversely, reform politicians who had to leave the government soon found positions in private companies.

[10] Much of the dissent focused on the monopolistic role of Gazprom, the leading gas company.

levels of bribery.[11]

### *2.2. The Informal Sector in Bolivia*

Bolivia is one of the poorest countries in Latin America, with current income per capita of less than $1,100. Its political economic history of regime instability, large income disparities, corruption, and patronage is typical of its neighboring countries. Numerous attempts at macroeconomic stabilization in recent decades have almost invariably been impeded by an unfavorable institutional environment characterized by continuous changes in rules, political upheaval, and general institutional volatility (Morales and Sachs, 1990).

In 1950 the Bolivian economy relied almost entirely on tin production and a very rudimentary agricultural sector, and ownership was highly concentrated in both the industrial and agricultural sectors. The tin industry, for example, was dominated by three major firms, which provided most of the state's revenues and exerted political influence accordingly. The distribution of land was likewise extremely unequal. Wealth and literacy requirements for political franchise were still in place, and the proportion of voters stood at around 4 percent of the population.

The revolution of 1952 brought the National Revolutionary Movement to power on a nationalistic platform whose goals included the overthrow of the mining oligarchy. The main result, however, was the creation of a large public sector, with a limited role for private enterprises. While the new regime carried out significant land reforms and nationalized the mining industry, a system of political clientelism developed as well. Members of the business elite were able to obtain lucrative jobs in the public sector or important concessions for their businesses in mining and other essential industries.

This system largely continued in the wake of a violent coup in 1971 that gave rise to a

[11] Influential observers pointed out many similarities between the rise of the oligarchs in Russia and the dominance of "Robber Barons" in the United States during the Gilded Age. Indeed, prominent tycoons such as Andrew Carnegie, Jay Gould, John Rockefeller, J.P. Morgan, and Cornelius Vanderbilt built fortunes by acquiring plots of public land or control over means of transportation, especially the railroads, and natural resources, such as gas and oil; often, these acquisitions were accompanied by bribery of public officials and judges. In both cases, there was a discernible link between money and politics, and in both cases there was public apprehension of a possible subversion of institutions. In the United States, this eventually led to the emergence of a strong regulatory system during the Progressive Era, which required a non-trivial set of reforms to be vigorously pursued and, by and large, implemented in the course of the first half of the twentieth century (Glaeser and Shleifer, 2003). The end result was a more independent judicial system, improved corporate governance (specifically, securities and anti-trust legislation), and wider participation of small stakeholders in corporate gains. It remains to be seen whether Russia's case will have a similar outcome.

military regime that lasted for about a decade. During this period the government had to rely on the support of the military and the business community to establish its power, and the patronage system continued unabated. This favored large businesses with political ties and worked against the interests of small entrepreneurs; under these conditions the informal economy reached about half of GDP. The collusion between business and financial interests on the one hand, and the state on the other hand, softened the constraints faced by the former, thus weakening their incentives. Political instability only aggravated the situation: between 1978-82 no fewer than nine governments changed, sometimes violently.

The period of relatively stable multiparty democracy since the mid-1980s witnessed macroeconomic reforms as well as efforts to improve the efficiency of public bureaucracy. The legacy of previous decades, however, made it very difficult to achieve significant progress. Income inequality in Bolivia, as in some of its neighboring countries, was high: the Gini coefficient has been more or less stable over the recent decades at 0.55, and the share of national income captured by the upper decile has been around 40 percent or more (De Ferranti, 2003).

The political economic system has proved resistant to reform. While domestic tax collections increased tenfold during the 1990s (Kaufmann, Mastruzzi and Zavaletta, 2003), corruption and high levels of informality of economic activity have remained a serious problem. Kaufmann, Mastruzzi and Zavaletta (2003) list several reasons for this, such as the historical weakness of the private sector in generating employment, the patronage system in the public sector, which results in state capture, and the fragmented party system. The historically weak judiciary, to a large extent subject to various political pressures, has been unable to cope with corruption, and the more recent attempts at reform have encountered stubborn resistance. Public trust in representative institutions hovered around 30 percent; furthermore, according to Latinobarometer surveys from 1996 to 2000, less than a quarter of Bolivia's population expressed trust in the judiciary—one of the lowest proportions in Latin America.[12]

## 3. The Model

Consider an economy populated by a measure one of households indexed by *i*, each consisting of

[12] The issue of high income inequality, extensive institutional weakness, and tight political cliques is, in fact, quite common in several Latin American countries, such as Peru, Ecuador, Paraguay, and Brazil. In Peru, for example, income inequality, as reflected by the Gini coefficient, has typically hovered between 0.55 and 0.60, while political institutions have remained extremely weak, as reflected by the fact that in the last twenty years the country's Constitution has been re-drafted four times.

a parent and child, operating in discrete time $t$. The initial level of household $i$'s income is exogenously given at $y_{io}$, and the income level in period $t$; $y_{it}$ is determined endogenously. The initial income distribution is assumed to be lognormal with the parameters $\mu_0$ and $\sigma_0^2$, and the distributions in subsequent periods are endogenously determined. The assumptions below will imply that all future distributions are lognormal with the parameters, say, $\mu_t$ and $\sigma_t^2$.

In each period, individuals allocate resources between consumption, $c_{it}$, productive investment, $k_{it+1}$, and unproductive investment in rent seeking, $r_{it+1}$. Normalizing all prices to one, the budget constraint then is

$$y_{it} = c_{it} + k_{it+1} + r_{it+1} \qquad (1)$$

so that the households are credit constrained.

Rent seeking is used to appropriate a larger share of a resource. This can be interpreted as a natural resource, or, alternatively, as appropriable technological knowledge. Letting $A$ denote the amount of the resource available at any period, the amount appropriated by household $i$ is

$$a_{it+1} = A \frac{r_{it+1}^{1-Q_{t+1}}}{\int_0^1 r_{it+1}^{1-Q_{t+1}} di}, \quad 0 \le Q_{t+1} \le 1 \qquad (2)$$

$Q_{t+1}$ is interpreted as the level of institutional quality; its higher values represent higher marginal productivity of rent seeking, which will increase inequality in the allocation of the resource.

The production function is given by:

$$y_{it+1} = \varepsilon_{it+1}\ a_{it+1}\ k_{it+1}^{\alpha}, \quad 0 < \alpha < 1 \qquad (3)^{13}$$

Each parent's preferences are assumed to derive from consumption as well as from the amount of income accrued to the child. This simple specification of the "warm glow" altruistic motive implies that the parents need not take into account children's actions when making their own decisions.

[13] Introduction of child's ability, while realistic, would not change the main conclusions.

Assuming for simplicity symmetric logarithmic preferences, we write the expected utility:

$$V(c_{it}, y_{it+1}) = \ln(c_{it}) + \ln(y_{it+1}) \qquad (4)$$

In each period, all decisions in the economy are made by the parents. They first determine the level of institutional quality and then allocate their resources between consumption, productive investment, and rent seeking. The determination of institutional quality is done collectively, through a political process, which may generally be biased toward the rich in a manner specified below.

## 4. Equilibrium Analysis

The analysis proceeds backwards. Given the level of institutional quality, households solve their resource allocation problem, and then, anticipating these decisions, the political choice of institutional quality is made.

### *4.1. Consumption-Investment Decisions*

Maximization of the utility function (4) subject to the budget constraints (1)-(3) leads to the following individually optimal consumption and investment levels:

$$c_{it+1} = y_{it}/(2 + \alpha - Q_{t+1}),\ r_{it+1} = (1- Q_{t+1})\, y_{it}/(2 + \alpha - Q_{t+1}),\ k_{it+1} = \alpha\, y_{it}/(2 + \alpha - Q_{t+1}) \quad (5)$$

implying that next-period income is:

$$y_{it+1} = A\,[y_{it}^{1-Q_{t+1}} / \int_0^1 y_{it}^{1-Q_{t+1}}\, di\,][\alpha\, y_{it}/(2 + \alpha - Q_{t+1})]^{\alpha} \qquad (6)$$

In particular, from (5), productive investment increases and rent seeking decreases with the level of institutional quality.

From (6), the average level of next-period income, $Y_{t+1}$, is

$$Y_{t+1} = A[\alpha/(2 + \alpha - Q_{t+1})]^{\alpha}\ E(y_{it}^{\alpha}) \qquad (7)$$

and differentiation reveals that it increases with institutional quality and decreases with current income inequality. Moreover, cross-differentiation reveals that current income inequality adversely affects future average income as institutional quality declines. The assumption of decreasing returns to scale, $\alpha < 1$, implies that a mean-preserving spread in income decreases

next-period average income. Because a mean-preserving spread is equivalent to an increase in inequality under our distributional assumptions, this indicates a negative effect of inequality on income growth. Moreover, this effect is clearly exacerbated when institutional quality is low.

We observe, from (6), that income inequality increases over time if and only if

$$1 + \alpha - Q_{t+1} > 1, \text{ or } Q_{t+1} < \alpha \qquad (8)$$

In other words, only when the institutional quality is low enough is inequality expected to increase.

To sum up the main points presented above,

***Proposition 1.*** Next-period income decreases with inequality, and more so when institutional quality is low. Low institutional quality not only reduces next-period average income, but also leads to higher inequality in its distribution.

### *4.2. Determination of Institutional Quality*

Suppose that the choice is between two extreme values of institutional quality, low $Q_t = 0$, and high, $Q_t = 1$.[14] We assume that this choice is carried out by means of a political process that is biased toward the rich. The simplest way to capture this is to assume that the identity of the decisive voter, $y_{dt}$, is given by:

$$\ln (y_{dt}) = \mu_t + \phi\sigma_t^2 \qquad (9)$$

where $\phi$ represents the extent of political bias in favor of the rich. For example, if $\phi = 0$, the median income voter is decisive; when $\phi = 1/2$, the average income voter is decisive. To make the analysis interesting we will assume that political bias exists and that $\phi > 1/2$.

The individual utility functions corresponding to the two values of institutional quality respectively are:

$$U_{it}^0 = \ln [y_{it}/(2 + \alpha)] + \ln \{A [y_{it}/\int_0^1 y_{it}\, di\,][\alpha\, y_{it}/(2 + \alpha)]^{\alpha}\} \quad (10a)$$

and

$$U_{it}^1 = \ln [y_{it}/(1 + \alpha)] + \ln \{A [\alpha\, y_{it}/(1 + \alpha)]^{\alpha}\} \qquad (10b)$$

so that the utility differential is:

[14] This, while not essential, significantly simplifies the presentation.

$$U_{it}^{1} - U_{it}^{0} = (1 + \alpha) \ln [(2 + \alpha) /(1 + \alpha)] - \ln [y_{it} / \int_0^1 y_{it}\ di\ ] \qquad (11)$$

As (11) decreases in income, the determination of institutional quality will be made by the decisive voter whose utility differential is

$$U_{dt}^{1} - U_{dt}^{0} = (1 + \alpha) \ln [(2 + \alpha) /(1 + \alpha)] - \ln [y_{dt} / \int_0^1 y_{it}\ di\ ] =$$

$$(1 + \alpha) \ln [(2 + \alpha) /(1 + \alpha)] - (\mu_t + \phi\sigma_t^2) + (\mu_t + \sigma_t^2/2) =$$

$$(1 + \alpha) \ln [(2 + \alpha) /(1 + \alpha)] - (\phi - 1/2)\ \sigma_t^2 \qquad (12)$$

Clearly, when $\phi \leq 1/2$, (12) is positive indicating that a high level of institutional quality will emerge at equilibrium. If, however, the political bias is large, as we have assumed, so that the individual with income above average is decisive, $\phi > 1/2$, then it is possible—when income inequality as measured by $\sigma_t^2$ is large—that the minimal level of institutional quality will be chosen.

### *4.3. Intertemporal Evolution*

The analysis of the economy's intertemporal evolution hinges on the initial degree of inequality, $\sigma_0^2$. If it is small, then, from (12), a high level of institutional quality will be chosen. From (8) this will then further decrease income inequality, reinforcing the political support for high institutional quality. Individual incomes will then converge, the average income growth rate will be high, and the steady-state income level will be relatively high as well. In contrast, if income inequality is initially large, then low quality institutions will prevail, further increasing inequality and strengthening the support by politically powerful coalitions for low quality institutions; growth will be slow and convergence to a low per capital income level will take place. We thus obtain multiple equilibria whose realization depends on initial conditions, while the dynamics indicate that economic equality and institutional quality reinforce each other.

***Proposition 2.*** Income inequality and low institutional quality reinforce each other along the transition path, slowing average income growth. As a result, multiple equilibria could be realized, depending on initial conditions: with low quality of institutions, high inequality, and low average income; and with high institutional quality and high income.

## 5. Empirical Strategy

Empirical research on the link between institutions and income inequality is scarce, and those studies that attempt to establish a link are limited to relatively small pure cross-country approaches. Examples are Chong and Calderón (2000b) and Gupta, Davoodi and Alonso-Terme (2002), who discern a link between low-quality institutions and income inequality. In order to deal with potential reverse causality problems, these researchers employ an instrumental variables approach to control for endogeneity. This approach, however, has several shortcomings, as satisfactory instruments are hard to find. In this study we take an alternative route to focus on the dynamic relationship between our variables of interest as well as on the direction of causality and their implied contribution to the possible correlation among these variables.

In particular, the first step is to analyze the dynamic relationship between inequality and institutions. The objective is to examine how the behavior of a given variable is related to the future behavior of the rest. Two issues are involved, effect and predictability. The first deals with whether changes in a variable have a lasting impact on another. The second examines whether the behavior of a given variable helps predict the behavior of the rest. Our methodology consists of estimating and testing vector autoregressions (*VAR*) in a panel setting that has the following form:

$$y_{i,t} = A(L)y_{i,t} + B(L)x_{i,t} + \eta_t + \mu_i + \varepsilon_{i,t} \quad (13)$$

$$x_{i,t} = C(L)y_{i,t} + D(L)x_{i,t} + \phi_t + \psi_i + \upsilon_{i,t} \quad (14)$$

where $y$ and $x$ represent the two variables of interest, inequality and institutions; $L$ is the lag operator; $A$, $B$, $C$, and $D$ are vectors of coefficients; $\eta_t$ and $\phi_t$ are unobserved time effects; $\mu_i$ and $\psi_i$ are unobserved country effects, and $\varepsilon_{i,t}$ and $\nu_{i,t}$ are regression residuals. Note that we also control for other determinants, $Z$, in particular the log of output, education, financial development, and the rate of inflation.[15] The subscripts $I$ and $t$ denote country and time, respectively.

As is standard in non-structural *VAR* analysis, no cross-equation parameter restrictions are imposed, we allow for a free cross-equation error covariance, and we interpret each equation

[15] These variables were included based on the available empirical literature (Li and Zou, 1998; Chong and Calderón, 2000a). The source for all the variables is World Bank (2003). Other empirical specifications, available upon

as a reduced-form regression. We choose the optimal lag structure for the panel *VARs* through likelihood ratio tests.[16] As described above, by testing for the dynamic relationship between institutions and inequality, we are interested in the impact of changes in one variable, say *x (institutions),* on another, say *y (inequality)*. The direct impact of *x (institutions)* on *y (inequality)*, given the past history of *y (inequality)*, is given by the sum of the coefficients on all lagged *x (institutions)*. Using the properties of the lag operator, this impact would be equal to *B(1)*. From estimation of the *VAR*, we can obtain the point estimate of *B(1)* and, for the purpose of statistical inference, its associated standard deviation.[17]

A second step is to examine whether a variable, say *x (institutions)*, helps forecast the other variable in the system, say *y (inequality)*, beyond what the past history of *y (inequality)* predicts.[18] This is a test of Granger causality, and, in the example above, it amounts to testing if the coefficients of the lag polynomial *B* are statistically significantly different from zero. Notice that the two issues of interest, namely, impact and Granger causality, are related but not identical. There may be cases when a variable has predictive power for another, yet its impact is zero because coefficients on different lags cancel each other. However, in the relationships we consider, it is usually the case that when the impact is statistically zero there is also no indication of Granger causality. In this context, and based on the work of Geweke (1982) and Chong and Calderón (2000a), we test a more complete approach than unidirectional Granger causality tests by measuring the degree of linear dependence and feedback between two panel series *x (institutions)* and *y (inequality)*. We do this by measuring the sum of linear feedback from *x (institutions)* to *y (inequality)*, linear feedback from *y (inequality)* to *x (institutions)*, and "instantaneous" linear feedback between *x (institutions)* and *y (inequality)*. Absence of a particular causal ordering implies that one of these feedback measures is equal to zero.[19] In

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request, do not yield significantly different results.

[16] These tests yield the use of one lag in the case of Kaufmann, Kraay and Mastruzzi (2003) and two lags in the case of all the other data sets.

[17] From the estimated coefficients we can also obtain the long-run effect of *x* on *y*. The long-run effect takes into account both the direct impact of *x* on *y* (given the past history of *y*) and the autoregressive properties of *y* (to account for own and cross feedback effects). Provided that *y* follows a stable process, the long-run effect of *x* on *y* is given by *B(1)/[1-A(1)]*.

[18] In Granger causality tests, if *x* causes *y*, *x* should help predict *y*. That is, in a regression of *y* against past values of *y*, the addition of past values of *x* as independent variables are expected to contribute to the explanatory power of the regression in a statistically significant manner. Furthermore, *y* is expected not to help predict *x*, as if this is the case and y helps predict *x*, then other variables are causing *x* and *y*. Also, see Table 1.

[19] This linear feedback and causality method has been recently applied to the case of institutional quality and economic performance by Chong and Calderón (2000a) and in the case of financial development and economic

particular, let us denote $z_t = (y_t, x_t)$ the vector with information on the variables *x (institutions)* and *y (inequality),* and the *VAR* representation for $z_t$ is $\Gamma_0 z_t = \Gamma_1 L z_t + \xi_t$, with $\Gamma_1 L = \sum_{i=1}^{m} \Gamma_{1i} L^i$ (Calderón and Liu, 2003). The proposed decomposition test is based on likelihood ratios comparing the following three system representations, as shown in Table 1. From these systems, the objective is to test a specific set of measures of linear feedback. The proposed measures to be tested are shown in Table 2 (Geweke, 1982; Chong and Calderón, 2000a).

In summary, the basic principle of our empirical approach to test for causality is to apply Granger causality tests to study the direction of the link between institutions and inequality. In fact, while we focus on the dynamic relationship between these two variables in order to test whether there is reinforcement as predicted by the model, we also focus on causality issues as measured by statistical precedence. Unlike most studies, however, the key emphasis of our empirical work is to decompose the contribution of each direction of causality between institutions and inequality by using a test of linear dependence and feedback.

## 6. Data

We use Gini coefficients as a proxy for income inequality from Deininger and Squire (1996). As is well known, the advantages of these data are various. First, the observations are based on household surveys. Second, the population and income coverage are comprehensive. Furthermore, different criteria from different sources are homogenized in order to avoid problems of definition (Chong and Calderón, 2000b).[20] While the data from Deininger and Squire go from 1960 to 1995, we are able to extend our inequality series by using household data from Milanovic (2002a, 2002b) and by generating information using the coefficient of variation of income and the income's linear correlation with ranks. For the sake of robustness, we also use alternative measures of income distribution such as the income share ratio of the top to the bottom quintile of the population as well as the income shares of the middle quintiles. The Gini coefficient ranges from 0 to 1, while the income shares for the top and bottom quintiles of the population are ratios that fluctuate between zero and one.

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growth by Calderón and Liu (2003).

[20] Definitional problems include whether a category applies to household or individuals, whether income is measured gross or net of taxes, and whether expenditure or income is used to calculate the income share and Gini coefficient.

We use a broad array of measures of governance that cover different time periods, countries, and relatively different, but nonetheless related, definitions. First, we use the widely used indicators developed by Kaufmann, Kraay and Mastruzzi (2003) for six dimensions of governance covering 199 countries for 1995, 1998, 2000 and 2002. These governance indicators are motivated by a broad definition of governance as the traditions and institutions by which authority in a country is exercised. This definition includes (i) the process by which governments are selected, monitored and replaced (i.e., voice and accountability and political stability and absence of violence), (ii) the capacity of the government to effectively formulate and implement sound policies (i.e., government effectiveness and regulatory quality), and (iii) the respect of citizens and the state for the institutions that govern economic and social interactions among them (i.e., rule of law and control of corruption). We also compute an average of the six dimensions for the specified periods.[21] For our purposes, the weakness of the data is the limited time-span covered, which, given the fact that both institutions and inequality tend to move slowly over time (Chong and Calderón, 2000a), may result in little variation and, consequently, not very useful findings.

We also use data from the International Country Risk Guide (ICRG) produced by the PRS group and originally used by Knack and Keefer (1995), Hall and Jones (1999), and several other researchers. The ICRG risk rating system assigns a numerical value to a predetermined range of risk components for about 130 countries. In this paper we consider five of the most commonly used institutional dimensions used in the literature: (i) government stability, (ii) corruption, (iii) law and order, (iv) democratic accountability, and (v) bureaucracy quality. As in the case of Kaufmann, Kraay and Mastruzzi (2003) we also computed an average of these five dimensions for the 1984-2000 period.

For the sake of completeness and robustness, we also use a third set of institutional indices, an index of civil liberties and an index of political rights developed by Freedom House and first used by Barro (1991). Since 1972, Freedom House has published an annual assessment of the state of institutional freedom in each country. The report scores from 1 to 7, with lower scores denoting higher degrees of freedom. We rescaled these variables to 0-1, with higher

[21] Kaufmann, Kraay and Zoido-Lobatón (1999) use an unobserved components method which expresses the observed data in each cluster as a linear function of the unobserved common component of infrastructure, plus a disturbance term capturing perception errors and/or sampling variation in each indicator. As in the previous case, the data is first standardized.

scores implying more freedom, and we also compute a Gastil Index, defined as the simple average of the civil liberties and political rights indices. The time-coverage for this variable goes from 1970 to 2000. Finally, we also use credit ratings from the magazine *Institutional Investor*, which provides country ratings of the institutional environment for investment. As with the Freedom House data, we re-scale our data from zero to one where higher scores represent a better institutional environment for investment. These data also go from 1970 to 2000.

In order to avoid potential country selection biases, we homogenize the number of countries to 121, which are the common countries in all four data sets.[22] In the case of ICRG, Freedom House, and *Institutional Investor*, we assemble a panel data set of 121 industrial and developing countries, spanning the corresponding full time periods for each sample, which are averaged over 5 years. In other words, we use panel data of at most six non-overlapping 5-year period observations over the sample period—which is in fact the case for Freedom House and *Institutional Investor*, as the periods those data cover are from 1970 to 2000.[23] This choice is based on the premise that institutional change occurs slowly through time and, thus, the observed variation from year to year may be rather small (Chong and Calderón, 2000a).[24] Since the Kaufmann, Kraay and Mastruzzi (2003) data are much more limited, although very well known, we are restricted to using a cross-section approach in this case.[25] In short, we consider a very broad array of country-homogeneous data sets, which we arrange in terms of time coverage. We first consider sources that are well-known and broadly used but with limited time span (Kaufmann, Kraay and Mastruzzi, 2003), as well as data that cover a much longer time-span but provide a somewhat broader definition of institutions (Freedom House, various years).[26] Table 3 provides summary statistics of all the variables used in this study, and Table 4 provides some basic correlation between all the institutional measures considered with the income inequality measures employed.

[22] The list of countries is shown in the Appendix.

[23] The number of observations is 684 in the case of both Freedom House and *Institutional Investor*, and 430 observations in the case of ICRG.

[24] For the sake of completeness we also perform our analysis using different year groupings (ten years) as well as with annual data whenever possible. We find very similar results regardless of the sample size or data stacking.

[25] Consequently, the number of observations when using these data is 121.

[26] As shown by Knack and Keefer (1995), the correlation between Freedom House measures and other institutional measures (ICRG, in particular) is extremely high.

## 7. Empirical Evidence

### *7.1. Dynamic Relationship*

When testing the dynamic relationship between measures of institutional quality and measures of income inequality, remarkably, institutional quality and income inequality reinforce each other, as predicted by our simple theoretical model. This appears to be true regardless of the data set and specific time-span considered, and whether or not the sample focuses on Industrial Countries or Less Developed Countries. This is shown in Tables 5-7. In the case of the Kaufmann, Kraay and Mastruzzi (2003) measures, shown in Table 5, we find that a one-unit change in the index of aggregate governance for the sample of all countries helps reduce the Gini coefficient by 0.034. Among the several indicators of governance reported in this table, improvements in *political stability* have the largest impact on income distribution, as reflected in a reduction of 0.081 in the Gini coefficient. Interestingly, measures of *rule of law* and *control of corruption* have the lowest impact on inequality, as they yield reductions in the Gini coefficient of 0.016 and 0.019, respectively.

On the other hand, we also find that an improvement in the distribution of income, as reflected by a reduction in the Gini coefficient, increases the different indices of aggregate governance. This is also shown in Table 5. In general, the largest impact of lower inequality on institutions is attributed to *political stability*, as a reduction of 0.1 in the Gini coefficient increases the coefficient of this measure by 0.072. Similarly, the lowest increases are experienced in the cases of the *rule of law* and *control of corruption* (with increasesof 0.038 and 0.039, respectively). Notice that there is a clear pattern in which the impact from inequality to institutions is consistently larger than the one from institutions to inequality, regardless of the sample. In short, we observe a dynamic relationship between institutions and inequality such that the two reinforce each other. Higher quality of institutions is linked with improvements in the distribution of income, as reflected by lower Gini coefficients, and a better distribution of income (a lower Gini coefficient) is linked with institutions of higher quality. The impact of the latter appears to be stronger than the impact of the former as measured by the size of the regression coefficients.[27]

[27] Additionally, we also test different measures of inequality. In particular, we consider the income share of the top to bottom quintiles, the Theil inequality index, and the Atkinson inequality index. We find qualitatively identical results for all the institutional measures used in this paper. Results may be provided upon request.

Interestingly, our findings stand regardless of whether the focus is on developing or industrial countries. This is also shown in Table 5. Furthermore, we find that the impact of better institutions on income distribution seems to be larger among industrial countries than among developing ones. For example, the impact of a one-unit increase in the aggregate governance index reduces the Gini coefficient by 0.16 among industrial countries, whereas an analogous change in this governance measure reduces the Gini coefficient by 0.01 among developing countries.[28] Notice that there is no clear pattern in the reverse relationship, as only in some cases is the impact of income inequality on governance larger among industrial than among developing countries. This is the case of voice and accountability, rule of law, and control of corruption.

While an obvious weakness of the data from Kaufmann, Kraay and Mastruzzi (2003) is the relatively short time span considered, this does not appear to be critical for any of our findings. In fact, it is remarkable that when using other data sources that cover longer time-spans we obtain very similar results. That is, regardless of the data source we use (ICRG, Freedom House, or Institutional Investor) we always find that there is a reinforcing quality between institutions and income inequality, whether the sample considered includes developing countries, industrial countries, or both. This is shown in Table 6 and Table 7. The only difference with respect to the data of Kaufmann, Kraay and Mastruzzi (2003) is that there is no obvious pattern of impact when comparing industrial countries and developing countries. In particular, it is not necessarily the case that the impact of institutional improvements on income inequality is larger among industrial countries than in developing countries. If anything, there appears to be an opposite pattern in which improvements in the distribution of income on institutions appear to be stronger in developing countries than in industrial countries. This is particularly true in the case of the Freedom House data.

### *7.2. Causality and Feedback*

In the previous section we essentially focused on the sign of the coefficients and its statistical significance in order to assess whether a dynamic relationship between institutions and inequality exists. In this section we measure the extent of the contribution of each direction of causality possible between these variables in the observed overall correlation. As described above, the

[28] Among industrial countries, regulatory quality and rule of law are the dimensions that have the strongest impact on income inequality. For developing countries, government effectiveness has the largest impact on income inequality.

direction of causality can go from institutions to inequality or from inequality to institutions—or it may be contemporaneous. Our findings are shown from Table 8 to Table 10.

Again, as shown in Table 8, we first focus on the data from Kaufmann, Kraay and Mastruzzi (2003). We find that there is a significant causal relationship in both directions—that is, from institutional quality to income inequality and from income inequality to institutional quality. This is the case regardless of the income inequality indicator used (e.g., Gini coefficient, the income share ratio of top to bottom quintiles of the population, or the income share of the middle quintile of the population) or the sample of countries used. Although we find that there is significant evidence of bi-directional causality between institutional quality and income inequality, we find that the relationship between these two variables is dominated by the causal direction from income inequality to institutional quality. For instance, this is the case when using the Gini coefficient as a measure for inequality. In fact, while the contribution of the *institutions to inequality* causality to the total linear dependence between these two variables is approximately 33 percent, the contribution of the *inequality to institutions* causality to the total linear dependence between these two variables is approximately 55 percent. This finding is arrived at when using the institutional summary measure for the full sample of countries,[29] and this finding holds when focusing on our sub-sample of industrial countries. In fact, the contribution of the *institutions to inequality* causality to the total linear dependence in this case is approximately 25 percent, and the contribution of the *inequality to institutions* causality to the total linear dependence is approximately 64 percent. Furthermore, we also find similar results in the case of developing countries. The contribution of the *institutions to inequality* causality to the total linear dependence in this case is 33 percent and the contribution of the *inequality to institutions* causality to the total linear dependence is 58 percent. This is also shown in Table 8.

In the case of the Gini coefficient, and using the full sample, the largest contribution to the linear relationship between institutional quality and inequality is attributed to the *Inequality to Voice and Accountability* causal direction (64 percent). Notice that even the one component that provides the smallest contribution to this direction of causality, *regulatory quality* (46 percent), contributes a much larger percentage to the total linear dependence between these two variables than any of the variables that go in the opposite direction. A similar pattern is observed in the case of industrial countries. The causal relationship that predominates is the one that goes from income inequality to

[29] Notice that the instantaneous causality between these two variables is not statistically significant.

*control of corruption*, as it explains nearly 73 percent of the total linear dependence between institutions and inequality. The one component that accounts for the smallest contribution to this direction of causality, *regulatory quality* (54 percent), contributes a much larger percentage to the total linear dependence than any of the contributions that go from institutions to inequality. Unsurprisingly, a similar pattern is also observed in the case of developing countries, where the causality from inequality to institutions also dominates. The causal relationship from income inequality to *rule of law* explains 74 percent of the linear dependence between institutions and inequality, which represents the largest contribution to the total linear dependence between inequality and institutions. Overall, it appears that the direction of causality from inequality to institutions is even more dominant in the case of developing countries than for industrial countries.

In general, we find strong evidence of bi-directional causality for all the indicators, regardless of the sample, with the aggregate governance to inequality direction being always significant but having a smaller share in the total linear dependence relationship. Consistently, the instantaneous correlation between inequality and governance is not significant for any of the indicators regardless of the inequality measure used. Robustness checks regarding the other measures of income inequality (i.e., income share ratio of top to bottom quintiles and the share of the middle income quintile), generate very similar results. As before, the causal direction from income inequality to institutional quality dominates the linear relationship between these variables regardless of the institutional indicators, the sample of countries and the income distribution variable used.[30]

We repeat the exercise above by using the ICRG data, which as mentioned above provides a longer time span, and we find remarkably similar results. The findings are shown in Table 9. Again we find that the causal direction from income inequality to institutional quality dominates the linear dependence between these two variables (64 percent in the case of the full sample). The largest contribution of this causal correlation to the linear dependence between these variables is 66 percent in the case of *corruption*, and the smallest contribution is 61 percent in the case of *bureaucratic quality*. Again, the instantaneous relationship between these variables is statistically negligible. The contribution of the *income inequality to institutional*

[30] We also used additional inequality measures, namely, the Theil and Atkinson indices. Our findings do not change. While we do not report these findings because of space considerations, we would be happy to provide them upon request.

*quality* direction is larger among industrial countries for *democratic accountability* (60 percent), *government stability* (59 percent), and *corruption* (59 percent). On the other hand, this contribution is larger among developing countries for *democratic accountability* (67 percent), *government stability* (63 percent) and *corruption* (63 percent). As before, it appears that the direction of causality from income inequality to quality of institutions is even more dominant in the case of developing countries than industrial countries.

As an additional robustness check, we also use Freedom House and *Institutional Investor* data. The findings are shown in Table 10. We find results very similar to those previously shown. That is, the causal direction from income inequality to institutional quality dominates the linear dependence between these two variables (59 percent for the full sample, 54 percent for industrial countries, and 58 percent for developing countries when using the Gini coefficient and the Gastil Index). The causal direction from institutional quality to inequality is also significant, although its contribution to the linear dependence between institutional quality and inequality is smaller (37 percent for the full sample, 38 percent for industrial countries, and 38 percent for developing countries).[31] Once again, the direction of causality from inequality to institutions tends to be more dominant for developing countries than for industrial countries. Finally, notice that the results for the other measures of income distribution are qualitatively similar.

## 8. Conclusions

The starting point of this paper is the observation that there is a significant correlation between income inequality and (low) quality of institutions. In theory, it stands to reason that weak institutions may be conducive to income inequality. Where the poor are not given the protection of an independent judicial system, for example, their ability to extract rents is inferior to that of the rich. It has also been suggested that high income inequality allows the rich to wield stronger political influence, thereby subverting institutions. Indeed, the recent history of Russia in transition and the history of several Latin American countries, such as Bolivia, seem to testify to the observation that income inequality and poor institutional quality reinforce each other.

This double feedback relationship is first exhibited in a simple dynamic model here and then tested empirically employing a comprehensive cross-country panel data set. We utilize an

[31] Findings are qualitatively very similar when using the *Institutional Investor* data as shown in Table 10.

alternative approach to the standard instrumental variables approach and address the endogeneity of the examined relationship, which enables us to directly establish causality links, using Granger tests of statistical precedence. Unlike typical causality studies, however, we decompose the contribution of each type of causality on the observed total linear dependence between variables. Our panel *VAR* approach indicates that, consistent with the theory, not only do institutions Granger-cause inequality, but inequality also Granger-causes low-quality institutions, which provides strong empirical support for the idea that there is a reinforcing quality between these variables. Furthermore, the decomposition analysis demonstrates that while both directions of causality do contribute towards the total correlation between the variables, the direction of causality from inequality to institutions clearly dominates the direction of causality that goes from institutions to inequality. This finding is remarkably strong and holds for all the institutional measures considered, as well as for different time-spans, year groupings, inequality measures, and changes in specification. The robustness of the results reinforces the confidence in the interpretation of the findings.

While our findings do not contradict the premise that better institutions may lead to a more equal distribution of income, the established reverse causality may help explain why countries with full awareness of the need to pursue dramatic institutional reforms have failed to do so, particularly in poor countries. Institutional reform may be an instrument to reduce inequality; political factors, however, may prevent its implementation.

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**Table 1. Feedback Decomposition Tests**

| System | Representation of Parameter Matrices | Var-Cov Matrix of Residuals | Causality Tests |
|---|---|---|---|
| AR System | $\Gamma_0 = I_2$<br>$\Gamma_1 = \begin{bmatrix} \sum_{i=1}^{m} C_{1i} L^i & 0 \\ 0 & \sum_{i=1}^{m} E_{1i} L^i \end{bmatrix}$ | $E(\xi_t^{(1)} \xi_t^{(1)}) =$<br>$\sum^{(1)} = \begin{bmatrix} \Sigma_{11}^{(1)} & \Sigma_{12}^{(1)} \\ \Sigma_{21}^{(1)} & \Sigma_{22}^{(1)} \end{bmatrix}$ | Current values of $y$ ($x$) are functions of $m$ past values of $y$ ($x$) only. |
| Granger System | $\Gamma_0 = I_2$<br>$\Gamma_1 = \begin{bmatrix} \sum_{i=1}^{m} C_{2i} L^i & \sum_{i=1}^{m} D_{2i} L^i \\ \sum_{i=1}^{m} F_{2i} L^i & \sum_{i=1}^{m} E_{2i} L^i \end{bmatrix}$ | $E(\xi_t^{(2)} \xi_t^{(2)}) =$<br>$\sum^{(2)} = \begin{bmatrix} \Sigma_{11}^{(2)} & \Sigma_{12}^{(2)} \\ \Sigma_{21}^{(2)} & \Sigma_{22}^{(2)} \end{bmatrix}$ | Granger Causality: $y$ ($x$) does not Granger-cause $x$ ($y$) iff $F_{2i} \equiv 0$ ($D_{2i} \equiv 0$), for all $i$. |
| Instantaneous System | $\Gamma_0 = \begin{bmatrix} 1 & -D_{30} \\ -F_{30} & 1 \end{bmatrix}$<br>$\Gamma_1 = \begin{bmatrix} \sum_{i=1}^{m} C_{3i} L^i & \sum_{i=1}^{m} D_{3i} L^i \\ \sum_{i=1}^{m} F_{3i} L^i & \sum_{i=1}^{m} E_{3i} L^i \end{bmatrix}$ | $E(\xi_t^{(3)} \xi_t^{(3)}) =$<br>$\sum^{(3)} = \begin{bmatrix} \Sigma_{11}^{(3)} & \Sigma_{12}^{(3)} \\ \Sigma_{21}^{(3)} & \Sigma_{22}^{(3)} \end{bmatrix}$ | Instantaneous causality between $x$ and $y$ if and only if $D_{30} \neq 0$ and $F_{30} \neq 0$. |

*Sources:* Chong and Calderón (2000a) and Calderón and Liu (2003).

**Table 2. Linear Feedback Statistics and Empirical Tests**

| Linear Feedback | Statistic | Null Hypothesis |
|---|---|---|
| From x to y ($F_{x \to y}$) | $\ln\left(\left\|\sum_{11}^{(1)}\right\| \Big/ \left\|\sum_{11}^{(2)}\right\|\right)$ | $H_0$: $F_{x \to y} = 0$, i.e. "*x* does not Granger-cause *y*." That is, $\left\|\Sigma_{11}^{(1)}\right\| = \left\|\Sigma_{11}^{(2)}\right\|$ |
| From y to x ($F_{y \to x}$) | $\ln\left(\left\|\sum_{22}^{(1)}\right\| \Big/ \left\|\sum_{22}^{(2)}\right\|\right)$ | $H_0$: $F_{y \to x} = 0$, i.e. "*y* does not Granger-cause *x*." That is, $\left\|\Sigma_{22}^{(1)}\right\| = \left\|\Sigma_{22}^{(2)}\right\|$ |
| Instantaneous ($F_{x \cdot y}$) | $\ln\left(\left\|\sum_{11}^{(2)}\right\| \Big/ \left\|\sum_{11}^{(3)}\right\|\right) = \ln\left(\left\|\sum_{22}^{(2)}\right\| \Big/ \left\|\sum_{22}^{(3)}\right\|\right)$ | $H_0$: $F_{x \cdot y} = 0$, i.e. "no instantaneous causality between *y* and *x*." |
| Linear Dependence ($F_{x,y}$) | $(F_{x,y}) = F_{x \to y} + F_{y \to x} + F_{x \cdot y}$ | $H_0$: $F_{x,y} = 0$, i.e. "no linear association between *y* and *x*." |

*Sources:* Chong and Calderón (2000a), Calderón and Liu (2003).

## Table 3. Summary Statistics

| Variable | Mean | Std. Dev. | Mean | Std. Dev. | Mean | Std. Dev. |
|---|---|---|---|---|---|---|
| *I. Inequality Measures* | | | | | | |
| Gini Coefficient | 0.3909 | 0.10 | 0.3220 | 0.04 | 0.4121 | 0.10 |
| Top to Bottom | 9.2360 | 6.12 | 5.9311 | 1.69 | 10.3855 | 6.67 |
| Middle | 0.1554 | 0.04 | 0.1777 | 0.02 | 0.1476 | 0.04 |
| *II. Kaufmann et al. (2003) Governance Data* | | | | | | |
| Governance | 0.2138 | 0.86 | 1.5145 | 0.31 | -0.0797 | 0.65 |
| Voice and Accountability | 0.1269 | 0.92 | 1.3807 | 0.19 | -0.1518 | 0.77 |
| Political Stability | 0.1503 | 0.89 | 1.2007 | 0.29 | -0.0831 | 0.81 |
| Government Effectiveness | 0.2347 | 0.94 | 1.6700 | 0.40 | -0.0842 | 0.70 |
| Regulatory Quality | 0.2793 | 0.86 | 1.3195 | 0.30 | 0.0481 | 0.77 |
| Rule of Law | 0.2425 | 0.97 | 1.7187 | 0.38 | -0.0856 | 0.73 |
| Control of Corruption | 0.2093 | 1.00 | 1.7974 | 0.50 | -0.1490 | 0.68 |
| *III. Freedom House Indicators* | | | | | | |
| Gastil Index of Liberties | 0.5389 | 0.32 | 0.9536 | 0.10 | 0.4396 | 0.27 |
| Civil Liberties | 0.5346 | 0.30 | 0.9372 | 0.11 | 0.4382 | 0.25 |
| Political Rights | 0.5430 | 0.35 | 0.9701 | 0.10 | 0.4408 | 0.31 |
| II Credit Ratings | 0.4541 | 0.2506 | 0.8046 | 0.11 | 0.3669 | 0.19 |
| *IV. ICRG Indicators* | | | | | | |
| ICRG Index | 4.0283 | 1.21 | 5.6895 | 0.58 | 3.5996 | 0.93 |
| Government Stability | 7.0606 | 2.00 | 8.2530 | 1.55 | 6.7529 | 1.99 |
| Corruption | 3.4412 | 1.33 | 5.1963 | 0.82 | 2.9909 | 1.03 |
| Rule of Law | 3.7025 | 1.50 | 5.5889 | 0.68 | 3.2185 | 1.26 |
| Democratic Accountability | 3.6942 | 1.51 | 5.6628 | 0.57 | 3.1891 | 1.23 |
| Bureaucratic Quality | 2.2413 | 1.18 | 3.7466 | 0.50 | 1.8551 | 0.98 |

## Table 4. Institutions and Income Inequality, Simple Correlations

| Variable | Gini Coefficient | Ratio of Top to Bottom Quintiles | Income Share of Middle Quintile |
|---|---|---|---|
| 1. World Bank | | | |
| Governance | -0.4020 | -0.2986 | 0.4238 |
| | (0.00) | (0.00) | (0.00) |
| Voice and Accountability | -0.3202 | -0.2094 | 0.3297 |
| | (0.00) | (0.01) | (0.00) |
| Political Stability | -0.3629 | -0.2506 | 0.3803 |
| | (0.00) | (0.00) | (0.00) |
| Government Effectiveness | -0.4135 | -0.3337 | 0.4339 |
| | (0.00) | (0.00) | (0.00) |
| Regulatory Quality | -0.2735 | -0.2065 | 0.2970 |
| | (0.00) | (0.01) | (0.00) |
| Rule of Law | -0.4136 | -0.3310 | 0.4360 |
| | (0.00) | (0.00) | (0.00) |
| Control of Corruption | -0.3971 | -0.2973 | 0.4221 |
| | (0.00) | (0.00) | (0.00) |
| 2. Gastil and Institutional Investor | | | |
| Gastil Index of Liberties | -0.1859 | -0.1177 | 0.1815 |
| | (0.00) | (0.01) | (0.00) |
| Civil Liberties | -0.1892 | -0.1238 | 0.1845 |
| | (0.00) | (0.01) | (0.00) |
| Political Rights | -0.1774 | -0.1089 | 0.1734 |
| | (0.00) | (0.02) | (0.00) |
| Credit Ratings | -0.3655 | -0.2787 | 0.3654 |
| | (0.00) | (0.00) | (0.00) |
| 3. ICRG | | | |
| ICRG Index | -0.4393 | -0.3718 | 0.4225 |
| | (0.00) | (0.00) | (0.00) |
| Government Stability | -0.2769 | -0.2172 | 0.2380 |
| | (0.00) | (0.00) | (0.00) |
| Corruption | -0.3726 | -0.3383 | 0.3783 |
| | (0.00) | (0.00) | (0.00) |
| Rule of Law | -0.4336 | -0.3553 | 0.4479 |
| | (0.00) | (0.00) | (0.00) |
| Democratic Accountability | -0.3634 | -0.3148 | 0.3501 |
| | (0.00) | (0.00) | (0.00) |
| Bureaucratic Quality | -0.3545 | -0.3195 | 0.3371 |
| | (0.00) | (0.00) | (0.00) |

Statistical significance is shown in parentheses.

## Table 5. Dynamic Relationship Between Institutions and Inequality

| | | All Countries | | Industrial Countries | | Developing Countries | |
|---|---|---|---|---|---|---|---|
| | | X -> Y | Y -> X | X -> Y | Y -> X | X -> Y | Y -> X |
| Aggregate Governance | Sum Coeff. | -0.0343 | -0.1259 | -0.1637 | -0.4236 | -0.0105 | -0.6460 |
| | [p-value] | (0.007) | (0.007) | (0.000) | (0.000) | (0.006) | (0.006) |
| Voice and Accountability | Sum Coeff. | -0.0415 | -0.4175 | -0.0596 | -0.4455 | -0.0155 | -0.3315 |
| | [p-value] | (0.009) | (0.038) | (0.010) | (0.031) | (0.200) | (0.051) |
| Political Stability | Sum Coeff. | -0.0805 | -0.7202 | -0.0645 | -0.4984 | -0.0050 | -0.7635 |
| | [p-value] | (0.045) | (0.030) | (0.008) | (0.008) | (0.006) | (0.027) |
| Government Effectiveness | Sum Coeff. | -0.0257 | -0.6472 | -0.0557 | -0.4827 | -0.0229 | -0.6872 |
| | [p-value] | (0.008) | (0.056) | (0.046) | (0.003) | (0.120) | (0.100) |
| Regulatory Quality | Sum Coeff. | -0.0707 | -0.6533 | -0.0790 | -0.4154 | -0.0123 | -0.4405 |
| | [p-value] | (0.059) | (0.029) | (0.000) | (0.003) | (0.037) | (0.051) |
| Rule of Law | Sum Coeff. | -0.0163 | -0.3756 | -0.0778 | -0.5115 | -0.0111 | -0.3655 |
| | [p-value] | (0.035) | (0.032) | (0.006) | (0.069) | (0.019) | (0.053) |
| Control of Corruption | Sum Coeff. | -0.0188 | -0.3908 | -0.0482 | -0.7668 | -0.0195 | -0.6037 |
| | [p-value] | (0.024) | (0.015) | (0.009) | (0.043) | (0.024) | (0.007) |

*Data source:* Kaufmann, Kraay, and Mastruzzi, 1995-2000.
Tests of dynamic relationship using institutional measures from Kaufmann, Kraay, and Zoido-Lobatón (1999) and Kaufmann, Kraay, and Mastruzzi (2003). The available data go from 1995 to 2000; *X* represents the corresponding institutional measure and *Y* represents the inequality measure as measured by the Gini coefficient. P-values are shown in parentheses.

## Table 6. Dynamic Relationship Between Institutions and Inequality

| | | All Countries | | Industrial Countries | | Developing Countries | |
|---|---|---|---|---|---|---|---|
| | | X -> Y | Y -> X | X -> Y | Y -> X | X -> Y | Y -> X |
| ICRG Aggregate Index | Sum Coeff. | -0.0514 | -0.4302 | -0.0241 | -0.7247 | -0.0592 | -0.3536 |
| | [p-value] | (0.009) | (0.041) | (0.008) | (0.049) | (0.008) | (0.052) |
| Government Stability | Sum Coeff. | -0.0923 | -0.2701 | -0.0415 | -0.8334 | -0.0271 | -0.2708 |
| | [p-value] | (0.009) | (0.043) | (0.008) | (0.021) | (0.009) | (0.006) |
| Corruption | Sum Coeff. | -0.0433 | -0.3977 | -0.0160 | -0.8053 | -0.0381 | -0.4026 |
| | [p-value] | (0.021) | (0.002) | (0.008) | (0.037) | (0.034) | (0.004) |
| Rule of Law | Sum Coeff. | -0.0343 | -0.4668 | -0.0219 | -0.4803 | -0.0465 | -0.4698 |
| | [p-value] | (0.013) | (0.009) | (0.009) | (0.057) | (0.008) | (0.019) |
| Democratic Accountability | Sum Coeff. | -0.0294 | -0.4302 | -0.0177 | -0.5377 | -0.0296 | -0.4175 |
| | [p-value] | (0.036) | (0.052) | (0.009) | (0.049) | (0.007) | (0.058) |
| Bureaucratic Quality | Sum Coeff. | -0.0177 | -0.8536 | -0.0368 | -0.4594 | -0.0175 | -0.7833 |
| | [p-value] | (0.008) | (0.050) | (0.008) | (0.071) | (0.009) | (0.010) |

*Data source:* ICRG, 1985-2000.
Tests of dynamic relationship using institutional measures from ICRG (Knack and Keefer, 1995). The available data go from 1985 to 2000. *X* represents the corresponding institutional measure and *Y* represents the inequality measure as measured by the Gini coefficient. P-values are shown in parentheses.

**Table 7. Dynamic Relationship Between Institutions and Inequality**
**(Data Source: Freedom House and *Institutional Investor*, 1970-2000)**

| | | All Countries | | Industrial Countries | | Developing Countries | |
|---|---|---|---|---|---|---|---|
| | | X -> Y | Y -> X | X -> Y | Y -> X | X -> Y | Y -> X |
| Gastil Index | Sum Coeff. | -0.0121 | -0.3335 | -0.0278 | -0.0521 | -0.0104 | -0.3241 |
| | [p-value] | (0.020) | (0.014) | (0.007) | (0.007) | (0.028) | (0.019) |
| Civil Liberties | Sum Coeff. | -0.0106 | -0.1133 | -0.0290 | -0.1313 | -0.0712 | -0.2756 |
| | [p-value] | (0.009) | (0.058) | (0.041) | (0.037) | (0.049) | (0.007) |
| Political Rights | Sum Coeff. | -0.0133 | -0.5624 | -0.0122 | -0.0216 | -0.0309 | -0.5805 |
| | [p-value] | (0.001) | (0.039) | (0.009) | (0.009) | (0.048) | (0.052) |
| Institutional Investor Credit Ratings | Sum Coeff. | -0.0027 | -0.7786 | -0.0050 | -0.5618 | -0.0019 | -0.7557 |
| | [p-value] | (0.004) | (0.009) | (0.045) | (0.044) | (0.060) | (0.011) |

Tests of dynamic relationship using institutional measures from Freedom House (1999) and Institutional Investor (various years). The available data go from 1970 to 2000. *X* represents the corresponding institutional measure and *Y* represents the inequality measure as measured by the Gini coefficient. P-values are shown in parentheses.

## Table 8. Linear Feedback and Causality Measures Between Institutions and Inequality

| | Gini Coefficient | | | | Income Share of Top to Bottom Quintile | | | | Share of Middle Quintile | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | x -> y | y -> x | y . x | y , x | x -> y | y -> x | y . x | y , x | x -> y | y -> x | y . x | y , x |
| *I. Sample of All Countries* | | | | | | | | | | | | |
| Aggregate Governance | 33.4 | 55.0 | 11.5 | 100.0 | 34.7 | 57.4 | 8.0 | 100.0 | 29.8 | 61.9 | 8.3 | 100.0 |
| | (0.05) | (0.02) | (0.91) | (0.02) | (0.05) | (0.05) | (0.72) | (0.05) | (0.08) | (0.03) | (0.94) | (0.04) |
| Voice and Accountability | 30.4 | 64.2 | 5.4 | 100.0 | 36.1 | 62.8 | 1.1 | 100.0 | 37.1 | 55.7 | 7.2 | 100.0 |
| | (0.10) | (0.02) | (0.88) | (0.04) | (0.04) | (0.02) | (0.96) | (0.02) | (0.05) | (0.02) | (0.91) | (0.03) |
| Political Stability | 26.5 | 63.5 | 10.0 | 100.0 | 32.3 | 58.3 | 9.4 | 100.0 | 26.2 | 65.5 | 8.4 | 100.0 |
| | (0.04) | (0.01) | (0.79) | (0.03) | (0.07) | (0.02) | (0.92) | (0.03) | (0.06) | (0.02) | (0.91) | (0.05) |
| Government Effectiveness | 39.2 | 56.9 | 3.9 | 100.0 | 39.3 | 54.7 | 6.1 | 100.0 | 25.6 | 72.3 | 2.1 | 100.0 |
| | (0.00) | (0.00) | (0.42) | (0.00) | (0.00) | (0.00) | (0.64) | (0.01) | (0.05) | (0.00) | (0.49) | (0.00) |
| Regulatory Quality | 35.2 | 46.0 | 18.8 | 100.0 | 18.7 | 77.0 | 4.3 | 100.0 | 39.8 | 59.5 | 0.7 | 100.0 |
| | (0.10) | (0.03) | (0.64) | (0.04) | (0.49) | (0.01) | (0.95) | (0.02) | (0.07) | (0.03) | (0.96) | (0.04) |
| Rule of Law | 34.6 | 52.6 | 12.8 | 100.0 | 25.8 | 69.2 | 4.9 | 100.0 | 38.2 | 50.2 | 11.6 | 100.0 |
| | (0.10) | (0.06) | (0.88) | (0.06) | (0.03) | (0.01) | (0.97) | (0.03) | (0.05) | (0.01) | (0.89) | (0.01) |
| Control of Corruption | 38.4 | 58.5 | 3.1 | 100.0 | 34.5 | 64.4 | 1.1 | 100.0 | 36.9 | 57.5 | 5.6 | 100.0 |
| | (0.04) | (0.01) | (0.77) | (0.03) | (0.07) | (0.03) | (0.53) | (0.05) | (0.06) | (0.04) | (0.67) | (0.03) |
| *II. Sample of Industrial Countries* | | | | | | | | | | | | |
| Aggregate Governance | 24.9 | 64.0 | 11.1 | 100.0 | 27.2 | 63.1 | 9.7 | 100.0 | 32.3 | 60.3 | 7.4 | 100.0 |
| | (0.06) | (0.01) | (0.91) | (0.04) | (0.07) | (0.01) | (0.58) | (0.04) | (0.06) | (0.04) | (0.90) | (0.05) |
| Voice and Accountability | 36.2 | 63.0 | 0.8 | 100.0 | 34.0 | 50.0 | 16.0 | 100.0 | 37.4 | 60.2 | 2.4 | 100.0 |
| | (0.07) | (0.03) | (0.90) | (0.04) | (0.06) | (0.03) | (0.76) | (0.05) | (0.06) | (0.01) | (0.93) | (0.01) |
| Political Stability | 27.5 | 61.9 | 10.6 | 100.0 | 32.3 | 62.3 | 5.4 | 100.0 | 38.2 | 59.9 | 1.9 | 100.0 |
| | (0.06) | (0.05) | (0.96) | (0.05) | (0.06) | (0.04) | (0.95) | (0.05) | (0.09) | (0.03) | (0.98) | (0.03) |
| Government Effectiveness | 34.3 | 56.4 | 9.3 | 100.0 | 24.5 | 65.8 | 9.7 | 100.0 | 35.5 | 62.8 | 1.7 | 100.0 |
| | (0.08) | (0.04) | (0.98) | (0.05) | (0.07) | (0.01) | (0.52) | (0.04) | (0.06) | (0.01) | (0.67) | (0.03) |
| Regulatory Quality | 39.1 | 54.2 | 6.8 | 100.0 | 29.5 | 67.1 | 3.4 | 100.0 | 36.1 | 59.2 | 4.7 | 100.0 |
| | (0.09) | (0.03) | (0.85) | (0.02) | (0.02) | (0.01) | (0.78) | (0.02) | (0.06) | (0.01) | (0.96) | (0.03) |
| Rule of Law | 36.5 | 62.4 | 1.0 | 100.0 | 38.8 | 50.8 | 10.4 | 100.0 | 34.2 | 62.9 | 2.9 | 100.0 |
| | (0.08) | (0.02) | (0.68) | (0.06) | (0.09) | (0.02) | (0.76) | (0.02) | (0.08) | (0.01) | (0.86) | (0.02) |
| Control of Corruption | 24.3 | 72.5 | 3.2 | 100.0 | 32.3 | 56.7 | 11.0 | 100.0 | 31.5 | 59.9 | 8.6 | 100.0 |
| | (0.07) | (0.04) | (0.77) | (0.05) | (0.06) | (0.04) | (0.88) | (0.05) | (0.05) | (0.01) | (0.47) | (0.02) |
| *III. Sample of Developing Countries* | | | | | | | | | | | | |
| Aggregate Governance | 32.8 | 58.0 | 9.2 | 100.0 | 29.8 | 62.3 | 7.9 | 100.0 | 41.2 | 55.1 | 3.7 | 100.0 |
| | (0.02) | (0.02) | (0.93) | (0.02) | (0.05) | (0.02) | (0.40) | (0.03) | (0.06) | (0.03) | (0.83) | (0.04) |
| Voice and Accountability | 32.8 | 58.0 | 9.2 | 100.0 | 34.9 | 62.6 | 2.5 | 100.0 | 31.5 | 58.4 | 10.1 | 100.0 |
| | (0.10) | (0.04) | (0.88) | (0.04) | (0.07) | (0.02) | (0.90) | (0.04) | (0.06) | (0.01) | (0.94) | (0.02) |
| Political Stability | 25.6 | 72.9 | 1.4 | 100.0 | 34.4 | 51.6 | 14.0 | 100.0 | 26.1 | 63.5 | 10.5 | 100.0 |
| | (0.09) | (0.03) | (0.93) | (0.04) | (0.04) | (0.02) | (0.71) | (0.03) | (0.05) | (0.03) | (0.80) | (0.03) |
| Government Effectiveness | 32.8 | 64.5 | 2.7 | 100.0 | 21.5 | 73.9 | 4.7 | 100.0 | 40.6 | 55.3 | 4.1 | 100.0 |
| | (0.05) | (0.02) | (0.93) | (0.05) | (0.08) | (0.01) | (0.83) | (0.02) | (0.00) | (0.01) | (0.74) | (0.00) |
| Regulatory Quality | 38.5 | 56.8 | 4.6 | 100.0 | 37.3 | 59.4 | 3.3 | 100.0 | 20.8 | 76.3 | 2.9 | 100.0 |
| | (0.00) | (0.00) | (0.85) | (0.01) | (0.07) | (0.01) | (0.84) | (0.06) | (0.09) | (0.01) | (0.93) | (0.04) |
| Rule of Law | 24.4 | 74.1 | 1.5 | 100.0 | 23.2 | 66.0 | 10.8 | 100.0 | 36.2 | 50.0 | 13.8 | 100.0 |
| | (0.05) | (0.02) | (0.97) | (0.05) | (0.08) | (0.04) | (0.92) | (0.05) | (0.07) | (0.05) | (0.79) | (0.05) |
| Control of Corruption | 34.5 | 60.7 | 4.9 | 100.0 | 42.0 | 56.0 | 2.0 | 100.0 | 35.4 | 52.7 | 11.9 | 100.0 |
| | (0.05) | (0.03) | (0.92) | (0.42) | (0.02) | (0.01) | (0.93) | (0.02) | (0.04) | (0.01) | (0.67) | (0.02) |

*Data source:* Kaufmann, Kraay, and Mastruzzi, 1995-2000.

The variable $x$ represents the measure of institutional quality, whereas the variable $y$ represents the measure of income inequality, as measured by the Gini coefficient. All feedback measures are expressed as a percentage of the total correlation or linear dependence between institutions and inequality *(F x,y)*. Hence, the causality from *institutions* to *inequality* is represented by $x \rightarrow y$. Similarly, the causality from *inequality* to *institutions* is represented by $y \rightarrow x$. Instantaneous causality is represented by $y \cdot x$ The statistical significance of each feedback measure is shown in parentheses ($p$-values for $\chi^2$ tests).

## Table 9. Linear Feedback and Causality Measures Between Institutions and Inequality

| | Gini Coefficient | | | | Income Share of Top to Bottom Quintile | | | | Share of Middle Quintile | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | x -> y | y -> x | y . x | y , x | x -> y | y -> x | y . x | y , x | x -> y | y -> x | y . x | y , x |
| *I. Sample of All Countries* | | | | | | | | | | | | |
| ICRG Index | 33.2 | 63.5 | 3.4 | 100.0 | 37.1 | 61.7 | 1.2 | 100.0 | 29.6 | 69.3 | 1.1 | 100.0 |
| | (0.04) | (0.00) | (0.67) | (0.01) | (0.02) | (0.00) | (0.89) | (0.00) | (0.00) | (0.00) | (0.64) | (0.00) |
| Government Stability | 35.0 | 60.7 | 4.3 | 100.0 | 39.9 | 59.3 | 0.9 | 100.0 | 38.2 | 61.2 | 0.6 | 100.0 |
| | (0.03) | (0.00) | (0.53) | (0.01) | (0.05) | (0.01) | (0.88) | (0.01) | (0.06) | (0.00) | (0.75) | (0.00) |
| Corruption | 32.2 | 66.2 | 1.7 | 100.0 | 36.2 | 58.0 | 5.8 | 100.0 | 34.2 | 62.5 | 3.3 | 100.0 |
| | (0.02) | (0.00) | (0.78) | (0.00) | (0.02) | (0.01) | (0.44) | (0.02) | (0.02) | (0.00) | (0.49) | (0.00) |
| Rule of Law | 31.5 | 65.3 | 3.2 | 100.0 | 33.0 | 66.1 | 0.9 | 100.0 | 35.5 | 63.7 | 0.8 | 100.0 |
| | (0.01) | (0.00) | (0.71) | (0.00) | (0.04) | (0.00) | (0.84) | (0.00) | (0.00) | (0.00) | (0.69) | (0.00) |
| Democratic Accountability | 32.9 | 64.5 | 2.5 | 100.0 | 34.1 | 63.1 | 2.8 | 100.0 | 34.4 | 64.5 | 1.1 | 100.0 |
| | (0.01) | (0.00) | (0.52) | (0.01) | (0.03) | (0.01) | (0.72) | (0.01) | (0.01) | (0.00) | (0.61) | (0.00) |
| Bureaucratic Quality | 36.5 | 60.6 | 2.9 | 100.0 | 35.4 | 62.0 | 2.6 | 100.0 | 29.4 | 66.5 | 4.1 | 100.0 |
| | (0.02) | (0.00) | (0.84) | (0.00) | (0.05) | (0.00) | (0.69) | (0.00) | (0.00) | (0.00) | (0.58) | (0.00) |
| *II. Sample of Industrial Countries* | | | | | | | | | | | | |
| ICRG Index | 37.7 | 59.2 | 3.0 | 100.0 | 37.6 | 52.1 | 10.3 | 100.0 | 35.6 | 59.7 | 4.7 | 100.0 |
| | (0.07) | (0.04) | (0.96) | (0.05) | (0.05) | (0.04) | (0.93) | (0.04) | (0.03) | (0.02) | (0.72) | (0.02) |
| Government Stability | 39.1 | 59.0 | 2.0 | 100.0 | 33.3 | 56.6 | 10.1 | 100.0 | 33.4 | 63.4 | 3.3 | 100.0 |
| | (0.05) | (0.01) | (0.91) | (0.02) | (0.07) | (0.01) | (0.65) | (0.01) | (0.02) | (0.01) | (0.78) | (0.01) |
| Corruption | 34.9 | 58.9 | 6.2 | 100.0 | 38.0 | 50.2 | 11.9 | 100.0 | 41.4 | 50.0 | 8.6 | 100.0 |
| | (0.02) | (0.01) | (0.93) | (0.01) | (0.08) | (0.02) | (0.89) | (0.05) | (0.03) | (0.01) | (0.49) | (0.02) |
| Rule of Law | 33.3 | 51.8 | 14.9 | 100.0 | 39.8 | 50.8 | 9.4 | 100.0 | 35.7 | 60.2 | 4.1 | 100.0 |
| | (0.09) | (0.03) | (0.94) | (0.05) | (0.08) | (0.02) | (0.81) | (0.05) | (0.04) | (0.03) | (0.81) | (0.04) |
| Democratic Accountability | 31.4 | 60.0 | 8.6 | 100.0 | 25.8 | 64.2 | 10.0 | 100.0 | 32.0 | 59.8 | 8.2 | 100.0 |
| | (0.06) | (0.01) | (0.75) | (0.02) | (0.05) | (0.02) | (0.86) | (0.05) | (0.06) | (0.05) | (0.51) | (0.05) |
| Bureaucratic Quality | 28.6 | 54.0 | 17.5 | 100.0 | 29.8 | 62.6 | 7.6 | 100.0 | 33.4 | 58.0 | 8.7 | 100.0 |
| | (0.10) | (0.04) | (0.74) | (0.09) | (0.09) | (0.04) | (0.93) | (0.06) | (0.10) | (0.05) | (0.82) | (0.08) |
| *III. Sample of Developing Countries* | | | | | | | | | | | | |
| ICRG Index | 34.3 | 62.3 | 3.4 | 100.0 | 42.7 | 55.3 | 2.0 | 100.0 | 33.5 | 59.1 | 7.4 | 100.0 |
| | (0.02) | (0.00) | (0.93) | (0.01) | (0.04) | (0.00) | (0.94) | (0.01) | (0.00) | (0.00) | (0.46) | (0.00) |
| Government Stability | 31.8 | 63.2 | 5.0 | 100.0 | 34.5 | 60.9 | 4.6 | 100.0 | 39.1 | 59.9 | 1.0 | 100.0 |
| | (0.01) | (0.00) | (0.51) | (0.01) | (0.05) | (0.01) | (0.90) | (0.04) | (0.00) | (0.00) | (0.96) | (0.00) |
| Corruption | 33.3 | 62.6 | 4.1 | 100.0 | 35.4 | 57.9 | 6.7 | 100.0 | 40.8 | 57.4 | 1.8 | 100.0 |
| | (0.02) | (0.00) | (0.54) | (0.01) | (0.04) | (0.01) | (0.51) | (0.02) | (0.00) | (0.00) | (0.62) | (0.00) |
| Rule of Law | 32.4 | 60.0 | 7.6 | 100.0 | 35.5 | 59.2 | 5.4 | 100.0 | 36.7 | 61.7 | 1.6 | 100.0 |
| | (0.03) | (0.00) | (0.89) | (0.01) | (0.01) | (0.00) | (0.73) | (0.01) | (0.00) | (0.00) | (0.58) | (0.00) |
| Democratic Accountability | 29.5 | 67.4 | 3.1 | 100.0 | 45.1 | 50.9 | 4.0 | 100.0 | 38.7 | 59.7 | 1.5 | 100.0 |
| | (0.02) | (0.00) | (0.66) | (0.01) | (0.04) | (0.01) | (0.67) | (0.03) | (0.00) | (0.00) | (0.67) | (0.00) |
| Bureaucratic Quality | 38.6 | 58.3 | 3.1 | 100.0 | 37.9 | 57.2 | 4.9 | 100.0 | 30.0 | 68.0 | 2.0 | 100.0 |
| | (0.00) | (0.00) | (0.60) | (0.00) | (0.03) | (0.00) | (0.81) | (0.01) | (0.00) | (0.00) | (0.59) | (0.00) |

*Data Source:* ICRG, 1985-2000.

The variable $x$ represents the measure of institutional quality, whereas the variable $y$ represents the measure of income inequality, as measured by the Gini coefficient. All feedback measures are expressed as a percentage of the total correlation or linear dependence between institutions and inequality *(F x,y)*. Hence, the causality from *institutions* to *inequality* is represented by $x \rightarrow y$. Similarly, the causality from *inequality* to *institutions* is represented by $y \rightarrow x$. Instantaneous causality is represented by $y \cdot x$ The statistical significance of each feedback measure is shown in parentheses ($p$-values for $\chi^2$ tests).

## Table 10. Linear Feedback and Causality Measures Between Institutions and Inequality

| | Gini Coefficient | | | | Income Share of Top to Bottom Quintile | | | | Share of Middle Quintile | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | x -> y | y -> x | y . x | y , x | x -> y | y -> x | y . x | y , x | x -> y | y -> x | y . x | y , x |
| *I. Sample of All Countries* | | | | | | | | | | | | |
| Gastil Index | 36.5 | 59.0 | 4.5 | 100.0 | 44.8 | 54.2 | 1.1 | 100.0 | 42.0 | 56.2 | 1.8 | 100.0 |
| | (0.06) | (0.02) | (0.96) | (0.03) | (0.00) | (0.00) | (0.96) | (0.00) | (0.00) | (0.00) | (0.72) | (0.00) |
| Civil Liberties | 25.5 | 66.0 | 8.4 | 100.0 | 42.3 | 56.1 | 1.6 | 100.0 | 44.1 | 53.5 | 2.5 | 100.0 |
| | (0.04) | (0.03) | (0.61) | (0.03) | (0.00) | (0.00) | (0.55) | (0.00) | (0.00) | (0.00) | (0.89) | (0.00) |
| Political Rights | 24.5 | 73.7 | 1.8 | 100.0 | 42.9 | 55.2 | 2.0 | 100.0 | 40.1 | 56.8 | 3.2 | 100.0 |
| | (0.09) | (0.00) | (0.84) | (0.02) | (0.01) | (0.00) | (0.66) | (0.00) | (0.01) | (0.00) | (0.73) | (0.01) |
| Institutional Investor | 38.6 | 58.4 | 2.9 | 100.0 | 47.6 | 51.2 | 1.2 | 100.0 | 34.0 | 65.3 | 0.7 | 100.0 |
| | (0.00) | (0.00) | (0.84) | (0.00) | (0.00) | (0.00) | (0.89) | (0.00) | (0.00) | (0.00) | (0.72) | (0.00) |
| *II. Sample of Industrial Countries* | | | | | | | | | | | | |
| Gastil Index | 37.7 | 54.3 | 8.0 | 100.0 | 44.1 | 51.8 | 4.1 | 100.0 | 35.6 | 51.9 | 12.5 | 100.0 |
| | (0.09) | (0.03) | (0.89) | (0.49) | (0.02) | (0.02) | (0.91) | (0.02) | (0.09) | (0.03) | (0.80) | (0.04) |
| Civil Liberties | 36.9 | 55.3 | 7.8 | 100.0 | 35.1 | 59.7 | 5.2 | 100.0 | 37.7 | 48.3 | 14.1 | 100.0 |
| | (0.06) | (0.03) | (0.75) | (0.05) | (0.08) | (0.02) | (0.97) | (0.05) | (0.07) | (0.05) | (0.92) | (0.05) |
| Political Rights | 32.9 | 64.5 | 2.7 | 100.0 | 31.5 | 60.2 | 8.3 | 100.0 | 27.8 | 62.9 | 9.3 | 100.0 |
| | (0.09) | (0.02) | (0.97) | (0.05) | (0.01) | (0.01) | (0.88) | (0.01) | (0.05) | (0.04) | (0.91) | (0.05) |
| Institutional Investor | 43.0 | 53.7 | 3.3 | 100.0 | 45.7 | 50.0 | 4.3 | 100.0 | 36.5 | 58.0 | 5.5 | 100.0 |
| | (0.00) | (0.01) | (0.63) | (0.01) | (0.06) | (0.04) | (0.76) | (0.05) | (0.00) | (0.01) | (0.94) | (0.01) |
| *III. Sample of Developing Countries* | | | | | | | | | | | | |
| Gastil Index | 38.4 | 57.9 | 3.7 | 100.0 | 33.8 | 62.3 | 3.9 | 100.0 | 38.2 | 56.9 | 4.9 | 100.0 |
| | (0.08) | (0.03) | (0.92) | (0.04) | (0.03) | (0.00) | (0.66) | (0.06) | (0.01) | (0.00) | (0.79) | (0.01) |
| Civil Liberties | 32.4 | 62.4 | 5.2 | 100.0 | 37.8 | 60.6 | 1.6 | 100.0 | 39.0 | 57.6 | 3.4 | 100.0 |
| | (0.05) | (0.02) | (0.78) | (0.04) | (0.01) | (0.00) | (0.75) | (0.00) | (0.03) | (0.00) | (0.61) | (0.02) |
| Political Rights | 31.9 | 58.5 | 9.6 | 100.0 | 41.0 | 52.1 | 6.9 | 100.0 | 36.5 | 57.8 | 5.6 | 100.0 |
| | (0.08) | (0.01) | (0.69) | (0.02) | (0.06) | (0.03) | (0.95) | (0.04) | (0.06) | (0.04) | (0.92) | (0.05) |
| Institutional Investor | 43.6 | 52.0 | 4.4 | 100.0 | 38.9 | 58.7 | 2.4 | 100.0 | 34.5 | 61.0 | 4.5 | 100.0 |
| | (0.06) | (0.03) | (0.78) | (0.04) | (0.01) | (0.00) | (0.43) | (0.01) | (0.00) | (0.00) | 0.95 | (0.00) |

*Data source:* Freedom House and *Institutional Investor*, 1970-2000.

The variable $x$ represents the measure of institutional quality, whereas the variable $y$ represents the measure of income inequality, as measured by the Gini coefficient. All feedback measures are expressed as a percentage of the total correlation or linear dependence between institutions and inequality *(F x,y)*. Hence, the causality from *institutions* to *inequality* is represented by $x \rightarrow y$. Similarly, the causality from *inequality* to *institutions* is represented by $y \rightarrow x$. Instantaneous causality is represented by $y \cdot x$ The statistical significance of each feedback measure is shown in parentheses ($p$-values for $\chi^2$ tests).

## Appendix: List of Countries

| | | |
|---|---|---|
| 1 | ARE | United Arab Emirates |
| 2 | ARG | Argentina |
| 3 | AUS | Australia |
| 4 | AUT | Austria |
| 5 | BEL | Belgium |
| 6 | BFA | Burkina Faso |
| 7 | BGD | Bangladesh |
| 8 | BGR | Bulgaria |
| 9 | BHR | Bahrein |
| 10 | BHS | Bahamas |
| 11 | BLR | Bielorussia |
| 12 | BOL | Bolivia |
| 13 | BRA | Brazil |
| 14 | BWA | Botswana |
| 15 | CAN | Canada |
| 16 | CHE | Switzerland |
| 17 | CHL | Chile |
| 18 | CHN | China |
| 19 | CIV | Cote d'Ivoire |
| 20 | COL | Colombia |
| 21 | CRI | Costa Rica |
| 22 | CYP | Cyprus |
| 23 | CZE | Czech Republic |
| 24 | DEU | Germany |
| 25 | DNK | Denmark |
| 26 | DOM | Dominican Republic |
| 27 | DZA | Algeria |
| 28 | ECU | Ecuador |
| 29 | EGY | Egypt |
| 30 | ESP | Spain |
| 31 | EST | Estonia |
| 32 | ETH | Ethiopia |
| 33 | FIN | Finland |
| 34 | FRA | France |
| 35 | GBR | United Kingdom |
| 36 | GHA | Ghana |
| 37 | GIN | Guinea |
| 38 | GNB | Guinea Bissau |
| 39 | GRC | Greece |
| 40 | GTM | Guatemala |
| 41 | HKG | Hong Kong |
| 42 | HND | Honduras |
| 43 | HRV | Croatia |
| 44 | HUN | Hungary |
| 45 | IDN | Indonesia |
| 46 | IND | India |
| 47 | IRL | Ireland |
| 48 | IRN | Iran |
| 49 | IRQ | Iraq |
| 50 | ISR | Israel |
| 51 | ITA | Italy |
| 52 | JAM | Jamaica |
| 53 | JOR | Jordan |
| 54 | JPN | Japan |
| 55 | KAZ | Kazhakstan |
| 56 | KEN | Kenya |
| 57 | KGZ | Kirgyz Rep. |
| 58 | KOR | Korea, Rep. |
| 59 | KWT | Kuwait |
| 60 | LBN | Lebanon |
| 61 | LBY | Libya |
| 62 | LKA | Sri Lanka |
| 63 | LSO | Lesotho |
| 64 | LTU | Lithuania |
| 65 | LUX | Luxembourg |
| 66 | LVA | Latvia |
| 67 | MAR | Morocco |
| 68 | MDG | Madagascar |
| 69 | MEX | Mexico |
| 70 | MLI | Mali |
| 71 | MLT | Malta |
| 72 | MNG | Mongolia |
| 73 | MRT | Mauritania |
| 74 | MUS | Mauritius |
| 75 | MYS | Malaysia |
| 76 | NER | Niger |
| 77 | NGA | Nigeria |
| 78 | NIC | Nicaragua |
| 79 | NLD | Netherlands |
| 80 | NOR | Norway |
| 81 | NPL | Nepal |
| 82 | NZL | New Zealand |
| 83 | OMN | Oman |
| 84 | PAK | Pakistan |
| 85 | PAN | Panama |
| 86 | PER | Peru |
| 87 | PHL | Philippines |
| 88 | PNG | Papua New Guinea |
| 89 | POL | Poland |
| 90 | PRT | Portugal |
| 91 | PRY | Paraguay |
| 92 | QAT | Qatar |
| 93 | ROM | Romania |
| 94 | RUS | Russia |
| 95 | RWA | Rwanda |
| 96 | SAU | Saudi Arabia |
| 97 | SEN | Senegal |
| 98 | SGP | Singapore |
| 99 | SLE | Sierra Leone |
| 100 | SLV | El Salvador |
| 101 | SVK | Slovak Rep. |
| 102 | SVN | Slovenia |
| 103 | SWE | Sweden |
| 104 | SYR | Syria |
| 105 | THA | Thailand |
| 106 | TTO | Trinidad and Tobago |
| 107 | TUN | Tunisia |
| 108 | TUR | Turkey |
| 109 | TWN | Taiwan |
| 110 | TZA | Tanzania |
| 111 | UGA | Uganda |
| 112 | UKR | Ukraine |
| 113 | URY | Uruguay |
| 114 | USA | United States |
| 115 | VEN | Venezuela |
| 116 | VNM | Vietnam |
| 117 | YEM | Yemen |
| 118 | YSR | Yugoslavia |
| 119 | ZAF | South Africa |
| 120 | ZMB | Zambia |
| 121 | ZWE | Zimbabwe |