



## Institutions and economic development in Brazil

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### Abstract

This paper investigates the effects of institutional reforms in Brazil. It first provides a comparative assessment of the level of institutional development of Brazil with other Latin American countries such as Chile and Argentina. It considers institutional indicators on “doing private business”, including those related to the start up costs, employment rigidity, the expropriation of private investment and bankruptcy law. In general, Brazil presents a lower level of institutional development than Chile and Argentina. As an example, the number of procedures to start a business in Brazil is roughly twice as large as in Chile. We evaluate the importance of institutional differences on economic development using data for a wide cross-section of countries. As in Acemoglu, Johnson, and Robinson [Acemoglu, D., Johnson, S., & Robinson, J. A. (2001). The colonial origins of comparative development: An empirical investigation. *American Economic Review*, 91(5), 1369–1398], we use the European mortality rate in the colonial period and the “legal origin” to exploit exogenous variation in the level of institutions. We identify issues where institutional reforms are likely to significantly affect per capita gross domestic product (GDP), the ratio of private credit to GDP and the ratio of investment to GDP. We then construct three indices developed in Tavares [Tavares, J. (2004). Institutions and economic growth in Portugal: a quantitative exploration. *Portuguese Economic Journal*, 3, 49–79] that measure the potential of institutional reforms by using institutional distance, in our case between Brazil and Chile. The most promising reforms for the Brazilian economy, as far as their effects on output per capita, are, in decreasing order: (i) reducing the number of procedures to open a business; (ii) decreasing the average time involved in insolvency proceedings; (iii) increasing labor market flexibility; and (iv) increase effective creditor’s protection.

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## 1. Introduction

Theoretical and empirical studies have shown that institutions have a first order effect on per capita income and on economic development (see Hall and Jones (1999)).<sup>1</sup> Such studies have corroborated the Douglass North (1990) hypothesis that institutions are the underlying determinant of long-run economic performance of nations. Countries with better institutions not only invest more in physical and human capital, but they also use these factors more efficiently.

In economics we cannot use laboratory experiments to determine the impacts of different policies and institutions on economic development. However, in the real world, there are various historical incidents that come close to the concept of “natural experiment”. Some examples, as pointed out by Mancur Olson (1996), are the divergent path of North and South Korea, East and West Germany, and Hong Kong and Mainland China, countries that were divided for political reasons and followed divergent economical paths.<sup>2</sup> Another “experiment” is the colonization of the new world by Europeans. As argued by Acemoglu, Johnson, and Robinson (2001), Europeans adopted very different colonization policies in different colonies, originating a very diverse set of institutions.<sup>3</sup> Where settler mortality was low and long stays palatable, colonizers adopted institutions that provide a legal environment that protected private property and constrained government and elite expropriation of private investment. In contrast, where settler mortality was high, colonizers created an extractive state, whose main purpose was the transfer of as much of the resource base as possible to the colonizers. Since there is path dependence on institutional changes, past institutions are correlated to current institutions and therefore affect current economic performance.

This does not mean that there is “*fate factor*” in economic development and poor countries will necessarily remain poor in the future. There is mobility in development and history is full of place changes in the economic development ladder. Some countries which were poor 40 years ago became rich in one generation (e.g., the so-called economic miracles of Singapore, South Korea and Taiwan). Others, which were relative rich 40 years ago, such as Argentina and Venezuela, have lost their position in the economic ladder and became economic disasters.<sup>4</sup> Finally, some countries have had persistent improvements in development despite being located in stagnated regions, e.g., Botswana and Chile.

<sup>1</sup> Cavalcanti and Novo (2005) also find evidence that institutions contribute significantly to more output per worker. In addition, they show that (i) the marginal contributions of institutions are larger at the bottom quantiles of the (conditional) distribution of output per worker, i.e., poor countries benefit the most from better institutions, and (ii) the conditional distribution of output per worker tends to become less disperse as countries reach higher levels of institutional development. Therefore, institutions are fundamental not only in promoting more development (output per worker) but also in promoting convergence in output per worker across nations.

<sup>2</sup> As an example, North Korea stagnated in the last 40 years while South Korea is one of the growth miracles.

<sup>3</sup> Differently from North, Summerhill, and Weingast (2000), Sokoloff and Engerman (2000, p. 219) point out that “*the relationship between national heritage and economic performance is weaker than popularly thought. . . Having been part of the British Empire was far from a guarantee of economic growth.*” They instead emphasize the role of factor endowment. According to them, the colonies that specialized in the production of sugar and other highly valued crops associated with large slave plantations adopted institutions that protected the elites and restricted the development of the low classes. The distribution of wealth remained highly unequal over time due to institutions that restricted the right to vote and the low investment in public education.

<sup>4</sup> According to the Penn World Table 6.1 in 1960 output per worker in Argentina and South Korea were about 60 and 15% of the United States output per worker, respectively. Forty years later output per worker in Argentina and South Korea were roughly 40 and 60% of the output per worker in the United States, respectively. In 1960 output per worker in Venezuela was about 85% of the American output level and the figure dropped to less than 30% in 2000.

This paper investigates the role of institutions in Brazilian economic development. We consider data from different institutional features. These indicate the regulatory costs of “doing private business”, such as those related to start up costs, employment rigidity, the expropriation of private investment and the bankruptcy law. We then evaluate the importance of these different institutions on economic development using data for a wide cross-section of countries. The economic indicators to be explained are the per capita gross domestic product (GDP), the ratio of private credit to GDP and the ratio of investment to GDP. We initially provide a comparative diagnostic of the level of institutional development of Brazil with respect to other Latin American countries such as Chile and Argentina. We then estimate the impact of selected institutions on those three economic indicators. Following Acemoglu et al. (2001), we use the European mortality rate in the colonial period and the “legal origin” to exploit exogenous variation in (on?) the level of institutions. Using the results from the regressions we construct three indices based on Tavares (2004) that measure the potential of institutional reforms by taking into consideration the institutional distance between Brazil and Chile. These indices measure which reforms have the highest payoff in terms of economic development, which are “less costly” to undertake and which deliver the best result per required effort.

## 2. Empirical strategy

Our basic specification follows closely that of Acemoglu and Johnson (2005) and is given by:

$$Y_c = \alpha + \beta I_c + \mathbf{X}'_c \boldsymbol{\theta}_0 + \varepsilon_c, \quad (1)$$

where  $Y_c$  is the outcome of interest for country  $c$ ;  $I_c$  is a measure of institution and  $\mathbf{X}_c$  represents other control variables.  $\beta$  is the parameter of interest and  $\boldsymbol{\theta}$  captures the effects of a set of control variables in  $Y_c$ .

We focus on three different outcomes: the level of GDP per capita, as a measure of economic development; the ratio of investment to GDP, measuring society’s ability to direct money to productive investment; and the amount of private credit provided by the banking sector in percent of GDP, which provides the level of financial development in country  $c$  (see Acemoglu & Johnson, 2005) (see the definition, description and source of all data used in Appendix A).

One would like to estimate Eq. (1) using OLS regression. However, institutions are endogenous. We do not know the direction of causation, i.e., whether institutions cause development or development implies better institutions. Countries with higher per capita income might, for instance, develop better ways to protect private property and, therefore, adopt better institutions. Therefore, an OLS procedure might yield biased estimates on the effect of institutions on development. In order to address this reverse causality problem we estimate Eq. (1) by two-stage least squares (2SLS). The strategy is to find instrumental variables that are correlated to institutions, but do not directly affect the dependent variables. We follow Acemoglu et al. (2001) and use Europeans settler mortality and legal origins as instrumental variables. The equation for the first stage regressions is given by:

$$I_c = \lambda L_c + \gamma M_c + \mathbf{X}'_c \boldsymbol{\theta}_1 + u_c, \quad (2)$$

where  $L_c$  is a dummy variable with value 1 if the country was colonized by Britain and the English legal code was transferred and 0 if the country was colonized by France, Spain, Belgium, Netherlands, Portugal or Germany and the French legal code was transferred.  $M_c$  is the log of settler mortality for European settlers during the early period of European colonization. It is

102 calculated from the mortality rates of European-born soldiers, sailors and bishops when stationed  
103 in colonies and it measures the effect of local diseases on people without inherited or acquired  
104 immunities and/or conflicts with the indigenous population. According to Acemoglu et al. (2001),  
105 settler mortality determined the colonization strategy and institutions.<sup>5</sup>

### 106 3. The data

107 All variables used in this paper are defined in detail in Appendix A. Here we describe only the  
108 set of institutional variables. We use eight measures for institutions. They indicate the regulatory  
109 costs of “doing private business” and most of them are available at World Bank (2005), unless  
110 stated otherwise.

- 111 • *All procedures required to register a firm*: It indicates the number of procedures that a firm has  
112 to comply in order to obtain a legal status.
- 113 • *Average time involved in insolvency proceedings*: It captures the time, in years, of closing a  
114 business in a given country.
- 115 • *Index of employment rigidity*: It combines the difficulties of hiring and firing in a given country.  
116 It varies from 0 to 100. Higher values indicate more rigidity.
- 117 • *Average cost to register a property*: It corresponds to costs, such as fees, transfer taxes, stamp  
118 duties and any other payment to the property registry, notaries, public agencies or lawyers. The  
119 cost is expressed as a percentage of the property value, calculated assuming a property value  
120 of 50 times income per capita.
- 121 • *Legal rights index – de juri*: It measures the degree to which collateral and bankruptcy laws  
122 facilitate lending. It varies from 0 to 10 and a higher index means that the law facilitates the  
123 access to credit.
- 124 • *Legal rights index – de facto*: This is the legal right index times the rule of law index computed  
125 by Kaufmann, Kraay, and Mastruzzi (2003). A higher index means that the law facilitates  
126 access to credit.
- 127 • *Costs to enforce a debt contract*: They are costs in court and attorney fees, where the use of  
128 attorneys is mandatory or common; or the cost of an administrative debt recovery procedure,  
129 expressed as a percentage of the debt value.
- 130 • *Average protection against risk of expropriation*: These data are from Political Risk Services  
131 (see Acemoglu & Johnson, 2005). It takes a value between 0 and 10 for each country and year,  
132 with 0 corresponding to the lowest protection against expropriation. We use the average value  
133 between 1985 and 1995.

134 Table 1 shows the descriptive statistics of all variables used. Column 1 reports the mean values,  
135 column 2 the median, column 3 the maximum, column 4 the minimum and column 5 the standard  
136 deviation for each variable used in the regressions. The numbers presented reflect the common  
137 sample, which includes 55 observations. Rows 1 through 3 report the descriptive statistics for  
138 the three dependent variables. Rows 4 through 11 report our measures of institutions. Rows 12  
139 through 15 report the other control variables, and the last two rows report the instruments. As it  
140 can be observed, there is a significant variation on the dependent variables.

<sup>5</sup> Both instruments for institutions have been used by several authors, such as Acemoglu et al. (2001), Acemoglu and Johnson (2004) and Easterly and Levine (2003).

Table 1  
Descriptive statistics

|  | Mean    | Median  | Maximum  | Minimum | S.D.   |
|--|---------|---------|----------|---------|--------|
| GDP per capita                             | 6237.16 | 3422.58 | 34430.48 | 559.21  | 7793.4 |
| Private credit-to-output ratio             | 40.16   | 25.29   | 219.54   | 0.97    | 44.0   |
| Investment-to-output ratio                 | 12.91   | 11.69   | 41.78    | 2.44    | 7.5    |
| All procedures required to register a firm | 10.45   | 11      | 17       | 2       | 3.6    |
| Average time in insolvency proceedings     | 3.27    | 3       | 10       | 0.8     | 1.9    |
| Employment rigidity index                  | 44.93   | 47      | 90       | 0       | 22.7   |
| Average cost to register a property        | 8.07    | 6.1     | 27.1     | 0.1     | 5.9    |
| Legal right index – <i>de juri</i>         | 4.71    | 4       | 10       | 0       | 2.2    |
| Legal right index – <i>de facto</i>        | 2.13    | 1.5     | 10       | 0       | 2.36   |
| Costs to enforce a debt contract           | 31.33   | 23.8    | 256.8    | 4.8     | 36.8   |
| Average protection for risk expropriation  | 6.51    | 6.45    | 10       | 3.5     | 1.5    |
| Percentage of Catholics                    | 41.88   | 29.3    | 96.6     | 0.1     | 39.1   |
| Percentage of muslims                      | 23.86   | 1.4     | 99.4     | 0       | 34.1   |
| Percentage of other religions              | 25.22   | 19.1    | 86       | 0.4     | 24.7   |
| Oil producer                               | 0.07    | 0       | 1        | 0       | 0.3    |
| Legal British origin                       | 0.35    | 0       | 1        | 0       | 0.5    |
| Settler mortality                          | 236.83  | 78.1    | 2940     | 8.55    | 477.6  |

Source: See Appendix A.

141 The GDP per capita for the richest country is approximately 60 times larger than the GDP per  
 142 capita of the poorest one. This ratio is even larger when for the credit-to-output ratio. A similar  
 143 variation can be found in other variables. For instance, while in some country it takes only two  
 144 procedures to start a business, in others this figure reach can reach 17. Some countries in the  
 145 sample are mostly Muslim, while others are almost entirely Catholic.

146 Table 2 provides another look at the data. The table reports the institutional indices for selected  
 147 countries, as well as data for per capita GDP, investment-to-output ratio and private credit-to-  
 148 output ratio. We report data for some Latin American and Caribbean countries for which the  
 149 data are available. For comparison reasons we also added three developed countries: the United  
 150 States, Canada and Australia. As can be observed, Brazil presents a lower level of institutional  
 151 development than Chile and Argentina. For instance, the number of procedures to start a business  
 152 in Brazil is roughly twice as large as in Chile and 8.5 times higher than in Canada or Australia.  
 153 The same can be said of the index of employment rigidity, the average cost to register a property  
 154 and the time to close a business. In fact, the number of procedures to start a business and the  
 155 time, in years, to close a business is higher in Brazil than in any other selected country. There  
 156 is also a large variation across countries on how the collateral and bankruptcy laws are designed  
 157 to promote access to credit. The legal right index *de juri* is two times lower in Brazil than in  
 158 Chile (recall that a higher index means that the law facilitates the access to credit). The effective  
 159 legal right index (*de facto*) is roughly 6.6 times higher in Chile than in Brazil. This indicates that  
 160 the bankruptcy and collateral laws are much more effective to facilitate credit in Chile than in  
 161 Brazil. In fact, the total private credit-to-output ratio is roughly two times higher in Chile than in  
 162 Brazil.

163 Our goal is to estimate, for example, what would happen to Brazil's GDP per capita if the  
 164 number of procedures to start a business in this country dropped to the level observed in Chile.  
 165 This would imply cutting procedures from 17 to 9. The expected impact of this and the other  
 institutional changes will be estimated below.

Table 2  
Indices for selected countries

| Region/countries            | All procedures required to register a firm | Average time involved in insolvency proceedings (years) | Employment rigidity index | Average cost to register a property (%) | Legal rights index – <i>de juri</i> | Legal rights index – <i>de facto</i> | Cost to enforce a debt contract (% of debt) | Average protection 1985–1995 | GDP per capita (2002 US\$) | Investment-to-output ratio (%) | Private credit-to-output ratio (%) |
|-----------------------------|--|---|---------------------------|---|-------------------------------------|--------------------------------------|---|------------------------------|----------------------------|--------------------------------|------------------------------------|
| Latin America and Caribbean | 11   | 3.5   | 42                        | 4.8                                     | 3.8                                 | NA                                   | 23.3  | NA                           | NA                         | NA                             | NA                                 |
| Argentina                   | 15   | 2.8   | 48                        | 8.3                                     | 3                                   | 0.75                                 | 15  | 6.39                         | 10.134                     | 15.71                          | 19.24                              |
| Bolivia                     | 15   | 1.8   | 40                        | 5                                       | 3                                   | 1.5                                  | 10.6  | 5.64                         | 2.384                      | 10.12                          | 54.02                              |
| Brazil                      | 17   | 10  | 56                        | 4                                       | 2                                   | 0.5                                  | 15.5  | 7.91                         | 7.480                      | 16.58                          | 34.95                              |
| Chile                       | 9  | 5.6   | 24                        | 1.3                                     | 4                                   | 3.32                                 | 10.4  | 7.82                         | 9.432                      | 21.04                          | 62.10                              |
| Colombia                    | 12   | 3   | 57                        | 3.5                                     | 4                                   | 0.68                                 | 18.6  | 7.32                         | 6.243                      | 12.11                          | 30.13                              |
| Costa Rica                  | 11   | 3.5   | 39                        | 3.6                                     | 4                                   | NA                                   | 41.2  | 7.05                         | 8.453                      | 16.45                          | 22.28                              |
| Dominican Republic          | 10   | 3.5   | 44                        | 5.1                                     | 4                                   | 1.32                                 | 35  | 6.18                         | 6.682                      | 13.55                          | 32.30                              |
| Ecuador                     | 14   | 4.3   | 58                        | 6.7                                     | 3                                   | 1.5                                  | 15.3  | 6.55                         | 3.402                      | 15.29                          | 25.89                              |
| Mexico                      | 9  | 1.8   | 51                        | 5.3                                     | 2                                   | 0.66                                 | 20  | 7.5                          | 8.797                      | 19.23                          | 20.52                              |
| Paraguay                    | 17   | 3.9   | 59                        | 2                                       | 3                                   | 0.99                                 | 30.4  | 6.95                         | 4.490                      | 11.95                          | 23.66                              |
| Peru                        | 10   | 3.1   | 48                        | 3.2                                     | 2                                   | 1                                    | 34.7  | 5.77                         | 4.820                      | 19.05                          | 23.25                              |
| Uruguay                     | 11   | 2.1   | 31                        | 7.1                                     | 4                                   | 1.68                                 | 25.8  | 7                            | 7.474                      | 11.28                          | 42.48                              |
| Venezuela                   | 13   | 4   | 38                        | 2.1                                     | 4                                   | 0.68                                 | 28.7  | 7.14                         | 5.259                      | 13.66                          | 13.66                              |
| United States               | 5  | 2   | 3                         | 0.5                                     | 7                                   | 5.81                                 | 7.5   | 10                           | 34.430                     | 21.25                          | 219.54                             |
| Canada                      | 2  | 0.8   | 14                        | 1.7                                     | 7                                   | 7                                    | 12  | 16.1                         | 28.154                     | 24.64                          | 81.31                              |
| Australia                   | 2  | 1   | 17                        | 7.1                                     | 9                                   | 9                                    | 14.4  | 9.32                         | 25.346                     | 23.33                          | 84.50                              |

Source: See Appendix A.

#### 166 4. Empirical results

167 In this section we estimate the effects of institutions on economic performance. Table 3  
168 below contains the regression results on how institutions affect output per capita. We use a  
169 2SLS procedure as described above. Panel A and panel C report the second and first stage  
170 regression results, respectively. For comparison purpose we also report on panel B the OLS  
171 estimated coefficient of institutions, as described in Eq. (1), and the  $R^2$ . According to panel B  
172 the  $R^2$  of our most simple specification captures a very large share of the total variability in per  
173 capita GDP across countries. Observe that all indices of institutional quality are normalized to a  
174 0–10.<sup>6</sup>

175 All regression coefficients on measured institutions have the expected sign and are sta-  
176 tistically significant at 95% confidence level, as shown in Table 3, panel A, columns 1–8.  
177 As expected, low start up costs, an efficient judiciary system, high labor market flexibility,  
178 low cost to register a property, high creditor’s protection, low expropriation and repudia-  
179 tion risks are all associated with higher per capita income. For instance, an increase in one  
180 unit in the index of required procedures to open a business decreases long-run output per  
181 capita by 25% if we use the OLS estimate or 59% according to the 2SLS procedure. Notice  
182 that the cost to enforce a debt contract has the largest coefficient in absolute value, while  
183 the legal right index has the lowest one. This, however, does not imply that reforms in the  
184 bankruptcy and collateral laws would not have any effect on the Brazilian per capita out-  
185 put level. The impact of reforms on economic performance depends also on the “distance” in  
186 terms of institutional development between Brazil and other countries, i.e., what is there to be  
187 reformed.

188 In order to check the robustness of our results we also run the log of output per capita on  
189 institutions and other additional control variables as suggested by Easterly and Levine (2003).  
190 Table 4 reports the estimated coefficients in the second stage regressions. For the sake of space we  
191 omit the first-stage results. We observe that the sign and statistical significance of all coefficients on  
192 measured institutions are robust to the introduction of additional control variables. The coefficient  
193 on the cost to enforce a debt contract remains the largest in absolute value, while the legal right  
194 index remains the smallest.

195 We also investigate how institutions affect two additional economic variables: the investment-  
196 to-output ratio and the private credit-to-output ratio. Results are reported in Appendix B.  
197 Table 9 in Appendix B shows that all measured institutions have a first-order effect on the  
198 investment-to-output ratio. Results, however, are not robust to the introduction of additional  
199 control variables (see Table 10) as in Easterly and Levine (2003). The coefficients on the average  
200 time in insolvency and the *de facto* creditor protection are not statistically different from  
201 zero in the presence of additional exogenous variables. For the credit-to-output ratio all esti-  
202 mated coefficients on measured institutions are statistically different from zero and results are  
203 robust to the introduction of exogenous control variables (see Tables 11 and 12 in Appendix  
B).

<sup>6</sup> The institutional indices presented use different scales, as shown in Table 1 above. For comparison reasons we normalized these variables using the following formula:  $10 \times (value - minimum)/(maximum - minimum)$ , where *value* corresponds to the reported value for each country, and *minimum* and *maximum* are, respectively, the minimum and the maximum observed values for the measured institution.

Table 3  
 Log of GDP per capita and institutions

|   | Panel A: second-stage regression results          |                 |                 |                 |                 |                 |                 |                 |
|---|---|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
|   | Dependent variable: log of GDP per capita in 2002 |                 |                 |                 |                 |                 |                 |                 |
|   | 1   | 2               | 3               | 4               | 5               | 6               | 7               | 8               |
| All procedures required to open a business                    | -0.59** (-6.69)                                   |                 |                 |                 |                 |                 |                 |                 |
| Average time involved in insolvency proceedings               |   | -0.76** (-2.74) |                 |                 |                 |                 |                 |                 |
| Index of employment rigidity                                  |   |                 | -0.38** (-5.02) |                 |                 |                 |                 |                 |
| Average cost to register a property (% of the property value) |   |                 |                 | -0.59** (-3.96) |                 |                 |                 |                 |
| Legal right index   |   |                 |                 |                 | 0.27** (3.30)   |                 |                 |                 |
| Legal right index × rule of law                               |   |                 |                 |                 |                 | 0.38** (6.07)   |                 |                 |
| Costs to enforce a debt contract (% of debt value)            |   |                 |                 |                 |                 |                 | -1.66** (-3.07) |                 |
| Average protection against risk of expropriation              |   |                 |                 |                 |                 |                 |                 | 0.85** (6.62)   |
|   | Panel B: results in equivalent OLS estimates      |                 |                 |                 |                 |                 |                 |                 |
|   | Dependent variable: log of GDP per capita in 2002 |                 |                 |                 |                 |                 |                 |                 |
| Measure of institutions                                       | -0.25** (-4.16)                                   | -0.16** (-1.91) | -0.24** (-4.68) | -0.30** (-6.02) | 0.20** (3.02)   | 0.25** (5.71)   | -0.30** (-3.30) | 0.53** (10.49)  |
| R <sup>2</sup>  | 0.18  | 0.14            | 0.13            | 0.20            | 0.14            | 0.38            | 0.21            | 0.54            |
|   | Panel C: first-stage regression results           |                 |                 |                 |                 |                 |                 |                 |
|   | Dependent variable: measure of institution        |                 |                 |                 |                 |                 |                 |                 |
| Log settler mortality   | 0.72** (3.29)                                     | 0.22 (1.36)     | 0.79** (3.48)   | 1.06** (4.63)   | -0.40** (-2.37) | -0.82** (-3.87) | 0.32** (3.05)   | -0.55** (-3.94) |
| English legal origin  | -1.06** (-1.94)                                   | -1.02* (-1.73)  | -1.78** (-2.75) | 0.35 (0.64)     | 2.65** (5.88)   | 2.05** (4.36)   | -0.25 (-1.00)   | 0.65* (1.87)    |
| Number of observations  | 60  | 58              | 56              | 56              | 59              | 55              | 58              | 64              |

*t*-statistics are in parentheses.

\* Significant at 90% confidence level.

\*\* Significant at 95% confidence level.



Table 4  
 Log of GDP per capita and institutions with additional control variables

|   | Panel A: second-stage regression results          |                 |                 |                  |                 |                 |                 |                 |
|---|---|-----------------|-----------------|------------------|-----------------|-----------------|-----------------|-----------------|
|   | Dependent variable: log of GDP per capita in 2002 |                 |                 |                  |                 |                 |                 |                 |
|   | 1   | 2               | 3               | 4                | 5               | 6               | 7               | 8               |
| All procedures required to open a business                    | -1.02** (-2.14)                                   |                 |                 |                  |                 |                 |                 |                 |
| Average time involved in insolvency proceedings               |   | -1.05 (-1.24)   |                 |                  |                 |                 |                 |                 |
| Index of employment rigidity                                  |   |                 | -0.30** (-2.67) |                  |                 |                 |                 |                 |
| Average cost to register a property (% of the property value) |   |                 |                 | -0.52** (-3.25)  |                 |                 |                 |                 |
| Legal right index   |   |                 |                 |                  | 0.27** (2.22)   |                 |                 |                 |
| Legal right index × rule of law                               |   |                 |                 |                  |                 | 0.39** (4.09)   |                 |                 |
| Costs to enforce a debt contract (% of debt value)            |   |                 |                 |                  |                 |                 | -1.37** (-2.22) |                 |
| Average protection against risk of expropriation              |   |                 |                 |                  |                 |                 |                 | 0.82* (5.58)    |
| Catholics   | 0.06* (1.72)                                      | 0.04 (0.85)     | 0.01 (0.05)     | -0.03** (-3.71)  | 0.01 (0.19)     | 0.001 (0.46)    | -0.004 (-0.41)  | 0.007 (0.91)    |
| Muslims   | 0.034 (1.205)                                     | 0.02 (0.522)    | -0.006 (-0.404) | -0.03** (-4.182) | -0.01 (-0.94)   | -0.007 (-0.67)  | -0.01* (-1.78)  | 0.001 (0.14)    |
| Other religions   | 0.04 (1.35)                                       | 0.04 (0.69)     | -0.01 (-0.64)   | -0.04** (-3.95)  | -0.01 (-0.79)   | -0.01 (-1.14)   | 0.001 (0.13)    | -0.004* (-0.38) |
| Ethno fractionalization                                       | 0.05 (0.04)                                       | -2.41** (-2.74) | -1.49** (-2.61) | -0.78 (-1.11)    | -2.10** (-3.88) | -1.59** (-3.08) | -1.59** (-2.79) | -0.72 (-1.45)   |
| Oil producer  | 1.16 (1.27)                                       | 1.07 (0.99)     | 0.17 (0.38)     | 0.91* (1.69)     | 0.20 (0.43)     | 0.70** (2.05)   | 2.02* (1.81)    | -0.28 (-1.07)   |
| Number of observations  | 51  | 49              | 48              | 48               | 51              | 47              | 49              | 54              |

t-statistics are in parentheses.

\* Significant at 90% confidence level.

\*\* Significant at 99% confidence level.

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204 **5. The impacts of institutional reforms in Brazil**

We now focus on the impacts of institutional reform on the Brazilian economy. We use three indices based on Tavares (2004).<sup>7</sup> We briefly describe these indices and we refer to Tavares (2004) for more details. Our goal is to evaluate the benefits of reforming each one of the measured institutions. Three summary indicators will be used. The first one is the impact of the reform on the economic variable being considered, the second one is the required reform effort and the last one is the efficiency of the reform. The definitions are presented below. In all cases, we take the institutions of Chile as a reference and compute the Brazilian indices accordingly. Our first indicator is:

$$\begin{aligned} &\text{Impact on the economic variable } j \\ &= [\text{Institution } i, \text{ Chile} - \text{Institution } i, \text{ Brazil}] \\ &\quad * \text{Regression coefficient (measured institution)} j \end{aligned}$$

205 This indicator measures the impact on the economic variable  $j$  (GDP, investment-to-output ratio  
206 and private credit-to-output ratio) that would result from a specific institutional reform elevating  
207 Brazil to the Chilean level. A higher level of this index means a stronger effect on, for instance,  
208 long-run output per capita.

209 The drawback of this measure is that it does not take into account the “*cost of reform*”.  
210 It might be too costly to reform a specific institution in Brazil to bring it to the Chilean  
211 level. An expedient, though imperfect, way to gauge the cost of reform is to base the  
212 “*cost of reform index*” on the distance between current institutions in Brazil and in Chile,  
213 that is, on the percentage change required. Required reform effort  $i = [\text{Institution } i, \text{ Chile} -$   
214  $\text{Institution } i, \text{ Brazil}] / [\text{Institution } i, \text{ Brazil}]$ .

215 The last next index, the “*efficiency of reform*”, combines the impact of a reform on economic  
216 performance and the required reform effort:  
217

$$\text{Efficiency of reform } i = \text{Impact on economic variable } j / \text{required reform effort } i$$

218 A higher index of “*efficiency of reform*” indicates a higher percent increase in the economic  
219 variable per unit of reform effort. The value of 1 denotes an increase of 1% on the economic  
220 variable for a reform effort of 100%.  
221

222 **5.1. Impact of institutional reforms on long-run per capita output**

223 Table 5 reports the impacts of institutional reforms on long-run output per capita. The first  
224 two columns present the data for each institution for Brazil and Chile, respectively. Observe that  
225 columns 1 and 2 are normalized to a 0–10 interval. The third column reports the difference between  
226 the index observed in Chile and in Brazil. The fourth column shows the coefficients associated to  
227 each institution. We use the coefficients estimated using 2SLS with additional control variables,  
228 which are reported in Table 4. Column 5 presents the impact of each institutional change on output  
229 per capita, while column 6 reports the required effort of each reform. Finally, column 7 reports  
230 the efficiency of reform.

<sup>7</sup> In Tavares (2004), the dependent variable is the average growth rate of per capita GDP in the 1960–2000 period. This should naturally translate into different levels of per capita GDP in the long run, as used here.

Table 5  
 Impact on long-run output per capita

| Institutions  | Brazil | Chile | Difference | Coefficient | Impact on | Required effort | Efficiency of reform (absolute value times coefficient) |
|---|--------|-------|------------|-------------|-----------|-----------------|---|
|   | 1      | 2     | 3 (2 – 1)  | 4           | 5 (3*4)   | 6 (3/1)         | 7 (5/6)   |
| All procedures required to open a business                    | 9.444  | 5.000 | -4.444     | -1.022      | 4.542     | -0.471          | 9.652   |
| Average time involved in insolvency proceedings               | 10.000 | 6.400 | -3.600     | -1.055      | 3.798     | -0.360          | 10.550  |
| Index of employment rigidity                                  | 6.222  | 2.667 | -3.556     | -0.304      | 1.081     | -0.571          | 1.892   |
| Average cost to register a property (% of the property value) | 1.320  | 0.429 | -0.891     | -0.523      | 0.466     | -0.675          | 0.690   |
| Legal right index   | 2.000  | 4.000 | 2.000      | 0.275       | 0.550     | 1.000           | 0.550   |
| Legal right index × rule of law                               | 0.526  | 3.495 | 2.968      | 0.394       | 1.170     | 5.640           | 0.207   |
| Costs to enforce a debt contract (% of debt value)            | 0.614  | 0.412 | -0.202     | -1.376      | 0.278     | -0.329          | 0.844   |
| Average protection against risk of expropriation              | 7.910  | 7.820 | -0.090     | 0.82        | -0.074    | -0.011          | -6.486  |

231 Both in Table 5 and Fig. 1 (represented in darker bars), we observe that the three institutional  
 232 reforms with stronger effects on Brazilian output per capita are, in decreasing order of impor-  
 233 tance: (1) the reduction in the start up cost of firms; (2) reduction in average time of insolvency  
 234 proceedings; and (3) improvements in the effective creditor’s protection. Observe that the impact  
 235 of the written creditor’s protection on long-run output per capita accounts for roughly half of the

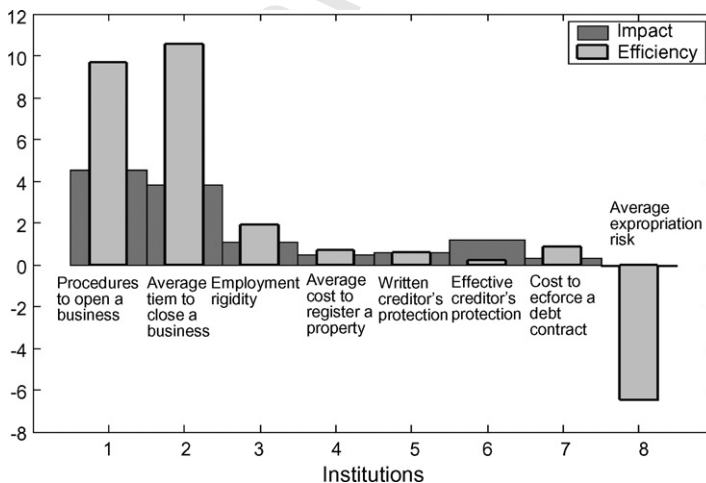


Fig. 1. Impact and efficiency of institutional reforms on long-run output per capita.

Table 6  
Impacts on the investment rate

| Institutions  | Brazil | Chile | Difference | Coefficient | Impact on | Required effort | Efficiency of reform (absolute value times coefficient) |
|---|--------|-------|------------|-------------|-----------|-----------------|---|
|   | 1      | 2     | 3 (2 – 1)  | 4           | 5 (3*4)   | 6 (3/1)         | 7 (5/6)   |
| All procedures required to open a business                    | 9.444  | 5.000 | –4.444     | –6.542      | 29.076    | –0.471          | 61.786  |
| Index of employment rigidity                                  | 6.222  | 2.667 | –3.556     | –2.387      | 8.487     | –0.571          | 14.852  |
| Average cost to register a property (% of the property value) | 1.320  | 0.429 | –0.891     | –3.372      | 3.005     | –0.675          | 4.451   |
| Legal index   | 2.000  | 4.000 | 2.000      | 2.66        | 5.320     | 1.000           | 5.320   |
| Costs to enforce a debt contract (% of debt value)            | 0.614  | 0.412 | –0.202     | –11.91      | 2.404     | –0.329          | 7.308   |
| Average protection against risk of expropriation              | 7.910  | 7.820 | –0.090     | 5.491       | –0.494    | –0.011          | –43.434   |

236 impact of the effective creditor's protection.<sup>8</sup> Notice that the reform that would require the largest  
 237 effort is the one associated to the effective creditor's protection. As a result this reform has the  
 238 lowest efficiency among the institutional reforms considered here. Reforms with larger efficiency  
 239 in term of impacts on long-run output and effort required are those associated to the procedures to  
 240 open and to close a business. Quantitatively, a bankruptcy and judiciary reform that would reduce  
 241 the average time in insolvency proceedings from the Brazilian to the Chilean level would increase  
 242 Brazilian GDP per capita by roughly 300%.<sup>9</sup>

### 243 5.2. Impact of institutional reforms on the investment rate

244 Table 6 is similar to Table 5, but we now investigate the impacts of institutional reforms on  
 245 the investment rate. Before we analyze Table 6, it is important to highlight that the estimated  
 246 coefficient of the investment equation with additional controls is not statistically significant for  
 247 two institutions: average time involved in insolvency proceedings and the effective creditor's  
 248 protection (see Table 10 in Appendix B). Therefore, Table 6 does not report their impacts on the  
 249 investment rate. The institutional reform with the strongest effect on the investment rate is the  
 250 reduction in the cost to start up a business. Its quantitative impact on the investment rate is roughly  
 251 three times higher than the impact of labor market reforms, which has the second stronger effect  
 252 on the investment rate. In terms of efficiency the most promising reforms are the reduction in the  
 253 procedures to open a business, labor market flexibility and the reduction in the cost to enforce a  
 254 debt contract (see also Fig. 2 below).

### 255 5.3. Impact of institutional reforms on the credit to output ratio

256 Table 7 reports the impact, effort required and efficiency of each institutional reform on the  
 257 credit-to-output ratio (see also Fig. 3). The reform with the strongest impact and efficiency on the

<sup>8</sup> Compared to Chile, Brazil has lower risk of expropriation of investment.

<sup>9</sup> GDP per capita in Brazil would increase to a level similar to what is observed in Australia.

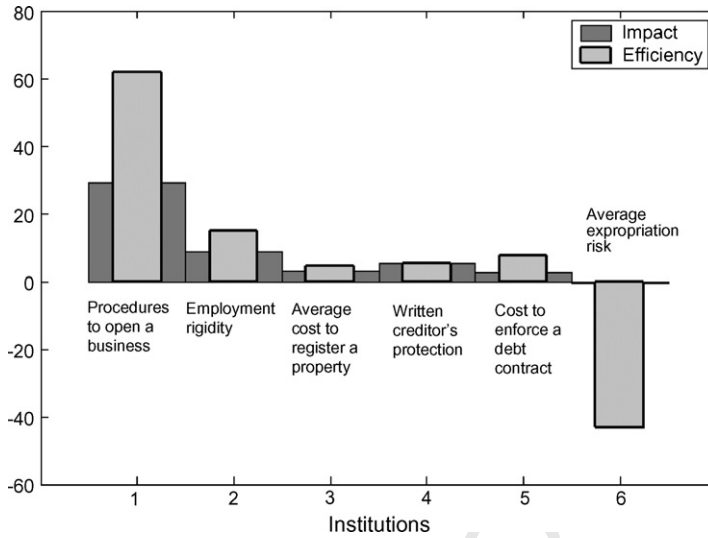


Fig. 2. Impact and efficiency of institutional reforms on the investment rate.

credit-to-output ratio is the reform of bankruptcy law to reduce the average time of insolvency proceedings. Reforms to reduce the number of procedures required to open a business would also have a sizeable effect on the credit-to-output ratio, as well as reforms that increase labor market flexibility in Brazil. As we noticed earlier, the observed average protection against risk of expropriation is higher in Brazil than in Chile. Therefore, decreasing the average protection from the Brazilian to the Chilean level would reduce the credit-to-output ratio.

Table 7  
Impact on the credit-to-output ratio

| Institutions  | Brazil | Chile | Difference | Coefficient | Impact on | Required effort | Efficiency of reform (absolute value times coefficient) |
|---|--------|-------|------------|-------------|-----------|-----------------|---|
|   | 1      | 2     | 3 (2 – 1)  | 4           | 5 (3*4)   | 6 (3/1)         | 7 (5/6)   |
| All procedures required to open a business                    | 9.444  | 5.000 | -4.444     | -40.77      | 181.213   | -0.471          | 385.078   |
| Average time involved in insolvency proceedings               | 10.000 | 6.400 | -4.400     | -53.78      | 236.636   | -0.440          | 537.810   |
| Index of employment rigidity                                  | 6.222  | 2.667 | -3.556     | -12.87      | 45.764    | -0.571          | 80.086  |
| Average cost to register a property (% of the property value) | 1.320  | 0.429 | -0.891     | -21.65      | 19.289    | -0.675          | 28.576  |
| Legal index   | 2.000  | 4.000 | 2.000      | 11.384      | 22.768    | 1.000           | 22.768  |
| Legal right index × rule of law                               | 0.526  | 3.495 | 2.968      | 16.985      | 50.419    | 5.640           | 8.939   |
| Costs to enforce a debt contract (% of debt value)            | 0.614  | 0.412 | -0.202     | -63.98      | 12.918    | -0.329          | 39.261  |
| Average protection against risk of expropriation              | 7.910  | 7.820 | -0.090     | 34.276      | -3.085    | -0.011          | -271.123  |

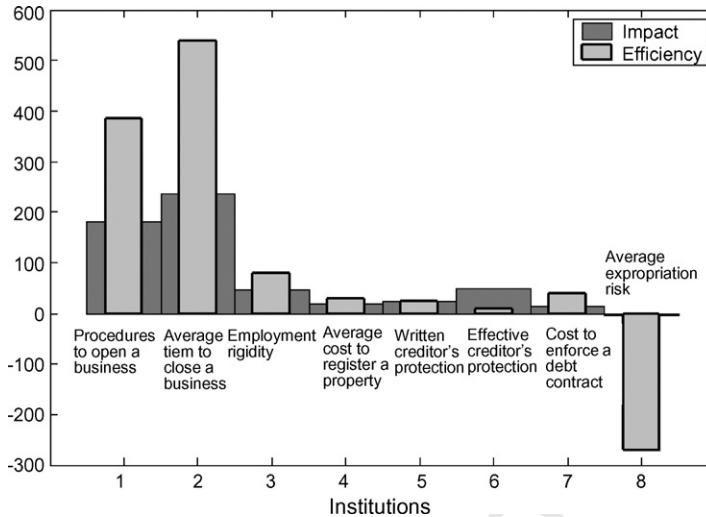


Fig. 3. Impacts and efficiency of institutional reforms on the credit-to-output ratio.

264 **6. Concluding remarks and policy implications**

265 This paper investigated the effects of institutional reforms on long-run output per capita, on the  
 266 investment rate and on the credit-to-output ratio. Regarding their effects on long-run output per  
 267 capita, we found that the most promising reforms for the Brazilian economy are: (i) the reduction  
 268 of the procedures to open a business; (ii) the decrease in the average time involved in insolvency  
 269 proceedings; (iii) increased labor market flexibility; and (iv) the increase in effective creditor's  
 270 protection. We found similar results for the effects of institutional reforms on the ratio of total  
 271 private credit to GDP and on the investment rate.

272 From our estimates it is clear that the Brazilian economy would benefit substantially from  
 273 institutional reforms that improve the average level of institutional development. For instance, the  
 274 reduction in the number of procedures to open a business from 17 to 9 – the Chilean level – is  
 275 quite significant. However, it is important to observe that the simple reduction of legal procedures  
 276 in Brazil would not necessarily strongly affect its economy since we are not controlling for other  
 277 factors that can interact with the direct impact of the number of procedures, such as the overall  
 278 quality of the Brazilian and Chilean bureaucracies. In fact, the number of legal procedures to open  
 279 a business in Brazil is twice what is observed in Chile, but the average time to register a business  
 280 is about 5.6 times higher. Therefore, Brazil should not only simplify its legal code to register a  
 281 firm as in Chile, but should also improve the efficiency of its bureaucracy.

282 We also found that policies toward the reduction of the average time involved in insolvency  
 283 proceedings from the Brazilian to the Chilean level would have a strong impact on the Brazilian  
 284 economy. According to our findings, the recent Brazilian bankruptcy reform that improved  
 285 liquidation and reorganization procedures, increased creditor's protection and improved the possi-  
 286 bility of extra-judicial agreements might have a strong impact on the Brazilian economy and on  
 287 its credit market. In a recent study, Araújo and Funchal (2005) corroborate these findings (see also  
 288 Antunes, Cavalcanti, & Villamil, 2006). However, it is not only the written law that is important.  
 289 The judiciary is crucial to enforce the law. As emphasized by Araújo and Funchal (2005), the  
 290 average time in insolvency proceedings in Brazil is about twice of what is observed in Chile, not

Table 8  
Data description and sources

Panel A: Dependent variables

*Log of GDP per capita*: This is the gross domestic product (GDP) per capita in 2002 US\$ adjusted for purchasing power parity from the World Development indicators.

*Investment-to-GDP ratio*: Ratio of investment to DGP in current prices, average from 1995 to 2002. Data are from the World Development indicator.

*Credit-to-GDP ratio*: This is the average from 1995 to 2002 of private credit over output. Data are from the World Development indicator.

Panel B: Institutions (most of them are from World Bank, 2005)

*All procedures required to register a firm*: It was developed by Djankov, La Porta, Lopez-de-Silanes, and Shleifer (2002) and indicates the number of procedures that a firm has to comply in order to obtain a legal status.

*Average time involved in insolvency proceedings*: This index was developed by Djankov, La Porta, Lopez-de-Silanes, and Shleifer (2003) and captures the time, in years, of closing a business in a given country.

*Employment rigidity index*: It combines the difficulties of hiring and firing in a given country. This methodology is originally developed by Botero, Djankov, La Porta, and Lopez-De-Silanes (2004). It varies from 0 to 100. Higher values indicate more rigidity.

*Average cost to register a property*: It corresponds to costs, such as fees, transfer taxes, stamp duties and any other payment to the property registry, notaries, public agencies or lawyers. The cost is expressed as a percentage of the property value, calculated assuming a property value of 50 times income per capita. Higher values indicate higher cost (see World Bank, 2005).

*Legal rights index – de juri*: It measures the degree to which collateral and bankruptcy laws facilitate lending. This index was developed by Djankov, MacLiesh, and Shleifer (2005) adapted from La Porta et al. (1998).

*Legal rights index – de facto*: We follow Araújo and Funchal (2005) and define this indeed as the legal right index times the rule of law index computed by Kaufmann et al. (2003), measure the degree to which laws are enforced in society. It varies from –2.5 to 2.5. Higher scores indicate that agents have higher confidence in the rules of society.

*Costs to enforce a debt contract*: They are costs in court and attorney fees, where the use of attorneys is mandatory or common; or the cost of an administrative debt recovery procedure, expressed as a percentage of the debt value. Higher values indicate higher cost. This index was developed by Djankov et al. (2003).

*Average protection against risk of expropriation*: These data are from Political Risk Services (see Acemoglu & Johnson, 2005). It takes a value between 0 and 10 for each country and year, with 0 corresponding to the lowest protection against expropriation. We use the average value between 1985 and 1995.

We normalize all indexes to a 0–10 interval. In order to assess how institutions affect long-run economic performance, we use three independent variables. They are:

Panel C: Set of control variables (similar to the data used in Easterly & Levine, 2002)

*Ethnolinguistic diversity*: It measures the probability that two randomly selected individuals from a country are from different ethnolinguistic groups.

*Religion*: We use dummies variables for Catholics, muslims and others. Religion can affect economic development by shaping national views regarding property rights, competition and the role of the state. *Oil*: An indicator variable that takes value equal to 1 if a country is an oil producer.

Panel D: Instrumental variables (similar to the data used in Acemoglu & Johnson, 2005).

*Log of settler mortality*: Log of estimated mortality for European settler before 1850.

*English legal origin*: Indicator variable that takes value 1 if country was colonized by Britain and Legal English code was transferred.

*French legal origin*: Indicator variable that takes value 1 if country was colonized by France, Belgium, Netherlands, Portugal or Germany and French legal code was transferred.

Table 9  
 Investment-to-GDP ratio and institutions

|   | Panel A: second-stage regression results            |                 |                 |                 |                 |                  |                 |                 |
|---|---|-----------------|-----------------|-----------------|-----------------|------------------|-----------------|-----------------|
|   | Dependent variable: investment-to-GDP ratio         |                 |                 |                 |                 |                  |                 |                 |
|   | 1   | 2               | 3               | 4               | 5               | 6                | 7               | 8               |
| All procedures required to open a business                    | -3.68** (-4.40)                                     |                 |                 |                 |                 |                  |                 |                 |
| Average time involved in insolvency proceedings               |   | -5.56** (-2.58) |                 |                 |                 |                  |                 |                 |
| Index of employment rigidity                                  |   |                 | -2.11** (-4.91) |                 |                 |                  |                 |                 |
| Average cost to register a property (% of the property value) |   |                 |                 | -2.73** (-2.93) |                 |                  |                 |                 |
| Legal right index   |   |                 |                 |                 | 2.13* (3.97)    |                  |                 |                 |
| Legal right index × rule of law                               |   |                 |                 |                 |                 | -5.71*** (-1.98) |                 |                 |
| Costs to enforce a debt contract (% of debt value)            |   |                 |                 |                 |                 |                  | -9.64** (-2.67) |                 |
| Average protection against risk of expropriation              |   |                 |                 |                 |                 |                  |                 | 5.06* (4.49)    |
|   | Panel B: results in equivalent OLS estimates        |                 |                 |                 |                 |                  |                 |                 |
|   | Dependent variable: investment-to-GDP ratio in 2002 |                 |                 |                 |                 |                  |                 |                 |
| Measure of institutions                                       | -1.75** (-4.44)                                     | -1.79 (-1.79)   | -1.28** (-3.66) | -1.39** (-3.62) | 2.01** (3.91)   | -0.85** (-2.52)  | -1.24** (-2.81) | 3.14** (5.69)   |
| R <sup>2</sup>  | 0.15  | 0.10            | 0.12            | 0.11            | 0.14            | 0.21             | 0.10            | 0.41            |
|   | Panel C: first-stage regression results             |                 |                 |                 |                 |                  |                 |                 |
|   | Dependent variable: measure of institution          |                 |                 |                 |                 |                  |                 |                 |
| Log settler mortality   | 0.72** (3.29)                                       | 0.22 (1.36)     | 0.78** (3.49)   | 1.06** (4.63)   | -0.40** (-2.37) | 0.57** (2.19)    | 0.32* (3.05)    | -0.55** (-3.95) |
| English legal origin  | -1.06* (-1.94)                                      | -1.02* (-1.73)  | -1.78** (-2.76) | 0.35 (0.64)     | 2.65* (5.88)    | 0.16 (0.23)      | -0.25 (-1.01)   | 0.65* (1.87)    |
| R <sup>2</sup>  | 0.31  | 0.10            | 0.38            | 0.40            | 0.52            | 0.10             | 0.10            | 0.32            |
| Number of observations  | 60  | 58              | 56              | 56              | 59              | 43               | 58              | 64              |

t-statistics are in parentheses.

\* Significant at 90% confidence level.

\*\* Significant at 95% confidence level.



Table 10  
Investment-to-GDP ratio and institutions with additional control variables

| Panel A: second-stage regression results                      |                 |                |                 |                 |                 |                |                  |               |
|---|-----------------|----------------|-----------------|-----------------|-----------------|----------------|------------------|---------------|
| Dependent variable: investment-to-output ratio                |                 |                |                 |                 |                 |                |                  |               |
|   | 1               | 2              | 3               | 4               | 5               | 6              | 7                | 8             |
| All procedures required to open a business                    | -6.54** (-2.06) |                |                 |                 |                 |                |                  |               |
| Average time involved in insolvency proceedings               |                 | -11.44 (-1.16) |                 |                 |                 |                |                  |               |
| Index of employment rigidity                                  |                 |                | -2.39** (-2.59) |                 |                 |                |                  |               |
| Average cost to register a property (% of the property value) |                 |                |                 | -3.37** (-2.51) |                 |                |                  |               |
| Legal right index   |                 |                |                 |                 | 2.66** (3.14)   |                |                  |               |
| Legal right index × rule of law                               |                 |                |                 |                 |                 | -16.54 (-0.65) |                  |               |
| Costs to enforce a debt contract (% of debt value)            |                 |                |                 |                 |                 |                | -11.91** (-2.08) |               |
| Average protection against risk of expropriation              |                 |                |                 |                 |                 |                |                  | 5.49** (3.48) |
| Catholics   | 0.47* (1.66)    | 0.57 (1.01)    | 0.05 (0.65)     | -0.191* (-2.70) | 0.11 (1.27)     | -0.06 (-0.14)  | 0.05 (0.44)      | 0.14 (1.30)   |
| Muslims   | 0.31 (1.26)     | 0.41 (0.86)    | 0.03 (0.31)     | -0.17** (-2.49) | 0.04 (0.51)     | 0.14 (0.33)    | -0.01 (-0.10)    | 0.12 (1.05)   |
| Other religions   | 0.37 (1.47)     | 0.59 (0.92)    | 0.00 (-0.05)    | -0.21** (-2.80) | 0.06 (0.63)     | -0.41 (-0.45)  | 0.14 (0.93)      | 0.10 (0.82)   |
| Ethno fractionalization                                       | 4.35 (0.42)     | -10.77 (-1.09) | -3.19 (-0.67)   | 0.20 (0.04)     | -7.66** (-2.06) | 63.64 (0.53)   | -4.07 (-0.75)    | -0.10 (-0.02) |
| Oil producer  | 9.02* (1.74)    | 11.28 (1.09)   | 2.35 (0.68)     | 7.47 (1.54)     | 2.08 (0.72)     | -16.94 (-0.46) | 18.10* (1.78)    | -2.26 (-0.65) |
| Number of observations  | 51              | 49             | 48              | 48              | 51              | 37             | 49               | 54            |

*t*-statistics are in parentheses.

\* Significant at 90% confidence level.

\*\* Significant at 95% confidence level.

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Table 11  
 Private credit-to-GDP ratio and institutions

|   | Panel A: second-stage regression results                    |                  |                  |                  |                 |                 |                  |                |
|---|---|------------------|------------------|------------------|-----------------|-----------------|------------------|----------------|
|   | Dependent variable: credit-to-GDP ratio                     |                  |                  |                  |                 |                 |                  |                |
|   | 1   | 2                | 3                | 4                | 5               | 6               | 7                | 8              |
| All procedures required to open a business                    | -25.76** (-4.49)  |                  |                  |                  |                 |                 |                  |                |
| Average time involved in insolvency proceedings               |   | -41.76** (-2.62) |                  |                  |                 |                 |                  |                |
| Index of employment rigidity                                  |   |                  | -17.19** (-3.89) |                  |                 |                 |                  |                |
| Average cost to register a property (% of the property value) |   |                  |                  | -19.52** (-2.88) |                 |                 |                  |                |
| Legal right index   |   |                  |                  |                  | 15.52** (4.08)  |                 |                  |                |
| Legal right index × rule of law                               |   |                  |                  |                  |                 | 18.20** (4.140) |                  |                |
| Costs to enforce a debt contract (% of debt value)            |   |                  |                  |                  |                 |                 | -69.19** (-2.82) |                |
| Average protection against risk of expropriation              |   |                  |                  |                  |                 |                 |                  | 36.10** (4.47) |
|   | Panel B: results in equivalent OLS estimates                |                  |                  |                  |                 |                 |                  |                |
|   | Dependent variable: credit-to-GDP ratio average (1997–2004) |                  |                  |                  |                 |                 |                  |                |
| Measure of institutions                                       | -12.49** (-3.23)  | -5.23** (-2.72)  | -8.74** (-2.90)  | -8.21** (-3.04)  | 12.11** (4.63)  | 13.03** (5.08)  | -9.10** (-2.33)  | 17.73** (4.65) |
| R <sup>2</sup>  | 0.16  | 0.15             | 0.16             | 0.06             | 0.16            | 0.28            | 0.10             | 0.37           |
|   | Panel C: first-stage regression results                     |                  |                  |                  |                 |                 |                  |                |
|   | Dependent variable: measure of institution                  |                  |                  |                  |                 |                 |                  |                |
| Log settler mortality   | 0.73** (3.29)   | 0.22 (1.36)      | 0.79** (3.48)    | 1.06** (4.63)    | -0.40** (-2.37) | -0.82** (-3.87) | 0.32** (3.06)    | -0.55* (-3.95) |
| English legal origin  | -1.06* (-1.94)  | -1.02* (-1.73)   | -1.78** (-2.75)  | 0.35 (0.64)      | 2.65** (5.88)   | 2.05* (4.36)    | -0.25 (-1.01)    | 0.66* (1.87)   |
| R <sup>2</sup>  | 0.31  | 0.10             | 0.38             | 0.40             | 0.52            | 0.52            | 0.10             | 0.32           |
| Number of observations  | 60  | 58               | 56               | 56               | 59              | 55              | 58               | 64             |

*t*-statistics are in parentheses.

\* Significant at 90% confidence level.

\*\* Significant at 95% confidence level.

Table 12  
 Private credit-to-GDP ratio and institutions with additional control variables

| Panel A: second-stage regression results                      |                 |                 |                  |                  |                  |                |                  |                  |
|---|-----------------|-----------------|------------------|------------------|------------------|----------------|------------------|------------------|
| Dependent variable: credit-to-output ratio                    |                 |                 |                  |                  |                  |                |                  |                  |
|   | 1               | 2               | 3                | 4                | 5                | 6              | 7                | 8                |
| All procedures required to open a business                    | -40.77* (-1.88) |                 |                  |                  |                  |                |                  |                  |
| Average time involved in insolvency proceedings               |                 | -53.78* (-1.65) |                  |                  |                  |                |                  |                  |
| Index of employment rigidity                                  |                 |                 | -12.87** (-2.34) |                  |                  |                |                  |                  |
| Average cost to register a property (% of the property value) |                 |                 |                  | -21.64** (-2.42) |                  |                |                  |                  |
| Legal right index   |                 |                 |                  |                  | 11.38** (2.34)   |                |                  |                  |
| Legal right index × rule of law                               |                 |                 |                  |                  |                  | 16.98** (2.92) |                  |                  |
| Costs to enforce a debt contract (% of debt value)            |                 |                 |                  |                  |                  |                | -63.98** (-2.11) |                  |
| Average protection against risk of expropriation              |                 |                 |                  |                  |                  |                |                  | 34.27** (3.20)   |
| Catholics   | 1.97 (1.29)     | 1.71 (0.634)    | -0.59 (-0.63)    | -2.01** (-3.12)  | -0.53 (-0.68)    | -0.34 (-0.55)  | -0.68 (-0.96)    | -0.16 (-0.29)    |
| Muslims   | 1.33 (1.02)     | 1.24 (0.54)     | -0.41 (-0.43)    | -1.545** (-2.51) | -0.589 (-0.75)   | -0.376 (-0.57) | -0.688 (-0.98)   | 0.036 (0.06)     |
| Other religions   | 1.47 (1.18)     | 2.02 (0.65)     | -0.61 (-0.62)    | -1.82** (-2.66)  | -0.52 (-0.63)    | -0.64 (-0.89)  | -0.02 (-0.02)    | -0.25 (-0.36)    |
| Ethno fractionalization                                       | 27.27 (0.38)    | -69.23 (-1.55)  | -27.06 (-1.21)   | 1.42 (0.04)      | -57.61** (-2.85) | -36.10 (-1.52) | -32.39 (-1.37)   | -0.14 (-0.00)    |
| Oil producer  | 19.90 (0.73)    | 22.03 (0.47)    | -21.35 (-1.37)   | 9.41 (0.34)      | -18.78 (-1.54)   | -0.66 (-0.07)  | 63.37 (1.21)     | -43.90** (-2.32) |
| Number of observations  | 51              | 49              | 48               | 48               | 51               | 47             | 49               | 54               |

*t*-statistics are in parentheses.  
 \* Significant at 90% confidence level.  
 \*\* Significant at 95% confidence level.

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291 only because of the written law but also due to differences in the efficiency of the judiciary in the  
292 two countries.

293 We also found that labor market flexibility in Brazil might also have sizeable effects on the  
294 long-run performance of the Brazilian economy. Observe that we did not investigate the effects  
295 of labor market reform on unemployment and the size of the informal sector, which are probably  
296 even more directly related to labor market rigidity.

297 The correct way to interpret our findings is to take them as a first move toward a road-map for  
298 reform. The most important result is that not all reforms are alike: some have a greater impact on  
299 growth than others, and the difference in impacts is substantial. In addition, if we take a simple  
300 indicator of the required reform effort, we find that some reforms are more efficient, that is, they  
301 deliver more growth per unit of institutional change. A more detailed analysis of the priorities  
302 for reform is in order, though well beyond the scope of the paper. What we have determined is  
303 that institutions matter for Brazilian development, and they matter in different ways. A sensible  
304 reform effort should take these results into account.

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### 310 Appendix A. Data description and sources

311 In this appendix we describe the variables used in this paper as well as their source. We use three  
312 dependent variables, eight measures for institutions, three set of additional control variables and  
313 three variables to exogenously test the effects of institutions on long-run economic performance  
314 (see Table 8).

### 315 Appendix B. Additional tables

316 In this appendix we present the estimates of the effects of each institution on the investment rate  
317 and on total credit over GDP. Table 9 contains the effects of each institution on the investment rate.  
318 It reports the first stage, second stage and OLS estimates. Table 10 reports the second-stage results  
319 of the investment equation when we add some additional exogenous control variables. Table 11  
320 is similar to Table 9 and Table 12 is similar to Table 10. The difference is the dependent variable.  
321 In Tables 11 and 12 we use total credit over GDP as the dependent variable in the regressions.

### 322 References

- 323 Acemoglu, D., & Johnson, S. (2005). Unbundling institutions. *Journal of Political Economy*, 113(5), 949–995.  
324 Acemoglu, D., Johnson, S., & Robinson, J. A. (2001). The colonial origins of comparative development: An empirical  
325 investigation. *American Economic Review*, 91(5), 1369–1398.  
326 Antunes, A., Cavalcanti T., & Villamil A. (2006). *The effects of financial repression and enforcement on entrepreneurship  
327 and economic development* (Working Paper). University of Illinois at Urbana-Champaign.  
328 Araújo, A., & Funchal, B. (2005). Past and future of bankruptcy law in Brazil and Latin America. *Economía*, 6(1),  
329 149–216.

- 330 Botero, J., Djankov, S., La Porta, R., & Lopez-De-Silanes, F. (2004). The regulation of labor. *Quarterly Journal of*  
331 *Economic, CXIV(4)*, 1339–1382.
- 332 Cavalcanti, T., & Novo, A. (2005). Institutions and economic development: How strong is the relation? *Empirical*  
333 *Economics, 30(2)*, 263–276.
- 334 Djankov, S., La Porta, R., Lopez-de-Silanes, F., & Shleifer, A. (2002). The regulation of entry. *Quarterly Journal of*  
335 *Economics, CXVII(1)*, 1–37.
- 336 Djankov, S., La Porta, R., Lopez-de-Silanes, F., & Shleifer, A. (2003). Court. *Quarterly Journal of Economics, CXVIII(2)*,  
337 453–517.
- 338 Djankov, S., MacLiesh, C., & Shleifer, A. (2005). *Private credit in 129 countries [Mimeo]*. Department of Economics,  
339 Harvard University.
- 340 Easterly, W., & Levine, R. (2003). Tropics, germs, and crops: The role of endowment in economic development. *Journal*  
341 *of Monetary Economics, 50(1)*, 3–39.
- 342 Kaufmann, D., Kraay, A., & Mastruzzi M. (2003). *Governance matters III: Updated governance indicators for 1996–02*  
343 (Policy Research Working Paper 3106). World Bank.
- 344 North, D., Summerhill, W., & Weingast, B. (2000). Order, disorder, and economic change: Latin America versus North  
345 America. In B. B. de Mesquita & H Root (Eds.), *Governing for prosperity*. New Haven: Yale University Press.
- 346 Sokoloff, K. L., & Engerman, S. L. (2000). Institutions, factor endowment, and paths of development in the new world.  
347 *Journal of Economic Perspectives, 14(3)*, 217–232.
- 348 Tavares, J. (2004). Institutions and economic growth in Portugal: A quantitative exploration. *Portuguese Economic Journal*,  
349 3, 49–79.
- 350 World Bank. (2005). *Doing business in 2005: Removing obstacles to growth*. Washington, DC: World Bank.