Rebellions, Technical Change, and the Early Development of Political Institutions in Latin America

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Abstract

This paper documents that differences in the early development of institutions in Latin America that led to the consolidation of oligarchic republics in the first decades of the twentieth century, explain the subsequent economic performance in the region. It develops a model with the aim of identifying the factors behind this institutional development. The model predicts that, due to asymmetric and uncertain costs, the risk of conflict leads to political institutions that poorly restrict the powers of chief executives. Since elite members cannot commit to a strong response to this type of conflicts, which in the model arise due to labor coercion, they empower the executive so he may react forcefully to conflicts. Then, in countries with a larger fraction of labor to be coerced, lower executive constraints are imposed. On the other hand, technical advance leads to higher constraints as expropriation becomes more costly. But this does not happen in countries with a large fraction of coerced labor because higher returns raise labor demand and hence larger production comes with more risk of conflict. Finally, the paper conducts an econometric exercise focusing in two factors, namely the risk of uprisings by natives and slaves, which historians have identified as an important risk for the Latin American elites at that time, and the first era of globalization that led to better economic conditions throughout the region. The results show that the dynamics of the institutional gap can be explained to a large extent by the risk of rebellion, globalization, and their interaction. (JEL D72, D74, N0, N26, O17)

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1 Introduction

After almost 200 years since achieving its independence, the economic performance of Latin America has been disappointing. This resource-rich region has been unable to catch-up with the developed world, and has even fell behind other initially poorer former colonies. More strikingly, despite a common colonial experience, Latin America has the highest dispersion in GDP per capita among world developing regions.\(^1\)

This weak economic performance has been the focus of a large body of research, mostly narrative, where common features, particularly the colonial heritage manifested in inefficient institutions and geographic features, which have contributed to disparities in wealth and significant racial diversity, have been identified as crucial factors behind Latin America’s relative underdevelopment (Engerman and Sokoloff, 1997, 2002; North et al., 2000; Lange et al., 2006). The literature on the colonial determinants of development, which empirically studies the causes and long-run consequences for the introduction of certain legal and political institutions by colonial powers around the world, can also shed some light on the causes of economic backwardness in Latin America (La Porta et al., 1997, 1998; Acemoglu et al., 2001, 2002). However, strong similarities across Latin American countries in terms of fundamental economic growth determinants and post-independence institutional and economic development, hinder comparative studies within the region about the long-run causes of underdevelopment. Additionally, the lack of theoretical models that can guide quantitative analysis make it difficult to apply the findings in the literature to the particular case of Latin America.

Others have focused on more recent features to explain the current economic problems in Latin America (see e.g. Calderón et al., 2005; Solimano and Soto, 2006). Among these it has been widely suggested that inward-looking policies and macroeconomic instability were fundamental in obstructing the development process in the region. Although they give valuable policy recommendations, these studies identify *proximate*, instead of *deep* causes of economic growth, and hence they can not be used to explain why some countries followed certain policies that were not conductive to long-run development.

This paper pursues a dynamic comparative analysis among Latin American economies of *deep* determinants of long-run development to explain current differences in economic outcomes within the region. In order to do this it develops a theoretical model, which guides an econometric exercise, with the aim of identifying the factors leading to differences in institutional development from independence to the eve of the first World War.

Political institutions in Latin America have transited through distinct stages since indepen-

\(^1\)The definition of world developing regions and the source of GDP per capita is the World Development Indicators (WDI). Regions, as defined by the World Bank, are South Asia, Europe & Central Asia, Middle East & North Africa, East Asia & Pacific, Sub-Saharan Africa, and Latin America & Caribbean. We adjust the last group to include only Latin American countries (see footnote 6), although in both cases the standard deviation of GDP per capita is the highest.
dence (Drake, 2009; Hartlyn and Valenzuela, 1998). During the first decades instability, conflict, and despotism abounded throughout the region, until the 1870s, when many countries restored some order through the establishment of more stable political institutions. This was the period of oligarchic republicanism, or protected democracy, featuring robust civilian and constitutional regimes, and open, although not fully fair, electoral competition, but with most of the population excluded from electoral participation. The Great Depression of the 1930s marked the end of that era and the starting point for the development of popular democracy, a process interrupted in the 1970s but recommenced again around 1980.

This paper focuses on the first period of institutional development, which started some decades after independence and ended with the consolidation of oligarchic republics in the first decades of the twentieth century. These regimes were “largely comparable to the restrictive representative regimes in Europe of the same period”, and even though they were replaced by authoritarian regimes, these disruptions did not represent serious breaks with the past in most of the countries (Hartlyn and Valenzuela, 1998, p.3 and 42). Within oligarchic regimes there were important differences; while rule was exercised by reasonably republican regimes in some countries, it was done by fundamentally authoritarian ones in others, and they either led to gradual incorporation of excluded groups, or to intensified oppression (Drake, 2009, p.129). It is a period identified by some political scientists as a “critical juncture”, or a crucial period of transition, with a profound impact on subsequent patterns of change in Latin America (Collier and Collier, 1991; Mahoney, 2001).

This paper presents evidence to support the claim that fundamental differences within these political regimes did exist, primarily in the extent of influence different members of the elite had in the decision making process, i.e. in the constraints imposed on executives, or checks and balances. It further shows that these differences are crucial in understanding the subsequent economic development within the region, not only due to their persistence and subsequent effect on more recent institutional features, but also because of their influence on additional factors not accounted for by them.

The theoretical analysis focuses on the determinants of political institutions to explain the divergence that started in the second half of the nineteenth century in Latin America. In the model there is an elite that faces a risk of uprisings by external groups. The benefit of fighting an insurgency is not internalized equally by the elite’s members, and hence there is disagreement in terms of the size of an eventual response. But disagreement is lower ex-ante because who will be affected by future uprisings is uncertain. Therefore the expected benefits of fighting are shared more evenly among members of the elite. Thus, elite members would like to commit in advance to a larger military response to conflicts than the one they are willing to sustain once a conflict has erupted in some region. One way of solving this is by empowering the executive so he may react

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2The analysis is based in a modified and extended version of the model presented in Aguirre (2011), incorporating technical change, and endogenous investment and rebellions.
forcefully to conflicts, despite the opposition of some fraction of the elite. However doing this raises
the likelihood of expropriation, as the executive is able to tax more freely. Elite members then face
a trade-off: imposing fewer constraints on the executive reduces the expected costs from uprisings,
but on the other hand it distorts investment incentives. The main implication of the model follows,
that a higher likelihood of a civil conflict in the future incites the elite to impose fewer constraints
on the executive.

The trade-off between military reactions to conflicts and the risk of expropriation is affected
by technical change. Expropriation is particularly costly when returns to investment are high, and
hence technological advance may lead to the imposition of more constraints on executive power.
But on the other hand it raises the demand for coerced labor, which, in the model, drives rebellions.
This last effect is stronger in countries where the availability of involuntary labor is larger. Therefore
the second prediction of the model is that the response of institutions to technical change depends
on the potential to exploit non elites. In countries where it is possible to coerce a larger fraction
of the labor force the change in executive constraints due to an increase in productivity is smaller,
and it can even be negative. This implies that institutional variation rises with technology.

The early development of political institutions in Latin America constitutes a unique case to
apply the model. This is not only because of its relevance for the subsequent economic development
of the region, but also because it is possible to clearly identify two factors that can be associated
with the determinants of political institutions according to the model. First, the risk of uprisings
by natives and slaves, which historians have identified as an important risk for the elites throughout
the region (Katz, 1988; Coatsworth, 1988, 2008; Eakin, 2007; Williamson, 2009a). These rebellions
were costly, localized in certain regions but widespread, and, with very few exceptions, far from
seizing power. The elite was geographically dispersed, since these were mainly agrarian and mining
economies. These features closely approximate those required by the model’s main mechanism.
Second, the first era of globalization, led by a worldwide transport revolution (North, 1958; Harley,
1988), and with profound consequences in the poor periphery, including Latin America, as it served
to erase geographic barriers to trade and to integrate previously isolated places with the global
economy (Williamson, 2006). The sudden integration with the rest of the world generated new
economic opportunities for the economy as a whole, introducing dynamic incentives to develop
less autocratic political institutions according to the model. But, also as argued by historians
(Coatsworth, 1988; Eakin, 2007), this process may have increased the risk of uprisings in countries
with large indigenous and slave populations, generating the opposite incentives.

The paper empirically tests these predictions and finds that the institutional gap in terms of
executive constraints observed in the first decades of the twentieth century can be explained to
a large extent by the risk of rebellions, technical change in transportation, and their interaction.
Countries prone to racial conflict, as proxied by the fraction of the population comprised of natives
and slaves, were the ones that showed fewer constraints on the executive on average between 1870
and 1910. Moreover it is shown that this was particularly the case in countries with geographic conditions preventing an efficient reaction to uprisings by the government. These results are robust to the inclusion of additional controls associated with alternative theories linking colonial experiences and long-run political and economic development, e.g. Engerman and Sokoloff (1997, 2002); Acemoglu et al. (2001, 2002).

In terms of institutional dynamics the evidence supports the hypothesis that integration was behind the reform of political institutions during the same period, as the largest changes occurred in countries that were relatively more favored by the transport revolution. When analyzing the effect of rebellions on institutional dynamics the results reveal that the negative relationship started long after independence, coinciding with the most intense stage of technological progress. In line with the prediction of the model, this implies that the rise in the risk of riots provoked by the process of modernization helped to widen the institutional gap across the region.

This paper is organized as follows. After reviewing the related literature the next section studies the long-run effects of the development of political institutions in Latin America during the nineteenth century, supporting the claim that explaining the causes for this process can illuminate the current debate on the development trap in the region. Section 3 presents the theoretical model and its implications for the post-independence period in Latin America are discussed and tested in section 4. The last section concludes listing possible mechanisms linking the early institutional development in the region and current economic development, for which a deeper treatment is left for future research.

Related Literature

This paper belongs to the literature on the determinants of institutional reform, particularly when conflict is considered as a fundamental cause (Tilly, 1992; Acemoglu and Robinson, 2000, 2006; Boix, 2003; North et al., 2009), and when Latin America is taken as the focus of the study (North et al., 2000; Munck, 2011). This literature has focused on the democratization process, and not on institutional developments within nondemocratic environments, as this paper does. Indeed one of the main theses in this literature is that conflicts, or the fear of conflicts, led to democratization or faster development of the state. This differs from the hypothesis explored in this paper as this literature considers large social uprisings or external conflicts, which threaten the survival of the elite as a whole, and not those that impose asymmetric and uncertain costs on the elites as this paper does.

After claiming that modern civil wars impose asymmetric and uncertain costs for the elites, Aguirre (2011) tests the implications of a simpler version of the model presented here in a sample of more than 80 countries that became independent after WWII, mostly from Africa, Asia, and Eastern Europe. To identify causality, geographic variables are used as instruments to capture the exogenous component of the likelihood of a civil conflict in the future. The results show that
a higher likelihood of a civil war in the future reduces the constraints imposed on the executive during the first years after independence, that the the effect is stronger when only minor conflicts and irregular wars are considered, and the effect is significant only in countries without oil fields. These results are in line with the model’s theoretical prediction, since the costs of internal conflicts are more likely to be asymmetric and uncertain when the conflicts are small and wars are irregular, and when natural resources are not abundant in the country. Aguirre (2011) also presents anecdotal evidence regarding the US constitution, which may be consistent with the predictions of the model. In particular the outcome of the convention in Philadelphia in 1787, characterized by a strong executive, was importantly influenced by rebellions and the different experience of the states regarding them and executive power.

Although the type of conflicts studied in this paper have been identified as a relevant danger for nineteenth century Latin American elites (Coatsworth, 1988; Katz, 1988), they have not been identified explicitly as a determinant of political institutions in the region. Probably the most important exception is the emphasis on rebellions by Coatsworth (1998) in his critical analysis of political economy theories linking Latin American underdevelopment to its colonial past, and in his own historical assessment of the causes of Latin American economic backwardness. Coatsworth argues that economies stagnated after independence because they inherited the manifold weaknesses of the colonial state, but now lacked the imperial deterrent to rebellion. This influenced the nature of post independence civil conflicts, whose duration and depth depended on how the power of elites was challenged from below. Civil conflicts and their constraints on growth were shorter where the contended issues centered on the spatial distribution of political power between provincial and central power, and longer where settler elites dominated large slave or indigenous populations. In the second case it was necessary a struggle to restore colonial stability, but also to avert a recurrence of destructive rebellion from below (Coatsworth, 1998, pp. 562-565).

Nunn (2008), in an empirical study of the Americas, finds a significant relationship between slavery and subsequent economic development, even across the British West Indies and across US states. But he does not find significant evidence that this relationship has been explained by the effect of slavery on inequality, as argued by Engerman and Sokoloff (1997, 2002). Indeed his results are consistent with the role of institutions as the mechanism through which slavery affected development in the region, in line with the predictions of our model. Sánchez et al. (2010) show empirically that the opportunities for higher revenues from exports in Colombia during the period 1850-1925, together with the lack of formal property rights, led to the emergence of land conflicts between peasants and landowners. The authors show that these conflicts may have explained the poor performance of the Colombian economy during that period. Although in the model conflicts are driven by coerced labor, the expropriation of land by elites, highlighted also by Coatsworth

\[ \text{Nunn (2008) includes population density in 1750 as a control in his estimations, which may capture the mechanism proposed by Acemoglu et al. (2001, 2002) to link colonialism and current development.} \]
Regarding the effect of technical change in political institutions the paper relates to the modernization hypothesis, i.e. the causal and positive effect of economic development on political development (Lipset, 1959). When applied to Latin America this theory has had problems explaining the link between economic development and democracy (O’Donnell, 1973; Linz, 1975; Mainwaring and Pérez-Liñán, 2003). However, besides the fact that its focus is on popular democracy and not on political institutions in non-democratic environments, the theoretical model in this paper identifies a specific mechanism through which technical change, and not necessarily income growth, leads to less authoritarian institutions. Hence the implications for testing are very different, as the link between income and institutional quality is obscured by additional factors, particularly the risk of rebellions, which may also increase when economies are facing rapid technological change.

A final related literature is the one that highlights property rights institutions to link colonial regimes with current economic development (Engerman and Sokoloff, 1997, 2002; Acemoglu et al., 2001, 2002). The common theme is that natural resource endowments and the exploitation of natives by Europeans generated deep inequalities and extractive institutions that were not designed to enforce property rights for a broad spectrum of the population. However, this paper deals with institutions regulating the relationship among members of the elite, and not between the elite and the rest of the population. In this context this paper stresses that the exploitation of the population in the colonies not only generated a concentration of political power within societies, but also within the group holding the political power. This may have had dynamic consequences, such as reducing the political power of new members of the elite, or hindering the evolution of democratic institutions. Previous studies have identified other effects of this concentration of political power, including the way frontier lands were distributed (García-Jimeno and Robinson, 2011), the increasing wealth inequality in some countries during that period (Williamson, 2009b), with the subsequent social conflicts and their effects on economic outcomes, or the way societies incorporated the social movements that began early in the last century (Collier and Collier, 1991).  

We see our paper as a complement to this literature on the colonial origins of development. But the mechanism we propose is new. And the theoretical model guides the empirical exercise in trying to conclude that the general results are indeed given by this proposed mechanism. We control for variables capturing alternative mechanisms in the empirical part. Additionally we explore interactions with geographic variables that have been associated with the risk of conflict in previous studies, and with a proxy of technical change, which, as predicted by the model, should affect the relationship between conflicts and institutions.

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4See Boix (2003) (p.210) for a discussion on the different outcomes, particularly related to the risk of expropriation and their internal political dynamics, of authoritarian regimes that differ in the extent to which power is concentrated at the elite level.
2 The Long-Run Effects of Early Institutional Development

In this section we show that understanding the development of political institutions during the second half of the nineteenth century is key in explaining the current development problems facing Latin America. After independence it took decades of civil discord before most countries could bring about enough order to construct functioning governments. Why some countries actually improved their institutions at that time, and why others kept the autocratic institutions built in the aftermath of post-independence conflicts, is the question we try to answer in the following sections of the paper. Here we show that these different paths existed, and that they have been crucial for understanding the differences in economic development leading to the large disparities in income per capita inside the region we observe today. Moreover, the evidence shows that these different paths were not related to contemporaneous differences in income per capita.

To characterize political institutions we use the index Constraints on the Executive, from the Polity IV database. This variable explicitly measures how constrained the executive is in making arbitrary decisions, which is the institutional dimension we focus on in this paper.\(^5\) Good scores in this index are possible with large groups excluded from the political process (and vice versa). For instance, South Africa under apartheid, and the US before the National Voting Rights Act of 1965, had the top-coded score, while France today does not. In the case of Latin America we think this is the relevant measure for the period under consideration, where widespread voting restrictions led to no more than 15% of the population having voting rights, in elections that were far from being regular, free, and fair (Colomer, 2004; Hartlyn and Valenzuela, 1998). Specifically this indicator “...refers to the extent of institutionalized constraints on the decision-making powers of chief executives... imposed by any accountability groups [like] legislatures... the ruling party in a one-party state; councils of nobles or powerful advisors in monarchies; the military in coup-prone polities; and ... a strong, independent judiciary... [It captures] the checks and balances [in] the decision-making process.” (Marshall and Jaggers, 2007).

Figure 1 shows average executive constraints (left panel) and its standard deviation (right panel) for the group of 20 Latin American countries since 1850.\(^6\) We can distinguish three periods of an upward trend in the indicator, 1865-1920, 1950-1960, and 1975-2010. The first two episodes were almost completely reversed afterwards. Out of these three periods the first one, which is the focus

\(^5\)As it will become clear later the model’s predictions are only about the constraints that the elite imposes on the chief executive, not about the constraints that the whole population imposes on the government or elite.

\(^6\)In this paper we define Latin America as composed by countries where languages derived from Latin are officially spoken (except Canada), i.e. all the nations in the Americas colonized by countries from continental Europe: Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Dominican Rep., Ecuador, El Salvador, Guatemala, Haiti, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Uruguay and Venezuela. Cuba and Panama achieved their independence later and so they are included only from 1905 onwards. All the results persist when Canada and the US are included. We do not include them in order to illustrate that the results are not influenced by (very) different colonial pasts.
of this paper, is the most persistent and very uneven within the region, as shown by the relatively high value of the standard deviation. The second period of increasing constraints is very short, while the last one is the most pronounced. In terms of standard deviation it seems that further disparities were related mainly to the reversal of the second upward trend around 1980.

How important were the long-run development effects of the divergence in institutional development experienced in the nineteen century? To answer this question we estimate the following set of regressions,

\[ y_{j,2008} = \beta_{0,t} + \beta_{1,t}XC_{j,t} + \beta_{2,t}XC_{j,indep} + \epsilon_{j,t} \]

where \( y_{j,2008} \) is GDP per capita in 2008 in country \( j \), \( XC_{j,t} \) is executive constraints in country \( j \) and period \( t = 1850:2008 \), \( XC_{j,indep} \) is the same index but in the period after independence (to control for any colonial feature that may affect both institutional development and current income per capita) \( \beta_{0,t} \), \( \beta_{1,t} \) and \( \beta_{2,t} \) are time-varying parameters to be estimated, and \( \epsilon_{j,t} \) is an error term.\(^7\)

In the left panel of Figure 2 we plot \( \beta_{1,t} \), which captures the effect of additional executive constraints in period \( t = 1850:2008 \) on the level of GDP per capita in 2008 and its 10% confidence interval. We can see that this effect increased vis-à-vis the rise in average executive constraints during the first period identified in Figure 1 (1850-1920). Around 1890 it becomes significant and remains so until 1910, when it becomes close to zero for the next 20 years. In 1930 the coefficient increases again, coinciding with the first reversion depicted in Figure 1 around the same year. The effect remains very significant until 1960, when it starts to fall until becoming non-significant in the years after 1980.

In the right panel of Figure 2 the \( R^2 \) of the regression is plotted. The first wave of institutional reform explains, at its peak around 1905, close to one fifth of the variance in GDP per capita today. During the first reversion and the second period of institutional reform, i.e. from around 1930 to 1970, the regression still explains a large fraction of the variance as well, despite the low dispersion

\(^7\)The source for GDP per capita for all the empirical exercises in this paper is Maddison (2008).
Figure 2: Historical Constraints on the Executive and Current GDP per capita, Regression Results

of executive constraints across countries (Figure 1). It is worth noticing though that due to the high persistence in institutional quality, part of this may be explained by institutional differences originated in previous decades, making the comparison of the $R^2$ not very informative regarding the relative importance of different periods to explain current GDP per capita.

Is the effect on current GDP per capita through the institutions in place during the second half of the nineteen century only due to the effect on the subsequent path of institutional development? To answer this question we run the following rolling regression,

$$y_{j,2008} = \gamma_{0,t} + \gamma_{1,t}XC_{j,1905} + \gamma_{2,t}XC_{j,t} + \epsilon_{j,t}$$

where now $XC_{j,1905}$ is executive constraints in country $j$ and period 1905, and $t$ goes from 1915 to 2008. Figure 3 shows the results. In the left panel $\gamma_{1,t}$ is plotted. We can see that the coefficient on executive constraints in 1905 remains significant even when controlling for future values of this variable, suggesting that the former influenced current GDP per capita through channels not fully captured by recent institutional developments. We do not explore these channels in this paper but we conclude in the last section suggesting some potential mechanisms, leaving a formal analysis for future research.

In the right panel of Figure 3 we plot $\gamma_{2,t}$. Executive constraints during the twentieth century are now significant only for the fifteen years from 1955 to 1970 (compared with the period 1935-1980 when not controlling for $XC_{j,1905}$), coinciding with the rise and abrupt fall in the average constraints observed in Figure 1. This suggests that an important fraction of the explanatory power of more contemporaneous political institutions revealed in Figure 2 is due to the early institutional development started in the second half of the nineteenth century.

It is likely that endogeneity issues are affecting the results. In the case of reverse causality the problem would be relevant only for more recent institutional indicators, strengthening the argument about the importance of executive constraints at the end of the nineteenth century as a determinant of current income per capita. But endogeneity may be relevant as well for the effect.
of early institutions if the estimated relationship is driven by a third factor explaining both GDP per capita and institutional quality. To see if this is the case we can check the correlation between early institutional development and early income per capita. If there is no correlation, then it is more likely that causality is running from early political development to current GDP per capita, and hence studying the determinants of the former is of greater interest.

A problem with this exercise is the lack of data on GDP per capita for an important fraction of the countries at the beginning of the twentieth century. Maddison (2008) only presents estimates of GDP per capita for 8 Latin American countries for 1900, and 12 in 1920. In Figure 4 we present the partial correlation between the 10 years average of executive constraints from 1895 to 1905 and GDP per capita in 1900, 1920, 1950 and 2008. In the upper panels we can see that there is no contemporaneous correlation between these two variables. An OLS regression shows that executive constraints explain only about 2% of the variance of income per capita at the beginning of the twentieth century.\(^8\) In the lower panel we can see that even in 1950, the first year for which we have data for all the countries, the relationship is unchanged. The significant relationship between early institutional development and current GDP per capita in Latin America, shown again in the lower right panel of Figure 4, materialized only during the last 60 years, favoring the claim that causality runs from the first to the second variable.\(^9\)

Although all of these results need to be taken with caution due to the small sample size, we conclude from the evidence presented in this section that the early development of institutions during the nineteen century is informative about current differences in income per capita inside the region. Income per capita was affected not only through subsequent institutional development but also through other unrelated features, and hence we have reasons to argue that the study of the

\(^{8}\)Similar results are obtained using data of GDP per capita in 1900 from Astorga et al. (2005) and the Oxford Latin American Economic History Database.

\(^{9}\)This rises another issue which is that better institutions cannot have a contemporaneous effect on income per capita in the model. We discuss this implication at the end of next section.
determinants of this process can give some insight into explaining current development problems in Latin America. The rest of the paper focuses on explaining this early political development. The following section presents a theoretical model, which is used in section 4 to assess empirically the determinants of early political institutions in Latin America.

3 The Model

The Environment

The economy is divided into $N$ districts indexed by $j$. A district $j$ may be in conflict or in peace. We denote district specific states by $s_j$, where $s_j = 1$ if there is conflict in the district and $s_j = 0$ otherwise. It is assumed for simplicity that there are only $N + 1$ aggregate states, one state where every district is in peace, and $N$ states where only one district is in conflict. Define by $S = 1$ an aggregate state where there is conflict in one district and $S = 0$ otherwise. As will be clear later there are only three possible combination of states for district $j$, $(s_j, S) \in \{(0, 0), (1, 1), (0, 1)\}$.

The economy is populated by a continuum of agents, who are of three types, each equally distributed across and inside districts. A measure 1 of agents are elites, who are the only ones with access to a technology to produce output, and do not work. The reminder of the agents can only
work. A measure $\lambda$ do so voluntarily at the market wage, $w$. A measure $1 - \lambda$ are forced to work and do not receive a payment for their services.

Elite members, indexed by $h \in [0, 1]$, have access to the following technologies to produce two different goods, denoted $i$ and $a$ respectively,

$$i = zk^\alpha \nu^{1-\alpha}$$
$$a = zl^\alpha (1 + f)^{1-\alpha}$$

where $z > 0$ is productivity, $k$ capital, $l$ land, $\nu$ and $f$ voluntary and forced labor respectively, and $\alpha \in (0, \frac{1}{2})$ is a constant. Total output in this economy is $y = i + a$. Elites have one unit of land so there is always positive production of $a$, even if forced labor is unavailable. Elites also receive an endowment $\bar{k}$ each period, which can be consumed or used as capital. We assume $z < \bar{z}$ and $\alpha \bar{z} \bar{k}^{\alpha-1} < 1$. This ensures $k < \bar{k}$ in equilibrium under the assumptions for the utility function and the supply of labor made below. To save notation we further assume $\bar{k} = 1$, and hence $\bar{z} < 1/\alpha$.

We can think of $z$ as total factor productivity or the international price of local goods, including transport costs. We could also include sector-specific technology parameters, but the focus is on economy wide changes. We assume there is a market for coerced labor, which has a price $p$ per period, and where the supply is decreasing in its net availability, $1 - \lambda - f$. Specifically we assume $p = f/(1 - \lambda - f)$ as the supply schedule. Notice that under this functional form no equilibrium will use all coerced labor available in the economy.

There is a government that collects revenues by imposing a tax to rents, $\tau_j$, in each district. Total revenues, $T$, are split into those financing a public good, denoted by $g$, and those financing military responses to conflicts, $d$.

Elites are risk neutral. They consume any endowment not used as investment as well as rents net of taxes. Flow utility for a producer $h$ in district $j$ is,

$$u(s_j, S) = (1 - \tau_j) \pi_hj - k'_hj + \gamma \left( (1 - S)g - (S + s_j \bar{\gamma}) (q - d) \right),$$

where $k'_hj$ is next period’s investment, $\pi_hj = y_{hj} - w\nu_{hj} - pf_{hj}$ are rents, and $\gamma$, $\bar{\gamma}$ and $q$ are positive constants. The parameter $q$ captures the cost of conflicts. These costs are mitigated with government’s military responses so in the event of a conflict ($S = 1$) the total cost is $q - d > 0$.

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10 The assumption $\alpha < \frac{1}{2}$ is needed, as a sufficient condition, for the main results. This is because, given the assumed functional forms, a marginal increase in executive constraints would have an effect on $i$, through $k$, that is too large to make it non-optimal.

11 Therefore it is assumed, to simplify the model, that capital does not need to be financed out of current output. Under this assumption future output is not affected by current output and taxes, and hence neither by current conflicts, reducing the number of states.

12 We omit from the utility the constant $\bar{k} = 1$.

13 It is natural to think that a conflict should affect production. Aguirre (2011) considers this case. Here we assume production is not affected, so aggregate output does not depend on $S$. However, in equilibrium, output in the district with conflict is fully taxed, reducing the return of investment in a similar way than assuming that output is destroyed.
To make this term positive in any equilibrium outcome we assume $q > \bar{z}$. The parameter $\gamma$ reflects tastes about public expenditures.\textsuperscript{14} Notice that $\gamma > 0$ implies that conflict is costly for all regions, but since $\bar{\gamma} > 0$, the costs of these events are asymmetric. This is key for the main prediction of the model.\textsuperscript{15}

The probability of conflict onset is defined by $\phi(F) = \kappa/(1 - F)$, where $F = \sum_{hj} f_{hj}$ and $\kappa \in (0, \lambda)$, so $\phi'(\cdot) > 0$, $\phi''(\cdot) > 0$, $\phi(0) > 0$ and $\phi(1 - \lambda) < 1$. Therefore, unlike the price $p$, the aggregate cost of forced labor is not a function of total availability, but only of the fraction actually employed.\textsuperscript{16} Under these conditions in a country with more of this type of labor available we would observe more demand for it, and hence a higher probability of conflict, than in a country with a lower supply. For simplicity it is assumed the conflict lasts for only one period and that there is an equal probability of conflict onset in each district, so the probability of observing a conflict in district $j$ is $\phi/N$. This implies a degree of uncertainty in terms of the incidence of future conflicts and their costs, which is the second key feature behind the main prediction of the model.

Taxes need to be set every period. Each district has a member in a legislature, who is an elite chosen stochastically. As these agents are identical inside each district we do not model elections. There is one agent, the executive, with agenda power. Every period he proposes the set $\{\tau_j\}_{j=1}^N$, which defines a tax rate for every district, and he can not commit to future proposals. Proposals need to be approved by a fraction $m > 0$ of the legislature to be implemented, otherwise $\tau_j = 0$ in all districts is the outcome. We assume members from districts with conflicts do not vote. It is also assumed that the district of the executive is not represented in the legislature and that the probability of conflict is zero there.\textsuperscript{17} Flow utility of the executive is $u_e = c_e + \gamma((1 - S)g - S(q - d))$.

The ratio $m$ captures the constraints on the executive, and it is set before production takes place and taxes are decided. Since members of the legislature are ex-ante identical there is no disagreement, and so we may assume that $m$ is chosen by unanimity.\textsuperscript{18} As usual the subset of members whose votes are decisive for approving the proposal is called the minimum winning coalition (WC).\textsuperscript{19}

\textsuperscript{14}And also government technology to produce them. Hence the linear function assumes linear utility as well as linear technology.

\textsuperscript{15}For simplicity it is assumed that $g$ and $d$ have the same marginal utility $\gamma$. Results do not change if this assumption is relaxed. In that case taxes will vary depending on the state. Since this is not the case the present assumptions taxes are the same and hence the return to investment is not affected by the risk of conflicts (for the same level of executive constraints).

\textsuperscript{16}More realistically the probability of conflict would depend on the amount of forced labor in each district. But since districts are homogenous we make $\phi$ a function of $F$ only.

\textsuperscript{17}These assumptions are not needed to get the main implication of the model but they simplify its solution since otherwise the policy function is different when the conflict arises in the district of the executive.

\textsuperscript{18}The ratio $m$ is assumed to be continuous, which may be the case if the number of legislators per district varies.

\textsuperscript{19}In the model the institutional framework is greatly simplified since in practice executive constraints are not only imposed by legislatures. As described before the institutional variable measuring executive constrains considers constraints from different political agents like parties or the judiciary.
Given \((z, \lambda)\), the timing of the events is as follows:

1. Given \(k_{hj}\) members of the legislature choose \(m\).
2. States \(\{s_j\}_{j=1}^{N}\) and \(S\) are realized, production takes place, and \(\phi\) takes its corresponding value.
3. Given \(k_{hj}, m, (\{s_j\}_{j=1}^{N}, S)\), and \(\phi\), the executive proposes \((\{\tau_j\}_{j=1}^{N}, g, d)\), which is either accepted or rejected by the legislature.
4. Given \(k_{hj}, m, (s_j, S), \phi\), and \((\tau_j, g, d)\), agents choose \(k'_{hj}\).

Let us define \(n = 1/N\) to simplify notation. We can write the problem for elite \(hj\) at step 4 as,

\[
V(s_j, S) = \max_{\{k'_{hj}\}} \left\{ (1 - \tau_j) \pi^*(k_{hj}) - k'_{hj} + \gamma \left( (1 - S)g - (S + s_j \bar{\gamma}) (q - d) \right) \right. \\
\left. + \delta \left( (1 - \phi)EV(0, 0) + n\phi EV(1, 1) + (1 - n)\phi EV(0, 1) \right) \right\}, 
\]

where \(\delta < 1\) is the discount factor, \(E\) is the expectation operator, which is taken with respect to future government policies, and \(\pi^*(k_{hj})\) solves the static problem of elites. The problem of the executive at step 3 is the following,

\[
V_e(S) = \max_{\{\{\tau_j\}_{j=1}^{N}, g, d\}} \left\{ c_e + \gamma \left( (1 - S)g - S(q - d) \right) + \delta EV_e \right\} \\
\text{s.t. } V(0, S; \tau_j, g, d) \geq V(0, S; 0, 0, 0) \quad \forall j \in WC \\
T = g + d = \sum_{hj} \tau_j \pi^*(k_{hj}). 
\]

The optimization problem at step 2 is static,

\[
\pi^*(k_{hj}) = \max_{\{f_{hj}, \nu_{hj}\}} \left\{ y - w\nu_{hj} - pf_{hj} \right\}, 
\]

Finally the problem faced by each member of the elite when deciding institutions is to choose \(m\) that maximizes \(EV(s_j, S)\), where the expectation now is taken with respect to policies and states.}

An equilibrium is levels of capital, \(k^*_{hj}\), and labor, \(\nu^*_{hj}, f^*_{hj}\), which are optimal for the elites in the current period, given the initial conditions, prices, and taking into account subsequent equilibrium outcomes; a policy vector \((\{\tau^*_j\}_{j=1}^{N}, g^*, d^*)\) that is optimal for the executive in the current period, given initial conditions, prices, the voting strategy by members of the legislature, and subsequent equilibrium outcomes; a level of constraints, \(m^*\), which is optimal for every member of the legislature given the initial conditions and taking into account subsequent equilibrium outcomes; and prices, \(p^*\) and \(w^*\), that clear the markets for labor. Since decisions need to be optimal in the current period we rule out pre-commitment to decision rules and hence we restrict attention to symmetric Markov-perfect equilibria (SMPE).

Before deriving the equilibrium allocations notice that elites’ problems differ inside districts only if \(k_{hj}\) does as well. Therefore in a SMPE we have \(k_{hj} = k_j\) for all \(hj\), so we drop the index \(h\) for the rest of this section.
Equilibrium

To characterize the equilibrium the model is first solved for a given value of \( m \). This implies finding the optimal level of capital as a function of future taxes and also finding a proposal, which means finding the maximum tax rate that makes a member of the legislature as well off as with \( \tau = 0 \) and \( g = d = 0 \), as a function of capital. Since this is a repeated game we get the equilibrium level of capital and revenues, as a function of \( m \), as those that are consistent with both relationships, and explore how they depend on \( m \) and the exogenous parameters \((z, \lambda)\). Finally, given these implicit functions, the institutional design problem can be solved, which consists of finding \( m^* \) that maximizes the utility of the members of the legislature through its effect on \( k^* \) and \( T^* \), and explore how this depends on the parameters \((z, \lambda)\).

First it is convenient to analyze step 3, how policies are set for a given \( m > 0 \) and a \( k_j \) distribution. When \( S = 0 \) nobody values defense spending so it is clear that \( d = 0 \) in equilibrium. The same happens with public goods when \( S = 1 \), so \( g = 0 \) in that case. Since the executive enjoys public expenditures and he does not bear any costs of financing them, his problem is equivalent to maximizing \( T \) subject to the approval constraint. It is clear then that the equilibrium proposal includes a tax rate of 1 for members outside the WC. For members inside the WC he needs to propose the maximum tax rate consistent with the first constraint in (2). Since the provision of public goods or defense spending does not affect expected utility, flow utility under the proposed tax needs to be at least equal to flow utility when no district pays taxes. Hence the first constraint in problem (2) becomes \( u(0, S; \tau_j, g, d) \geq u(0, S; 0, 0, 0) \). Using the fact that current investment is not a function of current policies (the FOC in problem 1 is not a function of current taxes), the tax rate proposed and accepted in any state is the maximum tax rate consistent with the following expression,

\[ \tau_j \pi^*(k_j) \leq \gamma T = \gamma \left( \sum_{x \in WC} \tau_x \pi^*(k_x) + \sum_{x \notin WC} \pi^*(k_x) \right). \]  

(4)

The LHS of this expression is the amount the legislator pays under the proposal. The RHS is what he gets in public goods or defense spending when this is approved. Notice first that (4) is independent of the current state and hence so is the tax rate. Furthermore only \( \tau \) and \( k \) are district specific in equation (4), implying that tax rates will differ across districts only if capital does also. But, since districts are homogeneous ex-ante, investment would differ only if expected taxes depend on \( j \). Therefore in a symmetric equilibrium capital is the same in every district, \( k_j = I, \forall j \), and every member of the WC, independently of the state, faces the same tax, \( \tau_{wc} \). Hence we drop the index \( j \) and (4) becomes,

\[ \tau_{wc} \pi^*(k) \leq \gamma T = \gamma \pi^*(k) \left( m\tau_{wc} + (1 - m) \right). \]  

(5)

20Investment can influence taxes through either defining the inclusion in the WC, or changing the LHS of expression (4).
If $\gamma > 1$ there is no $\tau_{wc} \in [0, 1]$ that makes this expression hold with equality, hence $\tau_{wc} = 1$. But in this case there is no investment in equilibrium, so $i = 0$. If there is, if for instance it is not feasible to set the tax rate above a certain level, there would not be a commitment problem because everyone agrees ex-post to pay the maximum tax rate that is feasible to fight insurgencies. We focus on the case where $\gamma < 1$, and so there exists positive investment and a commitment problem, and (5) always holds with equality for a unique $\tau_{wc} \in [0, 1)$. Then we can solve for the level of taxes,

$$\tau_{wc} = \frac{\gamma(1 - m)}{1 - \gamma m}.$$  \hspace{1cm} (6)

The tax rate proposed and approved by the legislature is strictly decreasing in executive constraints, $m$. This is because this tax rate is increasing in the amount every other district pays, as opposing the proposal means renouncing more spending when there are more revenues from other districts. Because there are fewer members outside the WC when $m$ increases, and because they pay the maximum amount, this tax rate is decreasing in $m$ and likewise in $T$, given the investment distribution. Notice also that the tax rate does not depend on $\phi$ or profits (and hence $z$, $k$, or $\lambda$).

Now, keeping $m > 0$ fixed, we solve step 4. The FOC for capital in (1) is independent of current and future states. Previous results and the fact that agents cannot influence investment at the district level implies that selection into the WC is stochastic, and so $E(\tau) = m\tau_{wc} + (1 - m) = 1 - m(1 - \tau_{wc})$. Hence the FOC is

$$m\delta y_k(1 - \tau_{wc}) = 1$$ \hspace{1cm} (7)

where $y_k = i_k$ is the marginal product of capital. Expression (7) implies that capital is increasing in $z$ and $\lambda$, as these increase its marginal product. It is also increasing in executive constraints: only with probability $m$ the agent can get a positive return. Otherwise he needs to pay everything in taxes. This can be interpreted as a probability of expropriation that is decreasing in the size of the WC. Since $\tau_{wc}$ does not differ across states, the expected return, and so $k$ in equilibrium, is not a function of $\phi$.

We finally solve the static problem of elites. Marginal productivities are equal to prices in equilibrium. Since the supply of voluntary labor is inelastic, $\nu = \lambda$. In the case of forced labor the FOC in problem (3) and the market clearing condition imply

$$\frac{(1 - \alpha)z}{F^\alpha} = p = \left(\frac{F}{1 - \lambda - F}\right).$$ \hspace{1cm} (8)

An increase in the relative endowment of free labor, $\lambda$, reduces $F$, and hence the probability of conflict as well. Both $F$ and $\phi$ are increasing in total productivity, although the size of the effect depends on the supply, i.e. in $\lambda$. In particular an increase in the demand for forced labor due to a positive productivity shock will be lower in countries with low availability of this type of labor.

\footnote{In this case $\gamma(m\tau_{wc} + (1 - m)) > m\tau_{wc} + (1 - m) \geq \tau_{wc}$, hence $\gamma \pi^*(k)(m\tau_{wc} + (1 - m)) > \pi^*(k)\tau_{wc}$.}

\footnote{An interior solution for $\tau_{wc}$ is possible despite the linear utility assumption. This is because members outside the WC always pay positive taxes and hence the RHS is positive even when $\tau_{wc} = 0$.}
We have now found the response of taxes to capital through the political process, and the response of investment to future taxes through the decisions of individual elites. Since this is a repeated game, we can now characterize the optimal level of capital and taxes, which determines the amount of public goods provided and the size of the responses to conflicts, for a given level of executive constraints.

**Proposition 1**

*Suppose* $\gamma < 1$. *For a given* $m \in (0, 1]$ *there exists a unique equilibrium with positive capital,* $k^*$, *and revenues,* $T^*$. *Moreover in this case,*

$$\frac{\partial k^*}{\partial z} > 0, \quad \frac{\partial T^*}{\partial z} > 0, \quad \frac{\partial k^*}{\partial m} > 0,$$

*and, \( \exists m < 1 \) such that if* $m > m^*$,

$$\frac{\partial T^*}{\partial m} < 0,$$

*and if* $m < m^*$ *the opposite is true. Also,*

$$\frac{\partial i^*}{\partial \lambda} > 0 \text{ and } \frac{\partial a^*}{\partial \lambda} < 0.$$

**Proof.** See Appendix A. ■

Thus, in the unique equilibrium with positive capital, technology raises the return to investment and then raises the tax base, increasing revenues. The positive effect of a higher stock of capital on labor demand generates a positive relationship between technological change and the risk of rebellions.

More constraints on the executive raises capital as well, as the risk of being expropriated and paying all output in taxes is reduced. The effect on revenues is ambiguous because this positive effect on the tax base is offset by the fact that fewer districts are being expropriated and the reduction in the tax rate for members of the WC. But the first effect is weaker when the WC is large, because in that case most of the districts pay just a fraction of the increase in investment to the government. The proposition shows that there exists some level of constraints such that increasing them above that level always leads to less revenues. This fall in revenues is costly for the district facing a rebellion, and generates an ex-ante trade-off between higher risk of expropriation and smaller responses to conflicts when rising constraints. Since this trade-off does not exist when constraints are lower than the cut-off defined by the proposition, this cannot be an equilibrium, as increasing them will lower expropriation and the strength of conflict responses. Since land is fixed constraints do not affect the demand for coerced labor and hence neither the probability of future rebellions.

Finally the composition of the labor force has an effect on the composition of output. A relative increase in the supply of free labor will translate to an increase in this type of employment and
capital. But on the other hand it makes coerced labor more costly for elites, reducing that type of employment and consequently the risk of conflicts. Although this externality will affect the choice of constraints, it does not influence the equilibrium when constraints are kept constant.  

Corollary 1  In the unique equilibrium with positive investment, for a given \( m \in (0,1] \),

\[
\frac{\partial \phi^*}{\partial z} > 0, \quad \frac{\partial \phi^*}{\partial m} = 0, \quad \text{and} \quad \frac{\partial \phi^*}{\partial \lambda} < 0.
\]

Now we solve the stage of the game when legislators choose the level of constraints anticipating their effects on the equilibrium level of investment and the future response to conflicts. First we can express \( V(s_j,S) \) as current utility plus discounted expected utility as a function of \( k^*, \tau^*_w, T^*, \phi^*, m, \) and the exogenous parameters. Using (5) we get,

\[
V(s_j,S) = \tilde{u}(s_j,S) + \frac{\delta}{(1-\delta)} \left[ \frac{\delta \pi^*(k^*)(m + (1-m)\tau^*_w)}{\delta} - k^* + n\phi^*\gamma \bar{\gamma} T^* - \phi^*q \right]. \tag{9}
\]

This expression shows the trade-off involved in choosing \( m \). The first term is flow utility plus capital (\( \tilde{u}(s_j,S) = u(s_j,S) + k^* \)). This flow is realized before \( m \) is chosen and it is the only term in (9) which is a function of the current state. Hence \( m^* \) is not a function of \( S \). The first term inside the brackets are the net gains from investment. With probability \( m \) the legislator will be part of the WC in the future and hence will pay a fraction \( \tau^*_w \) of profits. But the utility cost of doing this is exactly the same as the gain from provision of the public good or defence expenditure. Therefore with probability \( m \) total profits are simply the return. Of course still taxes distort individual investment decisions, and hence output will be lower than its optimal level. With probability \( (1-m) \) the legislator will be out of the WC and will have to pay more taxes than those that finance the desired level of public goods. Then the net cost, or actual expropriation, is the difference between its valuation of public expenditures, i.e. \( \tau^*_w \pi^* \), and total profits, which is what he pays in taxes. This is why as \( \tau^*_w \) approaches 1 the return on investment approaches total profits.  

The following term in (9) captures the benefits of lowering the constraints on the executive, i.e. reducing \( m \). With probability \( n\phi \) there is a rebellion in the district, which is \( \bar{\gamma} \) more costly than for others members of the legislature, who are the ones that need to approve the proposal. In that event then there is an additional benefit from revenues, which are used to mitigate the cost of conflicts. If constraints are low, specifically if \( m \leq m \) as shown in Proposition 1, a higher \( m \)

\[23\]  This can be easily modified allowing for different tax rates depending on the state. As the probability of conflict is increasing in the amount of coerced labor, the expected tax, which determines investment decisions, would vary according to the composition of labor.

\[24\]  Since at the margin the private gains of investment are zero, the marginal gain of increasing \( m \) through a higher output comes from the larger provision of public goods due to the increase in revenues, something that is valued marginally only by legislators outside the WC. Additionally there is a marginal change in the probability of paying \( \tau_w \) instead of \( \tau = 1 \).
increases revenues, $T^*$, because of the positive effect on the tax base, and hence there is no cost of raising $m$. On the other hand, if $m > m_0$, the negative effect on tax rates is stronger than the effect on the tax base, and an increase in $m$ leads to lower defense expenditures. At this point there is a trade off when raising $m$ between a lower expropriation risk and a lower response to conflicts. The higher the cost of conflicts in districts affected by them, captured by $\bar{\gamma}$, and the higher is the probability of conflicts, $\phi$, the more costly it is to constrain the executive. This generates the main prediction of the model, a positive causal relationship between the amount of labor that can be coerced, $1 - \lambda$, which raises the risk of conflicts, $\phi$, and executive constraints, $m$, conditional on asymmetric costs of conflicts (a high $\bar{\gamma}$).

**Proposition 2** There exists a constant $\gamma^* > 0$ such that if $\bar{\gamma} > \gamma^*$ and $\gamma < 1$, there exists a unique $m^* \in (0, 1)$ consistent with an equilibrium with positive investment, and,

$$\frac{\partial m^*}{\partial \lambda} > 0.$$ 

Also $\exists \lambda \in (0, 1)$ such that if $\lambda < \lambda^*$,

$$\frac{\partial m^*}{\partial z} > 0 \text{ and } \frac{\partial^2 m^*}{\partial \lambda \partial z} > 0.$$ 

Otherwise $\partial m^*/\partial z < 0$.

**Proof.** See Appendix A. ■

Proposition 2 formalizes the main prediction of the model. Given uncertain and asymmetric costs of conflicts, the last condition being captured by a high $\bar{\gamma}$, we should observe more constraints in the executive in countries where a larger fraction of labor is free, as conflicts are less likely in the future. In countries where a large fraction of the population can be forced to work the equilibrium level of coerced labor is larger because individual producers do not internalize the aggregate increase in the risk of conflicts. Legislators faced with this risk and knowing the commitment problem they face, empower the executive ex-ante so he can react more forcefully to conflicts.

The effect of technology depends on the distribution of labor. When technology improves, the share of profits that are expropriated becomes more important than the expected cost of conflicts, leading legislators to choose more constraints on the executive. However in countries where unfree labor is abundant the elasticity of this factor with respect to technology is larger. This generates a larger increase in conflicts as the economy grows, offsetting the first effect and making the expected cost of conflicts even larger than what is lost due to expropriation. Hence technical change raises the dispersion of constraints due to differences in labor endowments, and, if $\lambda$ is low enough, it can

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\(^{25}\)Since $\phi > \kappa > 0$, there is always the risk of rebellions and hence we can always find a $\gamma^*$ high enough to get the result. But because $\phi$ is increasing in $z$ and in $1 - \lambda$, the higher are these parameters the lower is the value of $\bar{\gamma}$ needed.
even lead to fewer constraints in the executive. We illustrate these dynamics in Figure 5, where we assume that the technological parameter, $z$, jumps twice, and we show three cases for the trajectory of constraints, one with low unfree labor availability ($\lambda_l$), one with a medium level ($\lambda_m$), and one with a high level ($\lambda_h$). It is always the case, for any $z$, that $m$ is higher the higher is $\lambda$. However the differences are increasing in the level of $z$, as the responses to the jumps in $z$ are also positively related to the value of $\lambda$.

As shown in Section 2 the institutional gap was not accompanied by an income gap. This is useful to reject double causality between the early development of institutions and economic performance. However the model does predict a causal effect from the institutional gap to an income gap. Countries with a lower risk of conflicts are favored not only by technological change but also by a lower expropriation risk and hence should grow faster than those with a smaller institutional change. But this is because the risk of rebellions does not affect output directly in the model. This can be modified for instance by making $q$ output lost, or if $\phi$ were decreasing on $T$ and taxes were higher in the state of conflict. This would capture the mechanism described by Coatsworth (2008) in his analysis of Latin America after independence, i.e. that economic growth “required an immense effort to exclude majorities from political power and influence, consolidate the dominance of desperately precarious elites, and provide reasonable security for elite and (foreign) investors.”

In the next section we argue that the early institutional development in Latin America in the second half of the nineteenth century is remarkably suitable to test the model’s main prediction since historians have identified the exploitation of a large fraction of the population as a relevant risk of rebellions, which may have influenced the region and its early political development. It has also been documented that a large technology shock driven by developments in the rest of the world raised the demand for goods in which the region had comparative advantages.
4 The Evidence

In this section we study the determinants of the early development of institutions in Latin America characterized in Section 2, in light of the theoretical model developed in the last section. First we briefly describe the experience of Latin America after independence and identify two exogenous features that deeply affected the region and closely relate to the main drivers of institutional development according to the model. These are the risk of rebellions and the development of transport technologies. Rebellion risk, closely related to coerced labor, or the variable $F$ in the model, can potentially explain differences across countries, while changes in transport technology, associated with the variable $z$, may explain the dynamics of the process. Consequently the interaction of these two developments may be key to explain the institutional gap observed in that period, and therefore, as argued in Section 2, key to explain current development problems in Latin America as well.

Latin America after Independence

In the aftermath of independence the new countries in Latin America suffered a vacuum of political power, which led to lack of governance and numerous armed conflicts. The first decades were chaotic and disorganized; there was little institutionalization and almost no agreement on national goals or ideology (Wiarda, 2005). The wars of independence unleashed a crisis with power struggles between regional elites or caudillos for control of the new independent countries, predatory militarism, and clashes between civilians and the military, or between the church and anticlerical forces. Besides internal wars and economic stagnation, Latin America fell victim to foreign interventions and numerous border wars, especially in Central America (Bates et al., 2007). Financially weak governments due to economic stagnation and raising military expenses were additional sources of civil conflict proliferation (Prados, 2009).\footnote{Countries that achieved order notably early were Brazil, which maintained the system of monarchy, and Chile, which established a centralized republican government.}

After a short period where power was generally held by radical groups who favored wide popular participation following the spirit of the wars of independence, conservatives dominated politics. This group supported the rebuild of the colonial order so as to secure authority over the lower classes. In constitutional terms, see e.g. Loevman (1993), Gargarella (2004) and Wiarda (2005), they supported a strong presidency. They saw the executive as a national authority with the means to prevent internal disorders, and so they invested him with extraordinary powers during internal or external crises, when he could declare a state of emergency, suspend the constitution, and rule by decree. Consequently, authoritarian governments were common throughout the region in the aftermath of independence.

The rise of conservatives in almost every country after 1820 in the context of intra-elite conflicts
can be potentially explained by the model. According to its main prediction, fragmented societies like the ones in Latin America after independence needed to concentrate political power to impose order. But authoritarism raised the expected pay-off from controlling the government, increasing the incentives to fight with different factions inside the ruling class. Moreover, as argued by Coatsworth (1998), civil conflicts were shorter where the contended issues centered on the spatial distribution of political power between provincial and central power, and longer where settler elites dominated large slave or indigenous populations. In this last case governments struggle to restore colonial stability, but also to avert a recurrence of destructive rebellion from below (Coatsworth, 1998, pp. 562-565). Additionally an important fraction of post-independence conflicts were due to the discontent by workers, often represented by caudillos, who resented the upper class and its model of government (Drake, 2009, p.92).

Nevertheless we do not test the model empirically by trying to explain the events that occurred during these decades. There is little variance during that period in terms of executive power, beyond the differences between North America and Latin America. Neither is there data to capture the incidence nor the main features of these conflicts, which would need to comply with the main requirements described in the previous section in order to reasonably apply the model. Furthermore there is no identifiable factor pushing for more inclusive institutions, as independence was not accompanied by identifiable productivity shocks. Finally, if there was a serious effort in building institutions during these decades, the process was probably influenced by the ongoing conflicts in most of the countries, further obscuring the mapping of the model into the data. The focus of our empirical exercise is on racial conflicts, for which we have better proxies and that, according to the model, should have continued to influence political institutions after the “lost decades” following independence, and also on technological advances originated in the developed regions of the world, which impacted Latin America after that period as well.

The Risk of Rebellions

Historians have identified the fear of a race war as one of the main causes for the lack of revolutionary support by the elites in the Americas at the end of the nineteenth century, mainly because the colonial pact also relied on the effective maintenance of the internal colonialism of white over non-white which the Catholic monarchy had been able to provide (Williamson, 2009a, p.203). The white oligarchies in the Americas did not have representative political institutions or open access to high government posts. But this was the price that had to be paid for the massive legitimacy of the Catholic monarchy, which evoked strong loyalty to the established order from the Indian communities and the lower classes of Hispanics, blacks and mixed-bloods in the colonies (Williamson, 2009a, p.115). In short, the elite had little choice but to seek protection in exchange for loyalty (Coatsworth, 2008), and only when the king faltered did they understand they could no longer rely on Spain to protect them (Bates et al., 2007).
The most spectacular, notorious, and disturbing indigenous uprising in the Colonial period exploded across Peru in 1780, led by Túpac Amaru (Eakin, 2007; Drake, 2009). Other notable episodes were the revolt by the Aymara speakers in Upper Peru, the *comunero* revolt in Colombia, the local revolts linked to the Hidalgo movement in Mexico, and a mulatto revolt in the northeastern province of Bahia in Brazil. Although these uprisings had important costs for the elites -including in some cases the indiscriminate slaughtering of whites-, they were far from seizing political power. All of them were brutally suppressed, save the Haitian Revolution -a colony where roughly 95% of the population were slaves-, the only successful non-white rebellion in the Americas’ colonial period, and an event that kept alive the fear of race war among the elites throughout the continent in the nineteenth century.

Rebellion by the lower classes continued to be endemic after independence, and there are good reasons to think that these risks persisted for most of the nineteenth century. This is because independence was a political and not a social or economic revolution. White elites still employed coerced non-white labor in agrarian or mining economies. The labor market changed only slightly, slavery was abolished only where it was of little consequence, and coercive practices were restored when it became clear that the Indian laborer had no incentive to seek paid work (Bulmer-Thomas, 1995, p.30). Therefore the risk of an uprising was virtually unchanged. Moreover there are reasons to expect that the risk of uprisings by Indians and slaves was even higher after the lost decades following independence. The improved long-run economic prospects in these economies increased this risk as, for example, landowners tried to enlarge their land possessions at the expense of the lower classes, or as the demand for forced labor increased (Coatsworth, 1988).

Katz (1988), analyzing rural rebellions in Mexico, argues that rural revolts between 1810 and 1920 affected that country much more than such revolts had ever influenced the territory during the colonial period. This was particularly the case in central Mexico, where rebellions became more common, larger, and bloodier, and repression more pronounced. Between 1840 and 1870 there was an unprecedented resurgence of village revolts, race wars, and regional rebellions (Coatsworth, 1988). According to Katz (1988) and in line with the model, one of the reasons for this was the greater strength of the Spanish crown relative to the new Mexican state. Moreover he argues that post-independence rebellions became less common around 1884 due, among other factors, to the beginning of the strongest state that independent Mexico had ever known, led by Porfirio Díaz, despite the massive expropriation of villagers’ lands by wealthier classes that began in the late nineteenth century.

Coatsworth (1988) surveys the literature on rural rebellions since the end of the seventeenth century in Latin America. This literature consists mainly of case studies and therefore is not

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27 Sánchez et al. (2010) report a close relationship between the price of coffee, its share in exports, and land conflicts, and argue that this was due to the interest of large landowners to expand their land.

28 Although the author recognizes that rebellions in cities and towns were also very common and similar to rural rebellions, they are not included in this analysis.
exhaustive. Most of the events studied took place in Mexico, Guatemala, Peru, Bolivia, and Brazil. In the case of revolts involving Mesoamerican and Andean villages, Coatsworth (1988) distinguishes three main types: land invasions, village riots, and caste wars. All of these involved high degrees of violence, including theft and assassinations, and they were mostly directed against the rural elites: land owners in the first case, public officials in the second case, and whites in the third case. Caste wars, regional uprisings directed towards the expulsion or elimination of non-Indian authority, were the largest revolts, while the most common and prolonged revolts involved formal and informal alliances between Indian villagers and non-Indian low classes. Finally slave-based revolts consisted of plantation riots and uprisings, slave insurrections, and maroon warfare. Slave insurrections, although uncommon, usually sought the expulsion or extermination of the European elite and, together with caste wars, could arise from small riots via contagion, a danger recognized by ruling classes throughout Latin America (Coatsworth, 1988, p.30).

Because the analysis is based on case studies for certain countries only, numbers are not representative. However they give a lower bound on the number of conflicts. Coatsworth (1988) reports 521 village riots and uprisings and 286 slave-based revolts from 1700 to 1899. In the case of regional, “peasant”, and caste wars, he reports 6 events before 1810 and 42 thereafter; 23 in Mexico, 8 in Brazil, 7 in Peru, and 10 in other countries (Argentina, Barbados, Bolivia, Ecuador, El Salvador, Guatemala, and Jamaica). In the case of Mexico these rebellions took place in 15 different regions. A similar pattern is observed in Brazil and Peru. This shows that they were not localized only in some specific regions. Of 31 maroon wars and slave insurrections recorded between 1700 and 1832, 13 occurred in the Guianas, Suriname, and Venezuela, while the rest were spread throughout the Caribbean islands and the mainland.

The model in this paper predicts that fear of race wars affected the institutions built after independence. The main features of this type of conflict resemble those needed by the main mechanism of the model. These rebellions were costly, localized in certain regions but widespread, and, with very few exceptions, far from seizing power. The elite was geographically dispersed, since these were mainly agrarian and mining economies.

Indeed it has been documented by historians that the risk of uprisings by the lower classes, together perhaps with the risk of intra-elite conflicts, was among the main reasons for the establishment of autocratic regimes throughout the continent after independence. The trade-off facing the new political elite was similar to the one highlighted in the model: “…a contradiction appeared: the only coherent political ideology available to [the elites] was liberalism, but democratic values such as liberty and equality ... tended to undermine state authority in regionally dispersed societies which were still seigniorial, hierarchical, racially divided and often based on slavery.” (Williamson, 2009a, p.233). Given severe racial and class inequalities, elite fears of mass upheaval compelled many of them to prefer authoritarism over republicanism, and where colonial rule relied on exploitation of large indigenous or slave populations, that cleavage carried on past independence and hindered
democratic prospects (Drake, 2009, p.54). Eakin (2007) concludes that much of US history in the aftermath of the revolution is about how to implement the ideals of the founding fathers, while in Latin America, where the elites all read, discussed, and exchanged the ideas of the age, the presence of liberal ideals and principles is very weak and minimal, and the focus is on war and maintaining elite control (Eakin, 2007, p.199).

Technical Change in Transportation

Historians suggest that only after the negative economic and political effects of the wars of independence started to be overcome countries were able to move to less autocratic political institutions. It took decades of civil discord before most of the countries could bring about enough order to construct functioning governments (Drake, 2009, p.15). It is interesting in this context to see that the origin of the institutional gap throughout the region, influenced by the risk of rebellions, coincides with the period of economic recovery and political domination by liberals, who dominated politics in almost every country by 1870. This group, who particularly benefited from overseas trade and new economic opportunities, supported the creation of a modern liberal state following the US constitution. They tried to constrain the potential abuses of the executive through limits on the president’s terms of office, restrictions on his powers of veto, and the elimination of his exceptional powers (Gargarella, 2004; Drake, 2009).

Better economic conditions and the diversification of the economy, leading to order and a period of institutional building, was driven by external factors. As stated by Williamson (2009a), only after about 1850 did overseas demand begin to pull a few Latin American economies out of stagnation, leading to a degree of political consolidation and, in some republics, to a period of constitutional politics and rule of law (Williamson, 2009a, p.234). These external factors were mainly related to technological developments in industrialized countries, specifically a transportation revolution that started in the early nineteenth century, generating spectacular maritime transport cost declines (North, 1958; Harley, 1988; Estevadeordal et al., 2003). O’Rourke and Williamson (2002) estimate that transport improvements over sea lanes between 1870 and 1913 induced a 45 percentage-point fall in trade barriers. Trade expansion was driven by the integration of markets between trading economies, inducing commodity price convergence and characterized by a reshuffling of resources within national economies, instead of booming import demand or export supply (O’Rourke and Williamson, 2002).

The institutional divergence is reflected in the fact that this group was not always able, or willing, to establish political institutions consistent with the liberal principles described above. As documented by Eakin (2007) (p.220), liberals sided with the option of authoritarian governments once they obtained the political power in countries like Mexico and Brazil, but extended political participation in countries like Chile, Argentina, Uruguay, and Costa Rica.

This distinction is relevant since it implies that this phenomenon benefited

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29 The institutional divergence is reflected in the fact that this group was not always able, or willing, to establish political institutions consistent with the liberal principles described above. As documented by Eakin (2007) (p.220), liberals sided with the option of authoritarian governments once they obtained the political power in countries like Mexico and Brazil, but extended political participation in countries like Chile, Argentina, Uruguay, and Costa Rica.

30 The causality may have also gone from internal stabilization to trade, as countries were able to remove prohibitive tariffs only after public finances started to improve (Prados, 2009). As we show below we only capture the causality from integration to institutional building in the empirical exercise.
most of the sectors in the economy and not only the few sectors with political power. Reinforcing this fact, there seems to be no evidence suggesting that world integration existed prior to 1820, implying that most nontradable primary products had become tradables after 1860 (Williamson, 2006). North (1958) argues that the tendency for ocean freight rates to fall rapidly promoted rapid regional development, as was the case for new wheat regions such as Argentina, while Williamson (2006) suggests that it also favored other bulky Latin American staple exports, like beef and guano. Bulmer-Thomas (1995) shows that the period from the middle of the nineteenth century to the First World War witnessed the rise of new export products throughout Latin America, finally eclipsing the the colonial pattern of exports (Bulmer-Thomas, 1995, p.57).

This technological advance in transportation is particularly suitable to test the model. It was clearly exogenous for the region, large, relatively easily identifiable, and every country in the region felt its consequences. Moreover it affected most economic sectors, and not only those that may have had the political power before the reforms. Therefore these developments in the transportation sector may have increased the marginal benefits for the elite of constraining the executive according to the model. As this happened, countries able to constrain their executive, because of a low risk of internal conflicts, did so.

But on the other hand, integration and its economic effects may have increased the risk of uprisings in countries with large Indian and slave populations. Regarding the modernization process in the last decades of the nineteenth century, in line with the arguments by Coatsworth (1988) described above, Eakin (2007) argues that its main cost was an enormous dislocation and hardships for rural peoples, as they lost their lands and saw their villages disrupted or destroyed (Eakin, 2007, p.221). Indeed modernization has long been identified as a determinant of ethnic conflict (Horowitz, 1985).

**Regression Results**

Now we pursue a quantitative analysis of the sources of institutional development highlighted above. First the focus is on differences across countries, where the effect of the risk of rebellions is emphasized. Later we explore the dynamics and focus on the effect of technological progress in transportation. When interpreting the results we need to be very careful due to the small sample size and data limitations due to the historical nature of the phenomenon under analysis.

The discussion in the last subsection implies that the existence of oppressed non-whites; Indians, blacks, mulattoes, and even mestizos generated a risk of conflicts for the white elites, in accordance with the structure of the theoretical model. It follows that a variable measuring non-whites as a fraction of total population may be a good explanatory variable for the constraints imposed on the executive throughout the region. Unfortunately there are only measures of Indians and blacks available, so we focus on these groups only. Mahoney (2003) estimates Indians and blacks as a fraction of total population for different countries in Latin America for the years around 1800. We
complement this variable with data for Brazil and Panama from McEvedy and Jones (1978). We use this variable, which we denote $BI$, as a proxy for the availability of coerced labor throughout the region. $BI$ ranges from roughly 1% in Uruguay and Costa Rica, to more than 70% in Brazil. Uruguay and Costa Rica, together with Chile and Argentina which had low indigenous populations as well, have been identified as the countries with the most democratic institutions in Latin America (Drake, 2009). This variable, together with all the data used in the regressions, is presented in Appendix B.

In Figure 6 we plot our variable $BI$, the fraction of blacks and Indians to total population around 1800, against average executive constraints from 1870 to 1910, the decades identified in Figure 2 as relevant in explaining current development in the region. As expected, we can see a negative relationship between the two variables. Uruguay, and to a lesser degree Venezuela and Argentina, situated in the lower left region in Figure 6, hinder a stronger negative relationship. It is worth noticing that all of them started their independent life with the lowest constraints on the executive, and so the average level may underestimate the true institutional development. Uruguay had in 1910 a value of 0.5 for the constraints on the executive variable, and 0.67 in 1920, only behind Chile and Costa Rica. Notice also that Venezuela is identified by Coatsworth (1988) as one of the countries most affected by slave insurrections in the region, and so there may be idiosyncratic factors affecting the relationship between the size of the black population and the risk of civil conflicts.

Some of these factors could be potentially included in a regression analysis. In Table 1 we show regression results, using the average over 1870 and 1910 of executive constraints as the dependent variable. Column 1 shows that the negative relationship depicted in Figure 6 is significant at a

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*We also have data for Jamaica (94%), the US (20%), and Canada (4.5%), but we do not include them in the econometric exercise. In the case of Jamaica this is because of its late independence (1962), a fact that may have been motivated by the fear of uprisings, fuelled by the example of Haiti (Eakin, 2007). In the case of the North American colonies, although results improve when they are included, we exclude them because of their different colonial pasts.*
Table 1: Constraints on the Executive and the Risk of Rebellions, Regression Results.

95% level of confidence, with the regression explaining about one fourth of the variance in average executive constraints during these forty years. In column 2 we add executive constraints at the time of independence to control for other idiosyncratic features that may have affected institutions, such as the colonial system of government or the process of independence. After doing this the estimated coefficient on BI increases and becomes significant now at the 99% level of confidence, showing that the explanatory power of BI is even larger when analyzing institutional development, i.e. the change in executive constraints since independence.

It is worth emphasizing that the estimated relationship between BI and executive constraints is not a direct outcome of the exclusion of certain groups from political participation. Ethnic friction, together with social inequalities, probably influenced the difficulties in achieving democracy in Latin America. But in this case the effect is on the institutions regulating the relationship among the members of the elite and not between them and the rest of the population. As explained above, constraints on the executive is only indirectly related to the fraction of population voting in elections, and the fraction of the population voting in elections throughout the region was much lower than the fraction of whites in the population at that time (Colomer, 2004; Hartlyn and Valenzuela, 1998).

To confirm that the results really correspond to the mechanism predicted by the model an interaction term with a variable capturing the roughness of the territory, denoted by RT, is included in the regressions. This variable captures how difficult it is to fight an uprising. As argued by Hegre

<table>
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<th>(3)</th>
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<td>Constant</td>
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<td>0.43***</td>
<td>0.53***</td>
<td>0.55***</td>
<td>0.50***</td>
<td>0.52***</td>
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<tr>
<td></td>
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<td>0.09</td>
<td>0.09</td>
<td>0.08</td>
<td>0.07</td>
</tr>
<tr>
<td>Blacks &amp; Indians (BI)</td>
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<td>-0.58***</td>
<td>-0.56***</td>
<td>-0.59***</td>
<td>-0.49***</td>
<td>-0.54***</td>
</tr>
<tr>
<td></td>
<td>0.23</td>
<td>0.21</td>
<td>0.20</td>
<td>0.20</td>
<td>0.19</td>
<td>0.15</td>
</tr>
<tr>
<td>Initial Constraints (XCind)</td>
<td></td>
<td></td>
<td>0.67**</td>
<td>0.30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rough Terrain (RT)</td>
<td>0.10**</td>
<td>0.16***</td>
<td>0.20***</td>
<td>0.30***</td>
<td>0.04</td>
<td>0.06</td>
</tr>
<tr>
<td></td>
<td>0.07</td>
<td>0.08</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rough Terrain (RT) x Blacks &amp; Indians (BI)</td>
<td>-0.22</td>
<td>-0.65***</td>
<td>0.16</td>
<td>0.22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R²</td>
<td>0.23</td>
<td>0.43</td>
<td>0.46</td>
<td>0.53</td>
<td>0.52</td>
<td>0.71</td>
</tr>
<tr>
<td>Observations</td>
<td>17</td>
<td>17</td>
<td>17</td>
<td>17</td>
<td>17</td>
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</tr>
</tbody>
</table>

Notes: The variable RT is normalized by its mean. Robust standard errors are in italics, * means significant at 10%, ** significant at 5%, and *** significant at 1%.
and Sambanis (2006), “rough terrain is ideal for guerrilla warfare and difficult for a government army to control. Mountain areas, giving advantage to rebel troops, allow the rebels to expand the scope of conflict, whereas forests provide cover, particularly against detection or aerial attack”. This is consistent with theories that focus on feasibility to explain the causes of civil conflicts (Collier and Hoeffler, 2007), and, since it is exogenously determined, it has also been used as an instrument to capture the exogenous likelihood of civil wars (Aguirre, 2011). Hence the model would predict that a relatively larger oppressed population should have a larger effect on the constraints imposed on the executive in countries with a relatively high value of RT. Therefore we introduce an interaction term between BI and RT and expect a negative sign.

There are at least two alternatives for measuring RT. Fearon and Laitin (2003); Hegre and Sambanis (2006), and Aguirre (2011) use the proportion of the country that is mountainous, identifying it as an important determinant of civil conflicts. Another variable is the one constructed by Nunn and Puga (2012), which captures small-scale instead of large-scale terrain irregularities as the first measure does. Each of these variables may be relevant for different conflicts. The first one is likely more relevant in capturing obstacles to military reactions by government in present times, but the second one may be more relevant for older fighting technologies. It captures the existence of caves for hiding and the ability to watch the lowlands and incoming paths (Nunn and Puga, 2012). Indeed Nunn and Puga (2012) use it to identify areas that could reduce enslavement in Africa before 1900, hindering raids and kidnappings. The correlation of these variables for our sample of 17 countries is 0.65.

In columns 3 and 5 of Table 1 we include our measures of RT, normalized by their means, as controls in the baseline regression. The coefficient on BI does not change much. We do not include initial constraints because of the small sample. Indeed results from this more complex specification should be interpreted with caution because of this problem. Results with the interaction term are shown in columns 4 and 6 of Table 1. As expected, the coefficients are negative, implying that the effect of BI rises with the roughness of the territory. This is true for both RT measures. In particular the coefficient on BI is negative and significant at a 90% confidence level only in countries with values of RT close to 65% the sample mean, corresponding to about 75% of the countries in the sample. The effect of BI when RT takes this value is about 50% to 70%, depending on the measure of RT used, the estimated effect in the country with the average value of RT. These results suggest that the channel is the one predicted by the model: a larger population of oppressed Indians and blacks meant a higher probability of civil conflicts, and when these conflicts were difficult to fight, the elite needed to organize itself in a certain way so to make the response to these events easier.

A possible concern with the results reported in Table 1 is that the relationship between BI and political institutions may be capturing a mechanism different than the one explained by the model. To see if this is the case we now control for a series of variables associated to different theories that have been proposed in the literature to link colonial and pre-colonial experiences with current
economic and political development. The results from this robustness analysis are presented in Table 2. Engerman and Sokoloff (1997, 2002) argue that factor endowments affected inequality, and inequality in turn led to bad institutions and underdevelopment in The Americas. To control for this mechanism we use a measure of land suitability for wheat versus sugarcane. This variable was constructed by Easterly (2007), who argues that it captures the exogenous component of the type of inequality considered by Engerman and Sokoloff (1997, 2002). In column 1 of Table 2 we can see that the size as well as the significance of the coefficient of interest increase when this variable is included in the regressions. Meanwhile the wheat-sugar ratio has an unexpected negative and significant effect on executive constraints.

Acemoglu et al. (2002) showed that relatively rich areas in 1500 are now relatively poor countries. Their explanation is that in poorer areas Europeans established institutions of private property that favored long-run growth, while in richer areas they established extractive institutions, which discourage investment and economic development. We control for each of the three variables that these authors have used to capture this mechanism: population density in 1500 (column 2), urbanization in 1500 (column 3), and settler mortality (column 4). In all cases the coefficient on \( BI \) is significant and negative. Only when settler mortality is used as control the size of the coefficient is similar to the one estimated in the baseline specification (column 1 of Table 1), in the other two
cases results are stronger. The only statistically significant control is population density in 1500, although it has a positive sign when it is supposed to be negative.

In column 5 of Table 2 we include a measure of state development during colonial times. This is the State Antiquity Index developed by Bockstette et al. (2002). This index captures the presence of a supra-tribal polity in present-day countries. Higher scores are associated to countries where intensive agriculture, urbanization, use of money, taxation, and government administration developed earlier.\textsuperscript{32} We use the average of the index from 1500 to 1800 to roughly capture the colonial period. The coefficient of interest is still highly significant and much larger than the baseline estimation, and the State Antiquity Index has a positive and significant effect on executive constraints. Finally in column 6 we introduce the controls altogether and the coefficient remains large and very significant.\textsuperscript{33} Therefore we can conclude from this exercise that it is likely that the channel behind the negative and significant relationship found in Table 1 is the one highlighted by the model. Keeping alternative determinants of state and economic development constant, the fraction of blacks and Indians to total population around 1800 is negatively associated with executive constraints around 1900.

To know more about the causes of early institutional development in Latin America we now study the dynamic process of reform. This will allow us to study the interaction of this process with the potential gains in productivity derived from the transport revolution. To capture the dynamic process of institutional development we estimate the following regression annually from 1835 to 1925,

$$ XC_{j,t} = \alpha_{0,t} + \alpha_{1,t}BI_j + \alpha_{2,t}XC_{j,\text{indep}} + \epsilon_{j,t} $$  \hfill (10)

Estimation results are shown in Figure 7. In the left panel the sequence of $\alpha_{0,t}$ is plotted. We

\textsuperscript{32}Bockstette et al. (2002) use the index to show that earlier state development is a good predictor of recent rates of economic growth, while Hariri (2012) use it to show that early development was an impediment to democracy outside Europe because it constrained institutional transplantation.

\textsuperscript{33}The same happens if initial constraints are included as an additional regressor as in Table 1
observe a sustained increase in this coefficient from 1850 to 1920, consistent with the evidence in Section 2. In the central panel the sequence for $\alpha_{1,t}$ is plotted, and we can see that this rapid institutional development took place only in countries with small Indian and black populations, as expected from the results in Table 1.

The temporal change in the value and significance of the coefficient is interesting. It only becomes negative and significant around 1865. This coincides with the period of fastest development, and rising dispersion across countries, of the quality of political institutions (see Figure 1). Moreover this suggests that the gap generated by our explanatory variable started long after independence, lowering the likelihood that it directly captures colonial differences rather than the risks of conflicts. We also observe that the coefficient becomes not significant around 1910, consistent with the idea that race uprisings like the ones highlighted by the model became less likely during the last century, being replaced by wider class conflicts for which neither the model nor the explanatory variable have much to say.\(^{34}\) Therefore, to understand the causes of early institutional reform, we need to search for exogenous factors affecting the region during that period. Based on the theoretical predictions of the model and the discussion above we explore the effects of the decline in transport costs next.

North (1958) constructs an index of ocean freight rates from 1750 to 1913. During most of the years from 1750 to 1815 freight rates were at very high levels, experiencing thereafter two periods of decline, 1815 to 1851, when cargos from Europe were particularly affected, and 1870-73 to 1908-09, when freight rates on the long hauls showed the greatest decline (North, 1958, p.542). Harley (1988) presents an alternative index and shows that the long decline in freights started only around 1850, being by the early 1900s only about a third of what they were before 1850.\(^{35}\) Mohammed and Williamson (2004) construct another index that starts in 1870, and show that the pre-World War I sharp decline in real transport costs slowed down during the interwar decades, and fell only modestly after 1950. Measuring it by the ratio of world trade to output, Estevadeordal et al. (2003) identify the period 1870 to 1913 as the first era of trade globalization, and the decline of transport costs as one of its main determinants. It is clear then that this transport revolution, which deeply influenced the region integration with the rest of the world, coincides very closely with the period of reform intensification in Latin America. Figure 8 plots the HP trend of the negative of the ocean freight index reported by North (1958), which we define as an index of transportation technology ($TT$), against the sequence of coefficients estimated in equation (10). We can see a positive long-run relationship, especially for the period after 1870. Using the revised index constructed by Harley (1988) the rise in $TT$ would start later (around 1850-1860), and we would not observe the

\(^{34}\)A similar temporal pattern is observed when the interaction term between $BI$ and $RT$ is included in Equation 10: the dynamics of $\alpha_{1,t}$ are conditional on how difficult is for the government to fight an uprising, and the main change occurs in the decades after 1865.

\(^{35}\)Harley (1988) argues that the difference with respect to North’s index is that the latter is dominated by cotton freights, which actually decline before 1850.
subsequent and temporary fall (1865-1875) shown in Figure 8, strengthening the correlation with
the sequence of $\alpha_{0,t}$. However we have been unable to access the index, only Figure 1 in Harley’s
paper.

It is not easy to explore more rigorously the relationship between these technological advances
and the process of institutional reform. Although it is clear that it was an exogenous shock,
it affected the whole region, which is good because it can explain the gap jointly with $BI$, but
hinders the search for a significant relationship.\textsuperscript{36} Therefore we follow an indirect way of testing
the hypothesis. We explore the interaction of technological advances with certain characteristics of
the countries that, in light of the model’s predictions, may have affected the influence of integration
on political reform. We select features that are exogenous to the political process, but due to data
restrictions, they need to be easily available. The first factor we consider is the distance to the
UK. The reason is that the reduction in transport costs affected mostly long-distance sea routes.
In particular North (1958) finds that “in the case of any internationally traded bulk commodity
the narrowing of the difference between the freight cost on short hauls versus long hauls is the
most striking feature” (North, 1958, p.542). Moreover these countries were more isolated before
the technological shock. Therefore we expect that as integration improves, countries further away
from the UK reform their institutions faster. The second variable is the size of the country. This
is the simplest proxy for the potential of diversification of an economy facing a structural change
of this sort. In small countries it is very likely that those that have the political power control the
few economic sectors. Hence we expect a positive interaction of this variable with our proxy for
technological advance.

We estimate a panel regression with data averaged for 5 years from 1850 to 1910 and incorporate
time effects. We adjust all variables by their mean so we do not need to include fixed effects.
Notice then that the relationships we measure here are different from those presented in Table 1,
as the variance of the dependent variable in that case is eliminated. We investigate now the slope

\textsuperscript{36}Moreover we have two variables with a trend, and hence, even if we find a relationship, this can be spurious.
### Table 3: Constraints on the Executive and the Risk of Rebellions, Regression Results.

<table>
<thead>
<tr>
<th>Dep. Var.: Executive Constraints</th>
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<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
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<tbody>
<tr>
<td>Distance to the UK × TT</td>
<td>0.15***</td>
<td>0.21***</td>
<td>0.21***</td>
<td>0.06</td>
<td>0.06</td>
</tr>
<tr>
<td>× TT</td>
<td>0.15</td>
<td>0.13</td>
<td>0.16</td>
<td>0.22</td>
<td>0.15</td>
</tr>
<tr>
<td>Size × TT</td>
<td>0.05*</td>
<td>0.08***</td>
<td>0.08**</td>
<td>0.03</td>
<td>0.03</td>
</tr>
<tr>
<td>Blacks &amp; Indians × TT</td>
<td>−0.51**</td>
<td>−0.94***</td>
<td>−0.93***</td>
<td>0.25</td>
<td>0.26</td>
</tr>
<tr>
<td>× TT</td>
<td>0.25</td>
<td>0.26</td>
<td>0.27</td>
<td>0.16***</td>
<td>0.06</td>
</tr>
<tr>
<td>TT</td>
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<td>194</td>
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</tr>
</tbody>
</table>

Notes: Time and fixed effects included in all specifications except for (5) where only fixed effects are included. Robust standard errors are in italics, * means significant at 10%, ** significant at 5%, and *** significant at 1%.

The lagged value of the dependent variable is not included in the specification because we are interested in long-run relationships since we do not have predictions for interactions at a higher frequency. Results are presented in the first two columns of Table 3. As expected, in both cases the interaction with transport technology is positive and significant, suggesting that institutions in more isolated and larger countries were more influenced by the integration process in developing more inclusive political institutions.

A third factor we consider is the risk of civil conflicts. The interaction term is included in column 3 of Table 3 and, as expected, it is negative and significant. In column 4 we add the three explanatory variables together and all the effects become larger and more significant. Hence, controlling for other differences, only countries with a relatively low risk of rebellions were able to constrain their executives when the gains of doing so rose due to technological change. To get some sense of the size of the effects we include TT as an additional regressor in the equation. This allows us to identify for which level of BI the effect of the technology shock is positive and significant. Of course this is feasible only if time effects are not included in the regressions. These results need

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37 This is not exactly true because the sample used here starts 10 years before the data used in Table 1. However the variability for that decade is very small (see Figure 1), and so the results when starting in 1860 are practically unchanged.

38 Moreover, when the lagged dependent variable is included as a regressor an endogeneity issue is introduced in the regression. Although there are methods to fix this problem we try to keep the exercise as simple as possible given the small number of countries.
to be taken with extreme caution as it is very likely to get a spurious relationship.\textsuperscript{39} Taking into account now the independent effect of $TT$, results, presented in column 5, imply that only countries with indigenous and black populations below or close to the sample mean saw their institutions improve due to economic integration. The conditional effect becomes negative when $RT$ is high, i.e. institutions get worse due to economic integration, although this latter result is only significant for countries with black and Indian populations larger than twice the sample mean.

In sum the results of the econometric exercises performed in this section are consistent with the hypothesis that economic integration and the risk of rebellions were significant causes for the divergence observed within the region in terms of political institutions.

5 Conclusions

This paper develops a theoretical model where the risk of conflicts interacts with technical change in shaping endogenous political institutions. Economy-wide technical change increases the costs of empowering the chief executive, since in this case expropriation is easier to perform. However, if the economy faces the risk of rebellions and if these generate uncertain and asymmetric costs to the elites it may be beneficial not to constrain the executive in order to have an ex-ante efficient response to these conflicts.

An ideal environment to which the model is applied is the post independence period in the Americas. Historians have argued that the risk of uprisings from non-whites in these economies was important, and some evidence reviewed in the paper suggests that they meet the conditions required by the theoretical model: they were geographically localized and small-scale conflicts that affected a regionally dispersed elite. On the other hand the region experienced a deep structural change in the second half of the last century, when a transport revolution lowered trade costs and allowed the integration of the regions in the periphery with the developed world. This generated an unprecedented and generalized rise in productivity throughout the region. The empirical part of the paper focuses on this era, which was characterized by divergent institutional development among Latin American economies. The econometric evidence shows that countries with a low risk of rebellions were able to raise the constraints imposed on the executive after the lost decades following independence, when a process of institutional design could take place at the same time that the technological advance in the transport sector started to be observed. But even though these countries were similarly influenced by this technical change, and they were similar to reformer countries before 1870, countries facing a high risk of rebellion kept their executives empowered. This may explain the institutional gap observed in the region during the process of consolidation of oligarchic republics in the first decades of the twentieth century.

\textsuperscript{39} An inspection of the residuals suggest that Chile seems to be the only country in the sample where $TT$ is not able to explain the trend in institutional development, i.e. where residuals seems to have a clear trend.
Evidence presented in the paper shows that this gap was not correlated with income per capita at that time. It also shows that it has significant explanatory power for income per capita today, in part due to its subsequent effect on contemporaneous institutions but also due to other unmodeled channels. The study of these issues is left for future research.

However it is possible to identify some mechanisms revising previous work on institutions and development in Latin America. For instance García-Jimeno and Robinson (2011) show that the presence of a frontier in the Americas after independence affected long-run development conditional on how constrained the executive was at the time of national expansion. Differences in political institutions resulted in different paths, ranging from clientelistic to open access to frontier lands. Other mechanisms may include increasing income inequality in less democratic countries during that period, which has been found by recent work (Williamson, 2009b), and that may had had an effect in subsequent social conflicts and trough that in economic outcomes. Indeed after World War I social inequalities together with industrialization, may have led to the process of democratization proposed among others by Acemoglu and Robinson (2000, 2006), Bourguignon and Verdier (2000), and Benhabib and Przeworski (2006), as larger social movements started to push for more political inclusion.

The outcome of that process may have been influenced by the political institutions existent at the beginning of the process. As stated by Drake (2009) regarding Uruguay’s President José Battle y Ordóñez (1903-07 and 1911-15), “who provided a prime example of political democratization combined with social reform, “[he] did not lead a middle and working class coalition... Rather, he engaged in preemptive or anticipatory reform and incorporation of those subordinate classes from an elite vantage point.” In this way reform emanated from above, not from below, providing the counterpart to Mexico, where after a violent Revolution, the country retained a protected authoritarian system (Drake, 2009, p.135). A related idea is the thesis by Collier and Collier (1991), who highlight the different assimilation of the labor movement during those decades as a determinant of subsequent political development. Whatever the channel may be linking the institutional gap observed the beginning of the last century and current development, this paper contributes to a better understanding of the origins of political institutions and their relevance for explaining the large differences in GDP per capita in Latin America.
Appendix A

Proof of Proposition 1

We can apply the Implicit Function Theorem (IFT) to expression (8) to get,
\[
\frac{\partial F}{\partial z} = \left(\frac{F}{z}\right) \frac{(1 - \lambda - F)}{(1 + \alpha)(1 - \lambda - F) + F} > 0
\]
(A.1)
\[
\frac{\partial F}{\partial \lambda} = -F \frac{1}{(1 + \alpha)(1 - \lambda - F) + F} < 0
\]
(A.2)

Also \( \partial F/\partial m = 0 \), \( \partial F/\partial k = 0 \), and \( \partial F/\partial \tau = 0 \). Now fix \( 0 < \gamma < 1 \) and express \( k \) using (7) and (5) as
\[
k = \lambda \left( m \delta \alpha z \frac{(1 - \gamma)}{(1 - \gamma m)} \right) \frac{1}{m}
\]
(A.3)

Hence \( k^* > 0 \) is unique (of course \( k^* = 0 \) and \( \tau_{\infty} = 1 \) is always an equilibrium). Moreover
\[
\frac{\partial k}{\partial m} = \frac{k}{m(1 - \alpha)(1 - \gamma m)} > 0
\]
(A.4)
\[
\frac{\partial k}{\partial z} = \frac{k}{z(1 - \alpha)} > 0
\]
(A.5)
\[
\frac{\partial k}{\partial \lambda} = \frac{k}{\lambda} > 0
\]
(A.6)

Since labor is paid its marginal productivity \( \pi = \alpha(a + i) \) and \( T = \alpha(a + i)(1 - m(1 - \tau_{\infty})) = \alpha(a + i)(1 - m)/(1 - \gamma m) \). Because \( k \) and \( F \) are strictly increasing in \( z \), both \( a \) and \( i \), and hence \( T \), are strictly increasing as well. To see the effect of \( m \) on \( T \) we differentiate \( T \) and use (A.4) to get,
\[
\frac{\partial T}{\partial m} = \alpha(1 - \gamma) \left[ \frac{(1 - m)(1 - \gamma m)}{1 - \gamma} \right] \frac{\partial k}{\partial m} \left( a + i \right) = \alpha(1 - \gamma) \left[ \frac{\alpha}{(1 - \gamma m)} \right] \frac{(1 - m)i}{m} \left( a + i \right)
\]
\[
\frac{(1 - m)i}{m} = z \frac{1}{m} \lambda \left( \alpha(1 - \gamma) \right) \frac{1}{a} \frac{1}{(1 - \gamma m)^{1/\alpha}}
\]

Since \( \alpha < 1/2 \), \( \partial(i(1 - m)/m)/\partial m < 0 \) and \( \lim_{m \to 0}(1 - m)i/m = \infty \). Hence \( \lim_{m \to 0} \partial T/\partial m = \infty \), because \( \lim_{m \to 0}(a + i) = a > 0 \), and \( \partial T/\partial m = -\alpha(a + i)/(1 - \gamma) < 0 \) when \( m = 1 \). The existence of \( m \) as defined in the proposition comes from the fact that the term inside the square brackets is strictly decreasing in \( m \) as \( \partial(a + i)/\partial m > 0 \).

Finally \( \partial i/\partial \lambda > 0 \) comes directly from (A.3), and \( \partial a/\partial \lambda < 0 \) comes directly from (A.2).

QED.

Proof of Proposition 2

The FOC of (9) with respect to \( m \) is,
\[
\delta \left[ \frac{i}{1 + a} \frac{\alpha(1 - m)}{(1 - \alpha)m} + \frac{(1 - \gamma)^2}{\gamma} \right] = \phi \gamma \left[ (1 - \gamma) - \left( \frac{i}{1 + a} \frac{\alpha(1 - m)}{(1 - \alpha)m} \right) \right]
\]
(A.8)

Since \( \partial(i(1 - m)/m)/\partial m < 0 \), \( \partial(a + i)/\partial m > 0 \), \( \lim_{m \to 0}(1 - m)i/m = \infty \), and \( \lim_{m \to 0}(a + i) = a > 0 \) (see proof of Proposition 1), the LHS in (A.8) is strictly decreasing in \( m \) and goes from \( \infty \) when \( m \to 0 \) to \( \delta(1 - \gamma)^2/\gamma \) when \( m = 1 \), and the RHS is strictly increasing in \( m \), and goes from \( -\infty \) when \( m \to 0 \) to \( \phi \gamma (1 - \gamma) \) when \( m = 1 \). We then have a unique solution, \( m^* \), which is lower than 1 if \( \kappa n \gamma > \delta(1 - \gamma)/\gamma \), or \( \gamma > \gamma^* = \delta(1 - \gamma)/(\kappa n \gamma) > 0 \).

To show \( \partial m/\partial \lambda > 0 \) when \( \gamma > \gamma^* \) notice that since \( \partial i/\partial \lambda > 0 \), \( \partial a/\partial \lambda < 0 \), and \( \partial \phi/\partial \lambda < 0 \), an increase in \( \lambda \) raises the LHS and lowers the RHS, which implies that the \( m \) that solves (A.8) needs to be strictly higher (strictly because the limits of the two expressions are unchanged so still \( m^* \in (0, 1) \)).

Now we show the relationship with \( z \). Defining \( H \) as \( LHS - RHS \) of (A.8), we can use the IFT to obtain,
\[
\frac{\partial m}{\partial z} = \frac{-1}{\partial H/\partial m} \left[ \frac{\partial(i(i + a))}{\partial z} c(m)(\delta + \phi n \gamma) - \frac{\partial \phi}{\partial z} m \gamma \left[ (1 - \gamma) - \left( \frac{i}{1 + a} \right) c(m) \right] \right]
\]
(A.9)
where \( c(m) = \alpha(1 - m)/(1 - \alpha)m \). Using
\[
\frac{\partial(i/(i + a))}{\partial z} = \frac{ai}{z(a + i)^2} \left( \frac{\alpha}{1 - \alpha} - (1 - \alpha)s(F, \lambda) \right),
\]
where
\[
s(F, \lambda) = \frac{(1 - \lambda - F)}{(1 + \alpha)(1 - \lambda - F) + F} = \frac{1}{(1 + \alpha) + zF^{-\alpha}},
\]
and
\[
\frac{\partial \phi}{\partial z} = \phi s(F, \lambda) \frac{F}{(1 - F)z}
\]
in (A.9) we get,
\[
\frac{\partial m}{\partial z} = -\frac{\phi F}{z} \left[ \frac{zi(F^{-\alpha} + F^{-1})}{(a + i)^2} \left( \frac{\alpha}{1 - \alpha} - (1 - \alpha)s(F, \lambda) \right) c(m) \left( \frac{\delta z}{\phi} + nz \right) - \frac{1}{1 - F}s(F, \lambda)n\left( (1 - \gamma) - \left( \frac{i}{i + a} \right)c(m) \right) \right] (A.10)
\]
Because \( \partial H/\partial m < 0 \), the sign of this expression is given by the sign of the term inside the square brackets. If \( \lambda \to 0 \), the first term converges to 0 (because \( i \to 0 \) and all the other terms converge to finite constants), while the second term converges to \( 1/(1 - F)s(F, \lambda)n\gamma(1 - \gamma) > 0 \). Hence \( \lim_{\lambda \to 0} \partial m/\partial z < 0 \). If \( \lambda \to 1 \), the first term converges to \( \infty \) (because \( F \to 0 \), \( s(F, \lambda) \to 0 \), and all the other terms converge to finite constants), while the second term converges to 0. Hence \( \lim_{\lambda \to 1} \partial m/\partial z > 0 \). And since the term inside the square brackets is strictly increasing in \( \lambda \) (because \( \partial F/\partial \lambda < 0 \), \( \partial(i/(i + a)^2)/\partial \lambda > 0 \) (see A.11 below), \( \partial s(F, \lambda)/\partial \lambda < 0 \), \( \partial \phi/\partial \lambda < 0 \)), we conclude there exists \( \lambda \) as defined in the proposition. Finally, since the term outside the parenthesis is decreasing in \( \lambda \), and when \( \lambda > \bar{\lambda} \) the term inside the square brackets is increasing in \( \lambda \), we conclude that \( \partial m/\partial z \) is increasing in \( \lambda \) in this case.

It is left to show \( \partial(i/(i + a)^2)/\partial \lambda > 0 \). Taking the derivative,
\[
\frac{\partial(i/(i + a)^2)}{\partial \lambda} = \frac{i}{\lambda(i + a)^3} \left[ a \left( 1 + \frac{2\lambda(1 - \alpha)}{(1 + \alpha)(1 - \lambda - F) + F} \right) - i \right] (A.11)
\]
since the term multiplying \( a \) is greater than 1, the fact that \( a = z(1 + F)^{1 - \alpha} > z > \max(i) = z\lambda^{1 - \alpha} \), implies that the derivative is positive.

QED.

Appendix B

<table>
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<tr>
<th>Country</th>
<th>XC: 1870-1910</th>
<th>BI</th>
<th>XCaud</th>
<th>RT: Mountains</th>
<th>RT: Small-scale</th>
<th>Dist. to the UK</th>
<th>Size</th>
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References


