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

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Abstract

This paper examines the early development of institutions in Latin America that led to the consolidation of oligarchic republics in the first decades of the twentieth century. First, it documents an institutional divergence inside the region with long lasting effects on subsequent political and economic development. Second, it develops a theoretical model focusing on two factors to explain institutional development, the risk of native and slave uprisings and technical change, both of which were observed throughout the region at that time. The risk of rebellions leads to institutions that weakly restrict the powers of chief executives, in order to allow them to react forcefully to them. Technical change leads to stricter restrictions as expropriation becomes more costly, but it also intensifies labor coercion and consequently the risk of rebellions. Hence the main prediction is that the effect of technical change depends on the availability of coerced labor, their interaction being a potential explanation for the institutional divergence. Finally the paper conducts an econometric exercise to test this hypothesis. Results from panel-data regressions suggest that the dynamics of the institutional gap in Latin America can be explained to a large extent by the interaction between the risk of rebellions and technical change in transportation. (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 fallen 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 as defined by the World Bank.

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., 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.[1]

This paper pursues a dynamic comparative analysis among Latin American economies of *deep* determinants of long-run development, i.e. political institutions, to explain current differences in economic outcomes within the region. In order to do this it develops a theoretical model, which together with a historical analysis, guides an econometric exercise.

Political institutions in Latin America have transited through distinct stages since independence (Drake, 2009; Hartlyn and Valenzuela, 1998). This paper focuses on the first period of institutional development, which started some decades after independence and ended with the consolidation of oligarchic republics, or protected democracy, in the first decades of the twentieth century. These robust civilian and constitutional regimes, featuring open, although very restrictive and not fully fair, electoral competition, 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

[1] Others have focused on more recent features to explain the current economic problems in Latin America (see e.g. Calderón et al., 2005). 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.

authoritarian ones in others, and they either led to gradual incorporation of excluded groups, or to intensified oppression (Drake, 2009, p.129). It has been identified as a crucial period of transition, with a profound impact on subsequent patterns of change in Latin America (Collier and Collier, 1991; Paige, 1998; Mahoney, 2001; Coatsworth, 2005).

To understand the early development of political institutions in Latin America the paper proceeds in three stages. First it quantitatively documents a divergence of political institutions in the region starting in the second half of the nineteenth century, 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. The paper then presents a historical analysis to identify two factors that can be associated with the determinants of political institutions in Latin America. First, the risk of uprisings, which were closely related to the exploitation of natives and slaves, identified by historians as an important risk for the elites throughout the region (Katz, 1988; Coatsworth, 1988, 2008; Chevalier, 2005; Eakin, 2007; Williamson, 2009; Rouquié, 2010).[2] Second, the first era of globalization, led by a worldwide transport revolution (North, 1958; Harley, 1988; Mohammed and Williamson, 2004), that served to integrate the region with the global economy (Williamson, 2006), and to generate new economic opportunities for the economy as a whole. These two processes were interrelated, as economic expansion increased the risk of uprisings in countries with large indigenous and slave populations (Bauer, 1986; Coatsworth, 1988, 2005; Chevalier, 2005; Eakin, 2007; Sánchez et al., 2010).

The second stage consists of a theoretical analysis that focuses on the determinants of political institutions to explain the divergence. In the model there is an elite that faces a risk of uprisings by external groups. This uprisings are driven by coerced labor used in production, and they have certain features that make them of particular relevance in the historical context of this paper. First, they affect only certain members of the elite. This feature implies that 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 if taxes need to be raised to finance it. Second, it is highly uncertain who will be affected by future uprisings, implying that disagreement on the size of the response is low ex-ante since 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. One way of solving this is by empowering the executive so he may react 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

[2]Racial conflicts were the main source of inter-class conflicts at that time, as socioeconomic differences in the region were defined mainly in terms of race. Intra-elite conflicts were prevalent as well. We discuss how our results relate to this feature in Section 4.

distorts investment incentives.[3] The first implication of the model follows; more labor available to be coerced, which leads to a higher likelihood of a rebellion in the future, incites the elite to impose fewer constraints on the executive.

There is also a dynamic dimension of the model generated by technical change: the trade-off between military reactions to conflicts and the risk of expropriation is dependent on the returns to investment. 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 higher productivity raises the demand for coerced labor, which, in the model, drives rebellions and consequently the benefits of empowering the executive. This last effect is stronger, and may dominate the first one, 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, in this particular context, institutional variation rises with technology, which could potentially explain the early divergence in political institutions in Latin America.

The last stage is to empirically test the model predictions. Econometric results suggest that countries prone to racial conflict due to a high fraction of the population comprised of natives and slaves, were the ones that showed fewer constraints at the end of the divergence process. But the focus of the empirical section is on the second prediction of the model, which can be tested exploiting time variation. Panel regression results from 1850 to 1910 show that the interaction between our proxy for the availability of involuntary labor and a measure of technological progress in navigation is highly significant explaining the evolution of executive constraints in the region. In line with the prediction of the model, the lower the availability of labor to be coerced, the larger the effect of the worldwide transport revolution on political institutions. Hence this process, that only started long after independence, helped to widen the institutional gap across the region. The results are robust to different specifications and estimation methods, to the inclusion of additional controls associated with alternative theories linking colonial experiences and long-run development, to the exclusion of individual countries from the sample, and to variations in the proxies for involuntary labor and transport technologies.

In their seminal paper on the economic reversal in former colonies, Acemoglu et al. (2002) show that economic divergence took place long after independence, although its deep determinant, the nature of political institutions, was determined during the colonial period. In this paper we show that inside Latin America political institutions started to diverge long after independence,

[3]This trade-off is illustrated by Heise (2007) when referring to the position of Chilean elites on the Constitution of 1833, which strengthened executive power: *"Our aristocracy knew that in the context of an authoritarian regime it would have to confront the Executive, but at the same time it was convinced that a strong government was fundamental for achieving order, a basic condition to sustain its economic activities."* (Heise, 2007, p.47, author's translation).

and that their economic effects started to be felt even later. Hence, like Coatsworth (2005), we consider the processes that occurred at the end of the nineteenth century as key for understanding the link between colonial development and modern economic performance in the region. The main contribution of this paper is to document this fact and elaborate a theory able to explain it. In order to do this the paper is organized as follows. After reviewing the related literature the next section studies the early development of political institutions in Latin America. Section 3 presents a historical review of two possible determinants of political institutions, namely the risk of rebellions and technical change. Section 4 presents the theoretical model, and its implications for Latin America are discussed and tested in section 5. The last section concludes.

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; Besley and Persson, 2010). A crucial difference with respect to this literature is the nature of conflicts we consider; they are costly for elites but not as effective as to threaten their political power. Indeed one of the main theses in this literature is that large social uprisings and external conflicts, or the fear to them, led to democratization or state development. We claim that in the region and during the period analyzed in this paper, rebellions from natives and slaves imposed asymmetric and uncertain costs on elites, leading to the mechanism we propose.

Although the type of conflicts studied in this paper have been identified as a relevant danger for nineteenth century Latin American elites, 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).

After claiming that modern civil wars impose asymmetric and uncertain costs for the elites, Aguirre (2016) tests the implications of a simpler version of the model in a sample of 80 countries. Using geographic variables to identify causality, the results show that a higher likelihood of a civil war in the future reduces executive constraints imposed during the first years after independence,

particularly when only minor conflicts and irregular wars, whose costs are more likely to be asymmetric and uncertain, are considered. Aguirre (2016) also presents anecdotal evidence regarding the US constitution, characterized by a strong executive, which was importantly influenced by rebellions and the experience of the states with executive power (Thach, 1969; Horowitz, 2002).

Other historical account where the mechanism proposed in this paper is present is the explanation by Anderson (1974) for the raise of the absolutist state in pre-industrial Europe. Anderson (1974) claims that absolutism was essentially a reorganization of feudal domination, designed to maintain the coercive practices in agriculture in the face of the spread of commodity production and exchange that raised the risk of rebellions.[4] But, as in the relationship between technical change and political institutions proposed in this paper, the process was contingent on certain pre-existent social structures, namely the presence of a mercantile bourgeoise. It would have been this additional force the one that originated a deep institutional divergence inside Europe. See also Brenner (1976, 1982).[5]

The general context of the paper relates to the seminal work on the path to political modernity of Moore (1966). Moore identifies the incidence of repressive agriculture, for which the landlords need the help of the state, as an essential feature of the path to modern capitalist authoritarianism, and to the detriment of parliamentary democracy (see also Rueschemeyer et al., 1992). According to Moore, the nature of agricultural relationships became relevant in the face of modernization, i.e. the extension of market relationships and the replacement of subsistence farming by production for the market. The penetration of commercial practices into labor repressive agriculture increased peasant hostility and state repression.

The contingent nature of institutional development, present in Moore (1966); Anderson (1974); Brenner (1976, 1982), and emphasized recently by Acemoglu and Robinson (2012), is at the core of our proposed explanation for institutional divergence in Latin America. In our model technical change is the exogenous factor calling for an institutional reorganization, and the nature of this reorganization is contingent on the structure of society, particularly labor coercion conductive to rebellions. Technical change increases institutional variation in our model only if it raises the risk of

[4]See also Skocpol (1979) and Hilton (1976), particularly the chapters by Hill and Merrington. Skocpol (1979), in her analysis of social revolutions in France, Russia, and China, follows Anderson (1974) in arguing that imperial states and landed classes were partners in exploitation. But they were also competitors in appropriating resources. When conflict of interest arose in these regimes dominant-class members obstructed monarchical undertakings, with the unintended effect of destroying the integrity of the imperial state itself, making the existing class relations vulnerable to assaults from below (Skocpol, 1979, p.49-51).

[5]According to Brenner (1976) a downward trend in population led by 1500 to an almost totally free peasant population in the west, and its debasement to serfdom in the east. This was caused largely by means of political reorganization by the eastern lords, through developing a more centralized State. Brenner (1982) argues that *"... to the degree that the lords ... were able to lessen the competition among themselves and to increase their collaboration ... they were able to intensify their domination, and even threaten peasant possession"*, and *"[In England] Monarchical government was indeed a manifestation of the lords' more or less conscious recognition of ... the need to regulate their mutual interrelations in order successfully to exploit the peasantry."* (Brenner, 1982, p.30 and 54).

rebellions, otherwise it would have an unambiguously positive effect on institutions.[6] In this paper we revisit previous historical studies to show that in the region and period under consideration technical change very likely raised the risk of rebellions, primarily due to the increasing demand for coerced labor and the intensification of land expropriation by elites.[7] Indeed this fact is common in other regions as well, particularly the least developed, as modernization has long been identified as a determinant of ethnic conflict (Horowitz, 1985).

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.[8] This allows us to focus on the evolution of political institutions in Latin America during the second half of the nineteenth century, long time before the advent of democracy to the region.

We see our paper as a complement to this literature on the colonial origins of development. Indeed its main empirical fact, i.e. that current development depends on colonial endowments and institutions, is consistent with the model. But the mechanism we propose and test is new, and so it is the implication for the timing of the development of political institutions. The empirical results show that the effect of the risk of rebellions started long after independence, during what Coatsworth (2005) identifies as the period when colonial heritage started to influence development in the region.

[6] This would be closer to North and Thomas (1970, 1973), where trade, facilitated by population growth, leads to institutional change, although not in a smooth way. Other work conditioning the relationship by alternative factors are Puga and Trefler (2014) and Acemoglu et al. (2005). Nugent and Robinson (2010) and García-Jimeno and Robinson (2011) show the conditionality, on institutions, of the economic consequences of endowments patterns and frontier colonization in the Americas.

[7] Consistent with the mechanisms of the model, Acemoglu and Wolitzky (2011) show theoretically that a rise in the price of output, equivalent to technical change in our environment, intensifies labor coercion, while Naidu and Yuchtman (2013) find evidence consistent with this in nineteenth century Britain.

[8] In this context this paper stresses that colonial features 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, hindering the evolution of democratic institutions, obstructing the assimilation of subsequent mass movements, and weakening incentives to strengthening state capacities or investing in public education (see Olson, 1993; Galor et al., 2009; Boix, 2003; Rueschemeyer et al., 1992; Collier and Collier, 1991; Besley and Persson, 2010).

2 Early Institutional Development

The first decades after independence were chaotic and disorganized; there was little institutionalization and almost no agreement on national goals or ideology (Wiarda, 2005). 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 important for understanding the differences in economic development leading to the large disparities in income per capita inside the region we observe today. Since the analysis is based on cross-section variation, and hence the number of observations is small, results are only suggestive. The aim of this exercise is to make the study of early institutions in Latin America of greatest interest.

To characterize political institutions we use the index Constraints on the Executive, from the Polity IV database.[9] This variable explicitly measures how constrained the executive is in making arbitrary decisions, which is the institutional dimension we focus on in this paper. Good scores in this index are possible with large groups excluded from the political process (and vice versa). In the case of Latin America we think this is the most relevant measure of political institutions 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).

Figure 1 shows average executive constraints (left panel) and its standard deviation (right panel) for the group of 20 Latin American countries since 1850.[10] We can distinguish three periods where an upward trend in the indicator was apparent, 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 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.

How important were the long-run development effects of the divergence in institutional development experienced in the nineteenth century? In terms of political development a regression shows that more than half of the difference in executive constraints observed during 1900-1910,

[9] The source for all the variables used in the paper, and notes on their construction, are presented in Appendix A.

[10] 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. We do not include Canada and the US in order to illustrate that the results are not influenced by (very) different colonial pasts.

roughly the end of the divergence process, persisted to the next century.[11] This high persistence is a well known theoretical and empirical feature of institutions (Acemoglu et al., 2005; Acemoglu and Robinson, 1969). In terms of economic development, a regression shows that the first wave of institutional reform explains, again using executive constraints from 1900 to 1910, close to one fifth of the variance in GDP per capita today.[12]

Are income differences behind this political divergence? To explore this issue 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. Unfortunately data on GDP per capita is scarce for the beginning of the twentieth century in Latin America. For the 9 and 14 countries we have data in 1900 and 1920, respectively, the correlation between GDP per capita and the 10 year average of executive constraints from 1900 to 1910 is not significant. The latter explain only about 6% of the variance of income per capita. Even when GDP per capita in 1950, the first year for which we have data for all the countries, is considered, the relationship is not significant. Thus the significant relationship between early institutional development and current GDP per capita in Latin America seems to be materialized only during the last 60 years, favoring the claim that causality runs from institutional development to income.[13] Similar results are found when using urbanization as a proxy for GDP per capita, for which we have data for 20 countries in 1900. Average constraints during 1900-1910 are not significantly correlated with urbanization in 1900, measured as the fraction of population living in cities of either 100,000, 50,000, or 25,000 inhabitants.

We may conclude from the evidence presented in this section that there was an institutional divergence during the nineteenth century, and that this is informative about current differences in development inside the region. The rest of the paper focuses on explaining this early political development.

3 The Risk of Rebellions and Technical Change

Before presenting the theoretical model it is useful to review two features that deeply affected the region during the second half of the nineteenth century, which we claim explain the institutional

[11] Aguirre (2013) pursues a regression analysis. When, in addition to constraints in 1900-1910, average constraints from independence to either 1870 or 1900 are included, the effect is almost unchanged.

[12] Aguirre (2013) investigates the timing of this effect. Results show that it was not significant before 1890, and after 1910, when it remains so for the following 20 years. Aguirre (2013) also shows that when controlling for current executive constraints the effect remains significant, suggesting that the early development of political institutions influenced current GDP per capita through channels not fully captured by recent institutional developments.

[13] Aguirre (2013) presents a regression analysis. Since results may be driven by the small sample size and the consequent effect of outliers and influential observations, a bootstrap technique (Efron, 1979, 1982) to construct confidence intervals (CI) and thus assess the significance of the estimated parameters is implemented.

development in the region during that period. These are the risk of rebellions and technical change.

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 internal colonialism of white over non-white which the Catholic monarchy had been able to provide (Williamson, 2009, p.203). 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).[14] During the colonial period rebellions were common, costly for the elites –including in some cases the indiscriminate slaughtering of whites–, and far from seizing political power, save the Haitian Revolution –a colony where roughly 95% of the population were slaves.

Rebellion by non whites 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 achieving independence was a political and not a social or economic revolution. The ethnic nature of social structures was not modified by it (Rouquié, 2010, p.38). 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). In some areas landowners succeeded in extracting a surplus from workers through the control of land and water, and with the help of state armed forces (Bauer, 1986, p.171).

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 exhaustive. Most of the events studied took place in Mexico, Guatemala, Peru, Bolivia, and Brazil. Revolts involving Mesoamerican and Andean villages consisted of land invasions, village riots, and caste wars. They involved high degrees of violence, including theft and assassinations, and they were mostly directed against the rural elites: land owners, public officials, or whites. 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 lower 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, statistics are not representative. However the numbers reported by Coatsworth (1988) imply a large lower bound on the number of conflicts, and show that,

[14] In Mexico for instance the elites initially opposed independence, influenced by the 1810 Hidalgo revolt (Acemoglu and Robinson, 2012, ch.1).

although they had a local nature, they were not localized only in some specific regions.[15]

We claim that the fear of race conflicts generated by the coercion of labor affected the institutions built after independence. Although the specific mechanism we propose is new, it has been documented by historians that the risk of uprisings by non whites, 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 elite faced a trade-off: "*...a contradiction appeared: the only coherent political ideology available to [the elites] was liberalism, but democratic values ... tended to undermine state authority in regionally dispersed societies which were still seigniorial, hierarchical, racially divided and often based on slavery.*" (Williamson, 2009, 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).[16]

The other feature we focus on as a possible determinant of political institutions is technical change. Historians suggest that only after the negative economic and political effects of the wars of independence started to be overcome were countries able to move to less autocratic political institutions. It took decades of civil discord before most 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 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, trying to constrain the potential abuses of the executive (Gargarella, 2004; Drake, 2009).[17]

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 (2009) (p.234), only after about 1850 did overseas demand begin to pull a few Latin American economies out of

[15] 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, including Argentina, Bolivia, Ecuador, El Salvador, and Guatemala. In the case of Mexico these rebellions took place in 15 different regions. A similar pattern is observed in Brazil and Peru. Of 31 maroon wars and slave insurrections between 1700 and 1832, 13 occurred in the Guianas, Suriname, and Venezuela, while the rest were spread throughout the Caribbean islands and the mainland.

[16] In Brazil, according to Williamson (2009), decentralization put the country in danger of being dismembered. By 1840, fear of such an outcome, and of the social chaos that might ensure in a country with such a high proportion of non-whites and slaves, persuaded liberal as well as conservative elements in the elites to bring forward Pedro's enthronement, and to recentralize the administration of the country (Williamson, 2009, p.251).

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

stagnation, leading to a degree of political consolidation and, in some republics, to a period of constitutional politics and rule of law. 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; Mohammed and Williamson, 2004). Orourke 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, inducing commodity price convergence and a reshuffling of resources within national economies, instead of booming import demand or export supply (Orourke and Williamson, 2002). This distinction is relevant since it implies that this phenomenon benefited most of the sectors in the economy and not only those with political power. Bulmer-Thomas (1995) shows that the period from the middle of the nineteen century to the First World War witnessed the rise of new export products throughout Latin America, finally eclipsing the colonial pattern of exports (Bulmer-Thomas, 1995, p.57).

We claim this technological advance in transportation increased the benefits of having better political institutions, along the lines of North and Thomas (1970, 1973). But it may also have had negative indirect effects. This is because the risk of uprisings by Indians and slaves rose with the improved long-run economic prospects brought by this technological development.[18] This was mainly because the demand for forced labor increased and because landowners tried to enlarge their land possessions at the expense of the lower classes, mostly indigenous communities (Bauer, 1986; Coatsworth, 1988). Regarding the modernization process in the last decades of the nineteenth century, 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). A massive new concentration of landholdings provoked violence in densely populated indigenous regions (Coatsworth, 2005). As the expansion of agrarian properties intensified in countries like Mexico, Peru, and Bolivia, aggression increased and the risk of uprisings rose (Chevalier, 2005, p.478-9). Sánchez et al. (2010) show empirically that 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 due to the desire of large landowners to expand their estates. Acemoglu and Robinson (2012) (ch.12) revise the post independence

[18] An exception is Brazil, which seems to have experienced a significant change in terms of labor coercion with the abolition of slavery in 1888, even though other forms of exploitation persisted (see Williamson, 2009, p.253). It is interesting in this respect that our indicator for executive constraints in Brazil shows only one change during the entire period we analyze in this paper, a rise in 1890, right after the end of slavery. This was due to the liberal constitution of 1891, which established a federal system. A military coup d'etat deposed the emperor, but the political system moved to a structure where power was devolved to the regional elites from Sao Paulo, Rio de Janeiro, and Minas Gerais (Eakin, 2007, p.236). Williamson (2009) argues that when the emperor approved the abolition of slavery there was little reason, politically, for the coffee planters of Sao Paulo to defer any longer to the imperial government in Rio de Janeiro (Williamson, 2009, p.411).

experience of Guatemala. They show how the increased demand for coffee in the second part of the nineteenth century led the elite to expropriate large sections of land, mostly indigenous, and to intensify labor coercion. Nugent and Robinson (2010) make a comparative analysis of coffee exporting economies of Latin America; while in Guatemala and El Salvador the onset of the coffee boom induced a mass land grab by powerful political elites and extreme labor repression, in Costa Rica the state never experimented with forced labor policies (Mahoney, 2001). Pérez Brignoli (1995) illustrates how the process in El Salvador was closely related to the large peasant uprising of 1932.

4 The Model

We now present a theoretical model where the two features reviewed in the previous section affect political institutions through a well defined mechanism. The exogenous parameters in the model that will relate to executive constraints are the availability of labor that can be coerced and the level of technology. The first is used in production and generates a risk of rebellions which is increasing in the intensity with which it is used. Producers do not account for this risk, so more availability leads to more labor coerced, as it is cheaper, and hence a higher risk of rebellions.

The political part of the model consists of an executive that can only make decisions with the approval of a certain fraction of the elite. The larger this fraction the harder for the executive is to raise taxes, and hence to fight insurgencies.[19] Then, as the risk of rebellions rises due to a larger availability of coerced labor, elites find it optimal to reduce the constraints on the executive. This first result depends on the uncertain and asymmetric cost of rebellions, as we explain in detail below.

The time dimension is captured by technical change and the fact that executive constraints obstruct the imposition of excessive taxation, which distorts investment decisions. Hence the model includes capital as a factor of production. When technology improves, returns rise, and excessive taxation becomes more costly than a suboptimal response to rebellions. This leads elites to choose higher constraints. But technology increases labor coercion, particularly in an economy where the type of labor that can be coerced is abundant. The positive effect on constraints is then undermined, and may even be negative. This is the second result and the focus to interpret institutional dynamics in the next empirical section.

The Economic Environment

The economy is populated by a continuum of agents, who are of two types. A measure 1 of agents are elites, who are the only ones with access to a technology to produce output and don't work.

[19] In principle we could consider private spending in protection against rebellions. However a free riding problem makes this possibility difficult to implement (North and Thomas, 1973).

The reminder of the agents, of mass $\lambda \in [0,1]$, are forced to work and do not receive a payment for their services.

Elite members, indexed by $h \in [0,1]$, have access to two different technologies to produce goods,

$$\begin{aligned} i &= zk^{\alpha} \\ a &= zl^{\beta}(1+f^{1-\beta}) \end{aligned}$$

where $z > 0$ is productivity, k capital, l land, f forced labor, and $\alpha \in (0,1)$ and $\beta \in (0,1)$ are constants. Our results need the existence of only two factors of production, k and f. The accumulation of the first relates to the benefits of executive constraints, and it introduces dynamic aspects to the model, and the demand for the second relates to the cost of constraints through conflict risk. It is natural to think that the first is used in a modern technology, like industry (i), and the second one in an older one, like agriculture (a). Ex-ante heterogeneity among elites in terms of the technology they have access to would translate into political disagreement, as elites in industry would push for more constraints than the ones in agriculture, a pattern present for instance in the historical accounts by Moore (1966) and Anderson (1974) described in the introduction. But to focus only on the channels described above we assume ex-ante homogeneity among elites, so individuals have access to both technologies to produce the same good, $y = i + a$.[20] The function for a implies positive production, even if forced labor is unavailable. We further assume elites own one unit of land so henceforth $a = z(1+f^{1-\beta})$.

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, which may be interpreted as commodity price shocks, but the focus is on economy wide changes. There is a market for coerced labor, which has a price p per period, and where the supply is decreasing in its net availability, $\lambda - F$, where $F = \sum_h f_h$. Specifically we assume $p = F/(\lambda - F)$ as the supply schedule. Notice that under this functional form no equilibrium will use all coerced labor available in the economy, and hence $F < 1$. Then there is margin for increasing coerced labor when facing technology improvements.

The probability of conflict onset is defined by the function $\phi(F) = \kappa + F^{\epsilon}$, where $\epsilon > 1$ and $\kappa > 0$ is a small number, so $\phi'(\cdot) > 0$, $\phi''(\cdot) > 0$, and $\phi(0) > 0$.[21] Therefore, unlike the price p, the aggregate cost of forced labor (i.e. the risk of rebellions) is not a function of total availability, but only of the fraction actually employed. 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.

We assume that the economy is divided into N districts indexed by j, with each group of agents equally distributed across and inside districts. Conflicts can occur in only one district at a time,

[20] Moreover elites in Latin America were closely linked by social and kinship relations (see in particular Paige, 1998). This, however, may be endogenous to the centralization of power due to the risk of rebellions.

[21] The condition $\kappa < 1 - (z/(1+z))^{\epsilon} < 1$ ensures $\phi < 1$ for any (z, λ) in equilibrium.

they last for only one period, and there is an equal probability of conflict onset in each district, so the probability of observing a conflict in district j is ϕ/N. This last assumption implies a high degree of uncertainty in terms of the incidence of future conflicts and their costs, a key feature behind the main prediction of the model as we explain below.

We denote district specific states by s_j, where $s_j = 1$ if there is conflict in the district and $s_j = 0$ otherwise. 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, $(s_j, S) \in \{(0,0),(1,1),(0,1)\}$.

There is a government that collects revenues by imposing a tax to rents, τ_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. A public good is included in the analysis to have positive taxes in times of peace.

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,

$$u(s_j, S) = (1-\tau_j)\ \pi_{hj} - k'_{hj} + \gamma\Big((1-S)g - (S + s_j\bar{\gamma})\ (q-d)\Big),$$

where k'_{hj} is next period's capital, $\pi_{hj} = y_{hj} - pf_{hj}$ are rents, and γ, $\bar{\gamma}$ and q are positive constants, with $\gamma < 1$, so the marginal benefit of consumption is larger than for public goods.[22] The parameter q captures the cost of conflicts.[23] These costs are mitigated with government's military responses so in the event of a conflict ($S = 1$) the total cost is $q - d > 0$. The parameter γ reflects tastes about public expenditures.[24] 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 the second key assumption for the main prediction of the model.

To see why costs need to be uncertain and asymmetric to obtain the commitment problem behind the main results it is useful to explore the marginal benefits for elites of fighting insurgencies. Ex-post, once a conflict has erupted in some district, asymmetry implies that this cost is $\gamma(1+\bar{\gamma})$ for agents in that district, and only $\gamma < \gamma(1+\bar{\gamma})$ for everybody else. Ex-ante the level of uncertainty we have assumed imply that these are the same for everyone: $(\phi/N)\gamma(N+\bar{\gamma})$. Therefore disagreement only happens ex-post. Suppose now that rebellions are very costly for elites, i.e. $\bar{\gamma}$ is large, a requirement we make explicit below. This larger asymmetry makes marginal benefits large ex-ante

[22] Elites also receive an endowment $\bar{k} = 1$ each period. We assume $z < 1/\alpha$, so $k < \bar{k} = 1$ in equilibrium. Therefore it is assumed that capital does not need to be financed out of current profits. Since the constant $\bar{k} = 1$ does not influence the derivation of the model we omit it from the analysis.

[23] It is natural to think that a conflict should affect production. Aguirre (2016) considers this case. Here 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.

[24] For simplicity it is assumed that g and d have the same marginal utility γ. Results do not change if this assumption is relaxed. In that case taxes will vary depending on the state. Here taxes are the same and hence the return to investment is not directly affected by the risk of conflicts.

for everyone, but ex-post they are larger only for those affected by the conflict. Hence everyone prefers a strong response ex-ante, but they will block it ex-post if they are not affected. This is the commitment problem, and political institutions may be designed to alleviate its costs.[25] If $\bar{\gamma} = 0$ there is no disagreement. If γ is large, as may be the case with large social uprisings and external conflicts, then everyone agrees to a strong response, and political institutions would not be needed to align incentives.

The Political Environment

Taxes need to be set every period. Each district has a (representative) member in a legislature. There is one agent, the executive, with agenda power. He is chosen stochastically every period from the mass of elites.[26] Every period he proposes the set $\{\tau_j\}_{j=1}^{N}$, which defines a tax rate for every district. 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.[27] 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.[28] As usual the subset of members whose votes are decisive for approving the proposal is called the minimum winning coalition (WC). Legislatures were not relevant at the time in most of the countries. Here we use them as a modeling device only, to capture the bargaining process between members of the elite. In the empirical part the measure of executive constrains considers constraints from multiple agents and institutions.

This political environment gives the possibility of alleviating the commitment problem described above. The executive, despite usually having the same marginal benefit from a military response as the elites not affected by the rebellion, γ, doesn't need to bear the costs from reacting to them. He can always tax other elites to finance a response. Even if he had a higher marginal benefit, $\gamma(1+\bar{\gamma})$, the response would be the same because he doesn't equalize marginal benefits and costs. Therefore, if he is not constrained by other elites he will always choose the strongest response to conflicts, independently of the district he comes from.

[25] In general, any kind of shock with asymmetric and uncertain costs for elite members would generate this commitment problem. We focus on rebellions because, as discussed, these were very important in Latin America in the period analyzed.

[26] Hence agents don't take into account the possibility of being the executive in the future. Also, to keep it simple, we assume either that the executive doesn't pay taxes, or that he pays the same amount than the elites in his district, which are equivalent assumptions.

[27] In equilibrium these elites always want the maximum tax so they are easily captured by the executive. That will imply he needs to convince less than a fraction m of the legislature, complicating notation unnecessarily. With this assumption these districts pay the maximum tax anyways.

[28] The ratio m is assumed to be continuous, which may be the case if the number of legislators per district varies.

Agent's Problems

Given (z, λ), 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, ϕ takes its corresponding value, and the executive is chosen.
3. Given k_{hj}, m, $(\{s_j\}_{j=1}^N, S)$, and ϕ, 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), ϕ, and (τ_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,

$$\begin{aligned} V(s_j, S) &= \max_{\{k'_{hj}\}} \Big\{(1-\tau_j)\ \pi^*(k_{hj}) - k'_{hj} + \gamma\Big((1-S)g - (S + s_j\bar{\gamma})\ (q-d)\Big) + \\ &\quad \delta\Big((1-\phi)EV(0,0) + n\phi EV(1,1) + (1-n)\phi EV(0,1)\Big)\Big\}, \end{aligned} \tag{1}$$

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,

$$\begin{aligned} V(s_j, S) &= \max_{\{\{\tau_j\}_{j=1}^N, g, d\}} \Big\{\pi^*(k_{hj}) - k'_{hj} + \gamma\Big((1-S)g - (S + s_j\bar{\gamma})(q-d)\Big) + \delta EV(s'_j, S')\Big\} \\ \text{s.t. } T &= g + d = n\textstyle\sum_{hj} \tau_j\ \pi^*(k_{hj}) \\ V(0, S; \tau_j, g, d) &\geq V(0, S; 0, 0, 0)\ \ \forall j \in \text{WC}. \end{aligned} \tag{2}$$

where T are total revenues, normalized by n to simplify notation. The last restriction makes sure that members of the WC aprove the policy. The optimization problem at step 2 is static,

$$\pi^*(k_{hj}) = \max_{\{f_{hj}\}} \Big\{y - pf_{hj}\Big\}, \tag{3}$$

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.

Equilibrium

An equilibrium is levels of capital, k^*_{hj}, and labor, 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^*, that clear the market 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.

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 $g = d = 0$, and how revenues are spent, g and d, as a function of capital. Since this is a repeated game we get the equilibrium level of capital, revenues, and spending, 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, λ). 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^*, g^*, and d^*, and explore how this depends on the parameters (z, λ).

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, independently of the state. 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 last 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 last 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 consistent with the following expression,

$$\tau_j \pi^*(k_j) \leq \gamma T = \gamma n \Big(\sum_{x \in \text{WC}} \tau_x \pi^*(k_x) + \sum_{x \notin \text{WC}} \pi^*(k_x) \Big). \tag{4}$$

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 τ 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, $k_j = k$, $\forall j$, and

every member of the WC, independently of the state, faces the same tax, τ_{wc}. Hence we drop the index j and (4) becomes,

$$\tau_{wc}\pi^*(k) \leq \gamma T = \gamma\pi^*(k)\Big(m\tau_{wc} + (1-m)\Big). \tag{5}$$

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. This is the reason we assume $\gamma < 1$, 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,

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

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 is T, given the investment distribution. Notice also that the tax rate does not depend on ϕ or profits (and hence z, k, or λ).

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

$$\frac{\alpha i}{k} m\delta(1-\tau_{wc}) = 1 \tag{7}$$

Expression (7) implies that capital is increasing in z, as it increases its marginal product. It is also increasing in executive constraints: only with probability m (i.e. being part of the WC) 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 τ_{wc} does not differ across states, the expected return, and so k in equilibrium, is not a function of ϕ.

We finally solve the static problem of elites. The FOC in problem (3) and the market clearing condition imply

$$\frac{(1-\beta)z}{F^\beta} = p = \Big(\frac{F}{\lambda - F}\Big). \tag{8}$$

An increase in the relative endowment of forced labor, λ, increases F, and hence the probability of conflict as well. Both F and ϕ are increasing in total productivity, although the size of the effect depends on the supply, i.e. in λ. In particular an increase in the demand for forced labor due to a positive productivity shock will be higher in countries with high availability of this type of labor.

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

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, if $\alpha < 1/2$, $\exists\ \underline{m} < 1$ such that if $m > \underline{m}$,

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

and if $m < \underline{m}$ the opposite is true.

Proof. See Appendix C. ■

Thus, in the unique equilibrium with positive capital, technology raises the return to investment and then raises the tax base, increasing revenues. More constraints on the executive raises capital as well, as the risk of being expropriated and paying all output in taxes is reduced. The use of revenues between public goods and defense spending is very simple, if $S = 1$, $d^* = T^*$, and if $S = 0$, $g^* = T^*$. Hence comparative statistics work in the same way than for T^*, depending on the aggregate state.

The effect on revenues is ambiguous because the positive effect on the tax base trough a higher k is offset by the fact that fewer districts are being expropriated. But the first effect is weaker when the WC is large, because in that case most of the districts pay just a small fraction of the increase in investment to the government, and hence the distortionary effect of taxes are weaker. 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. The condition $\alpha < 1/2$ is sufficient for obtaining this result. This is because, as α increases, the effect on the tax base, through capital, increases as well, eventually offsetting any negative effect on tax rates.

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. In order to

do this first notice how the likelihood of conflicts depends on the parameters z, λ, and m, as these importantly influence the choice of constraints. The positive effect of technology on labor demand generates a positive relationship between the first and this risk. Since land is fixed constraints do not affect the demand for coerced labor and hence neither the probability of future rebellions. Finally an increase in the supply of coerced labor will translate to an increase in this type of employment because it becomes cheaper for elites, and consequently will increase the risk of conflicts.

To find the equilibrium level of constraints, first we can express $V(s_j, S)$ as current utility plus discounted expected utility as a function of k^*, τ^*_{WC}, T^*, ϕ^*, m, and the exogenous parameters. Using (5) we get,

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

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 τ_{WC} 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, as captured by condition (7), 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. $\tau_{\text{WC}}\pi^*$, and profits, which is what he pays in taxes. This is why as τ^*_{WC} approaches 1 the return on investment approaches 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 $m \leq \underline{m}$ as shown in Proposition 1, a higher m 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 $m > \underline{m}$, 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, ϕ, the more costly it is to constrain the executive. This generates the first prediction of the model, a positive causal relationship between the amount of labor that can be coerced, λ, which raises the risk of conflicts, ϕ, and executive constraints, m, conditional on asymmetric costs of conflicts (a high $\bar{\gamma}$).

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

$$\frac{\partial m^*}{\partial \lambda} < 0 \quad \textit{and} \quad \frac{\partial^2 m^*}{\partial z \partial \lambda} > 0,$$

with m^* strictly increasing in z when $\lambda = 0$, and strictly increasing or decreasing when $\lambda = 1$.

Proof. See Appendix C. ■

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.[29] 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 second main implication regards the effect of technology, which depends on the stock 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 λ is high enough, it can even lead to fewer constraints in the executive. We illustrate these dynamics in Figure 2, 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 (λ_l), one with a medium level (λ_m), and one with a high level (λ_h). It is always the case, for any z, that m is lower the higher is λ. However the differences are increasing in the level of z, as the responses to the jumps in z are negatively related to the value of λ.[30]

[29] As explained in detail above, asymmetry is needed because it generates the commitment problem behind the negative effects of constraining the executive. As can be seen in the proof of Proposition 2, the degree of asymmetry needed, or the value of $\bar{\gamma}$, is decreasing on λ and z, because these increase the risk of riots.

[30] As shown in Section 2 the institutional gap was not accompanied by an income gap, which argues against double causality. 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 less expropriation. But if conflict risk affects output, those with higher risk may end up with more output as they lower executive constraints. As argued by Coatsworth (2008), growth required consolidation of the dominance of precarious elites, and provided security for them. This would explain why the concentration of elite power had the opposite effects to what Engerman and Sokoloff (1997) postulated, as it actually led to economic growth during those years (Coatsworth, 2005, p.140).

5 Evidence

In this section we study empirically the determinants of the early development of institutions in Latin America in light of the theoretical model developed in the last section. In Section 3 we identified two exogenous features that deeply affected the region during the second half of the nineteenth century, which closely relate to the main drivers of institutional development according to the model. These are the availability of labor to be coerced, or the variable λ in the model, and the development of transport technologies, associated with the variable z. We concluded that the exploitation of labor produced a relevant risk of rebellions for elites, and that this risk was intensified by the improvement in economic conditions brought by the change in transport technology.[31]

In terms of rebellion risk, notice that the main features of this type of conflict resemble those needed by the main mechanism of the model, i.e. uncertain and asymmetric costs. The review in Section 3 showed that these rebellions were costly, localized in certain regions but widespread, and, with very few exceptions, far from seizing power.[32] The elite was geographically dispersed, since these were mainly agrarian and mining economies.

The way the response to rebellions depends on political institutions, which is behind the main prediction of the model, is also present in the historical accounts. For instance 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. 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. The centralization of political power allowed the Díaz regime to achieve this, leading to increasing inflows of external capital, and reinforcing the "regressive agricultural commercialization" (Coatsworth and Torres, 1975).

It is worth noticing that other types of social conflicts are also valid for the main prediction of the model. The feature that is really important is that they impose asymmetric and uncertain costs for members of the elite. Since in the period studied social groups were not as powerful or

[31] A significant institutional change also occurred in the British West Indies, where 11 colonies voluntarily abolished local parliaments between 1860 and 1880, empowering the colonial administration. Dippel (2014), using a sample of 28 British Colonies from North America, Australasia, and The Caribbean, finds that a positive relationship between the share of slaves in the population in 1834 and an indicator of government representativeness in 1832, becomes negative and very significant when measuring the last variable in 1882. Although Dippel (2014) proposes an alternative explanation, our model is consistent with these facts. Slavery was abolished in 1834 throughout the British Empire, but new forms of coercion were implemented in the West Indies thereafter (Bolland, 1981; Engerman, 2007).

[32] The small influence of these conflicts at a national level comes in part from the local character of their grievances, and the difficulty their leaders had in thinking about policy at a national level (Chevalier, 2005, p.481).

well organized yet to threaten the elite political control, we may consider all types of socioeconomic conflicts.[33] But as the discussion in Section 3 shows, with the exception of intra-elite conflicts during the decades after independence, racial conflicts were probably the main source of conflicts as social differences in the region were defined mainly in terms of race. Indeed social conflicts were even more pronounced as they were based on ethnic differences (Rouquié, 2010, p.77). Consequently, as argued by Chevalier (2005) (p.477), during the period analyzed peasant uprisings were particularly numerous in regions of large indigenous populations.

Although there was a decline in intra-elite conflicts after the lost decades following independence, these type of conflicts were still very important during the period we analyze, specially in countries like Brazil, Mexico, Colombia, and, before 1880, Argentina. Many factors could explain their persistence, and they may have contributed to shape political institutions as well. But the predictions of the model are still valid and they could even contribute to understand the nature of these conflicts. On the one hand, in countries with high risks of rebellions the high costs of sharing political power may have raised the expected pay-off from controlling the government.[34] Or groups of the elite who lost political rights may have resisted empowering rival groups. Likewise the raise in constraints in countries with low risks might have been opposed by those harmed inside the elite, generating conflicts as well (e.g. the Chilean civil war of 1891). Finally, inter-state wars were very uncommon in the region, with only 11 episodes from 1850 to 1930, according to the COW data set.

Data

Now we pursue a quantitative analysis of the sources of institutional development highlighted above. We focus on the second implication of the model, the interaction between the availability of labor to be coerced and technological progress in shaping political institutions. This allows us to exploit time variation and control for any fixed factor affecting the relationship of interest.[35]

The discussion so far shows that, in accordance with the structure of the theoretical model, the availability of indigenous and black populations, which were the groups most oppressed at that time, generated a risk of conflict for the elites, and this risk, not the realization of conflicts, influenced political institutions.[36] Then for the empirical exercise we use an estimate of Indians

[33] Rural workers organized in unions later (Bauer, 1986), while urban workers, then a relatively small population, started their increasingly intense demonstrations late in the century generating reactions from political regimes after World War I (Hall and Spalding, 1986; Collier and Collier, 1991; Rueschemeyer et al., 1992).

[34] Coatsworth (1998) argues that conflicts were shorter when the issues centered on the distribution of power between provinces and the center, and longer where elites dominated large slave or indigenous populations. In this last case governments struggled to restore stability, but also struggled to avert destructive rebellions from below (Coatsworth, 1998, pp. 562-565).

[35] Aguirre (2013) focuses on the relationship between the availability of labor to be coerced and average executive constraints. Regression results show a strong correlation, which is robust to the inclusion of a large set of controls.

[36] Alternatively we could focus on the structure of production, i.e. crop suitability and the presence of mines. But the availability of coerced labor shaped the way production took place in each sector. For example, while mining

and blacks as a fraction of total population for the years around 1800, which we denote by BI. For the fraction of Indians we use the data compiled from multiple sources by Mahoney (2003). Data on black population is more scarce. We impute values such that the ratio of black to Indians is the same than the one reported by Putterman and Weil (2010) for descendants in current populations. To complement these sources we also use data from Engerman (2007) and Rosenblat (1945) (see the details in Appendix A). The value of BI, disaggregated between Indians and blacks, is presented in Table 1.[37] The value of BI ranges from less than 5% in Uruguay and Costa Rica, to more than 70% in Ecuador. Without weighting by population, the averages are close to 30 and 10% in the case of Indians and blacks, respectively. In the robustness exercises we show that results are not influenced by the imputation of blacks or the use of additional sources.

Although the survey of rebellions in nineteenth century Latin America by Coatsworth (1988), reviewed in Section 3, is based on case studies, the numbers reported can give some idea of the quality of our proxy, i.e. how well pre-existing indigenous and black populations gave information to elites of that time about the risk of rebellions. For each country we add the different type of conflicts occurred between 1810 and 1890, reported by Coatsworth (1988), to get a measure of conflict realization.[38] In Figure 3 we show the relationship between the log of this variable and BI.[39] Since it is not clear whether countries that don't appear in the tables in Coatsworth (1988) suffered rebellions comparable to those that do appear, we first show in the left panel the relationship for the nine countries with at least one episode. There is a positive and strong correlation between the two variables. The OLS slope is significant at a 99% level and the regression explains two thirds of the variability in conflict. In the right panel we include all the countries and the correlation is still positive and strong, with the slope still significant at a 99% confidence level, and the regression explaining more than one third of the variability in conflict. With the caveat that they are based on cross-country variability, these results suggest that BI is strongly correlated with rebellions and hence it very likely gave information to elites concerning the risk they were facing.

Before pursuing a panel estimation we show the correlation between BI and executive constraints (XC). To capture the dynamic nature of this relationship we estimate the following regression from 1835 to 1910,

$$XC_{j,t} = \alpha_{0,t} + \alpha_{1,t} BI_j + \alpha_{2t} XC_{j,indep} + \epsilon_{j,t} \tag{10}$$

Estimation results are shown in Figure 4. In the left panel the sequence of $\alpha_{0,t}$ is plotted. We observe a sustained increase in this coefficient from 1850 to 1910. In the left panel the sequence

in Bolivia and sugar in Brazil and the Caribbean employed forced labor, in the United States and Australia mining companies employed free migrant labor and sugar was grown by smallholders in Australia (Acemoglu et al., 2002).

[37] Although it would improve the results we don't include Haiti because of its particular history. We don't include Panama and Cuba either because they achieved their independence later.

[38] These are "Village Riots and Uprisings" for 1820-1899, "Regional, Peasant, and Caste Wars", for 1810-1899, and "Plantation Uprisings", for 1810-1889.

[39] Since we include countries without episodes we report the log of 1 plus the number of episodes.

for $\alpha_{1,t}$ is plotted, and we can see that the rapid institutional development took place only in countries with small Indian and black populations, as expected. Moreover 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).

The other explanatory variable suggested by the model and the historical analysis in the previous sections is technology, and in particular the gains in productivity derived from the transport revolution. This development, described in Section 3, 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 political power before the reforms.[40]

Historians have quantified the technological advances in maritime transportation, allowing us to pursue a dynamic econometric exercise. Harley (1988) constructs an index of ocean freight rates from 1740 to 1870, which he complements with an index constructed by Isserlis (1938), to obtain a series to 1915. After almost a hundred years, when freight rates remained at very high levels, the index shows a long decline starting around 1850, falling by the early 1900s to only about a half of what it was before 1850.[41] More recently Mohammed and Williamson (2004) constructed an alternative index from 1870 to 1950, which improves upon the one calculated by Isserlis (1938). They use the same source, but additional information contained in it, which was not used by Isserlis, and confirm the decline in freights rates before World War I. We use as an explanatory variable in our regressions the negative value of the ocean freight index constructed by Harley (1988), complemented with the one constructed by Mohammed and Williamson (2004) for the period after 1870. We define this variable as transportation technology (TT).

Regression Results

Now we test the main prediction of the model, i.e. that technical change has a larger effect on executive constraints when less labor is available to be coerced. To do this we estimate a 5-year panel from 1850 to 1914, incorporating time and fixed effects. The time span allows us to consider a balanced panel of 17 countries for 13 periods. The dependent variable is executive constraints, and the explanatory variable is an interaction between BI and TT. Note that any unconditional effect across countries coming from BI, and over time coming from TT, are captured by the

[40] Railroad expansion was also important in the region. We do not consider this in the empirical exercise because it responded to economic conditions, and hence it is difficult to capture its exogenous component. Nonetheless we think this expansion was associated with the development of navigation technologies as well. Migration is another important development, which may have been facilitated by these technical improvements. But it is not clear if it had an effect on the risk of rebellions.

[41] Harley (1988) improves upon the index constructed from 1750 to 1913 by North (1958). North's index experienced two periods of decline, 1815 to 1851, and 1870-73 to 1908-09. The difference between Harley and North's indexes is that in the latter cotton freights are overrepresented, which actually decline before 1850.

fixed and time effects, respectively.[42] Results are presented in the first column of Table 2. As expected, the interaction is negative and significant. Hence only countries with a relatively low slave and indigenous populations constrained their executives when the gains of doing so rose due to technological change.[43]

As explained already the TT index displays a downward trend, at least from 1865 to 1910. This may rise the concern that, although conditional on BI, any other trending variable may be behind the results. We try to rule out this possibility in two ways; introducing an interaction between BI and a time trend, and running the regression is first differences. Results from the first case are presented in column (2), where we also include the lagged value of the dependent variable to better capture the dynamics involved in the relationship of interest. The coefficient remains negative, and it is even more significant now, while the interaction with the time trend has the opposite sign. Lagged executive constraints are highly significant as well. Since introducing the latter makes the OLS estimator biased, we implement the GMM estimator proposed by Arellano and Bond (1991) in column (3), where we can see that the parameter is still negative and highly significant. Second-order autocorrelation in the error term and over identification are rejected, as shown by the test's p-values reported in the last two rows. Also it is clear the downward bias in the estimate of lagged executive constraints when using OLS. Results from taking first differences are presented in columns (4) and (5), without (OLS) and with (GMM) lagged executive constraints, respectively. Results are very similar, as the lagged dependent variable is very close to zero and not significant. More importantly the parameter of interest is negative and significant. These exercises show that TT was very likely behind the divergence in political institutions.

In the rest of this section we pursue a robustness analysis of the results presented in Table 2. To do this we consider the specifications in columns (3), with trend interactions and lagged executive constraints and using the GMM estimator, and (5), in differences, no lagged constraints, and using the OLS estimator. We explore if the results vary when excluding countries from the sample, when controlling for interactions between TT and other possible determinants of political institutions, and when varying the proxies used for capturing the availability of labor to be coerced and transport technology.

In Table 3 the results from the first robustness exercise are shown. Together with the results

[42] BI may be endogenous (Summerhill, 2010; Acemoglu et al., 2012). To be problematic for the results a third factor would need to influence this variable, which is measured around 1800, and the evolution, not the average level, of executive constraints after 1850. Additionally this last effect needs to be conditional on TT. Below we pursue a robustness analysis including many related controls interacted with the TT index, particularly geography and colonial features. We also show that the findings remain significant when not considering blacks, which may be the most endogenous component of BI.

[43] It is worth emphasizing that the estimated relationship is not a direct outcome of the exclusion of certain groups, particularly black and Indians, from political participation. As explained above, constraints on the executive is only indirectly related to the fraction of population voting in elections, and this fraction was much lower than the fraction of whites in the population (Colomer, 2004; Hartlyn and Valenzuela, 1998).

for the full sample in the first row, we show below the results when excluding one country at a time. The first two columns show the coefficient and its p-value, respectively, using the first specification. The coefficient of interest remains highly significant, and with minor changes (no more than 15% of the benchmark value). In the last two columns we show the same statistics but using the specification in differences. Again we don't observe large variations in the size of the coefficient (no more than 20% of the benchmark value), and the significance level remains at 5% in all cases. Note that results change only slightly when excluding Brazil or the Dominican Republic, the two countries for which we use alternative sources to construct BI.

To further ensure that the relationship between BI and political institutions is really capturing the mechanism explained by the model, we control for a series of variables associated with different theories that have been proposed in the literature to link colonial and pre-colonial experiences with current economic and political development. As noted in the introduction we see most of these theories as complementary to our model. What the model does is to propose a specific mechanism, which allows to get sharper predictions about the explanatory variables we should use, and the timing of the effects. Indeed BI is the most correlated variable with the measure of conflicts, constructed from Coatsworth (1988), among the variables we consider as additional controls next.[44]

We consider initial executive constraints first. These control for many unobserved features of the countries at the time of independence. 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 (the wheat-sugar ratio), and a direct measure of inequality, the degree of concentration in the ownership of land (for sources and details see Appendix A).[45] Acemoglu et al. (2002) showed that in relatively poor areas in 1500 Europeans established institutions of private property that favored long-run growth, while in richer areas they established extractive institutions. We control for each of the three variables that these authors have used to capture this mechanism: population density in 1500, urbanization in 1500, and settler mortality. We also include a direct measure of state development during colonial times, the State Antiquity Index developed by Bockstette et al. (2002).[46] Finally we consider different geographic variables: distance to the UK, access to the Atlantic Ocean, latitude, fertile soil, and size. These control for agricultural productivity, the

[44] Accordingly the aim of this exercise is not to test the validity of these theories, especially since we use only proxies of the relevant variables, and the mechanisms identified by them could have realized before or after the period we consider. Moreover they may have explanatory power for a larger cross-section of countries and not solely Latin America countries, which are very similar in many of the relevant dimensions.

[45] Easterly (2007) argues that the wheat-sugar ratio captures the exogenous component of the type of inequality considered by Engerman and Sokoloff (1997, 2002).

[46] This index captures the presence of a supra-tribal polity in present-day countries. Higher scores are associated with countries where intensive agriculture, urbanization, use of money, taxation, and government administration developed earlier.

disease environment, and the distance to markets.[47] Since including all the controls together is problematic due to the lost degrees of freedom we compute the principal component and use it as an additional control.

Results using the first specification are shown in Table 4. In each column we include one of the new explanatory variables, in the same order as described above. On the top of each column the name of the corresponding control is shown. In the first column this is labeled *Control*. We included them both interacted with TT and the time trend. Results show that, while the coefficient of interest, and the interaction between BI and the time trend, are similar than the ones estimated in Table 2, the interactions with alternative controls are not significant. The only exception is the principal factor interacted with the time trend. Table 5 presents the results for the specification in differences. Results are mostly unchanged. Now latitude becomes significant, while the principal component remains so. Hence results suggest that the channel behind the negative and significant relationship found in Table 2 is likely the one highlighted by the model. Keeping alternative determinants of early state and economic development constant, the fraction of blacks and Indians to total population around 1800 is negatively associated with the development of executive constraints during the second half of the nineteenth century.

Finally we explore if our results are influenced by our measures of BI and TT. First we run the regressions using only the fraction of Indians in the population around 1800, for which data is more reliable, interacted with TT (and the time trend). The first two columns in Table 6 show the results. These are weaker, as we would expect from the historical discussion and the model as the risk of rebellions by blacks were as important as those from Indians. But the coefficient is significant and close to the value estimated before. Hence our measurement of the fraction of blacks is not behind the main results. In the last two columns we modify our TT index. Instead of using the index by Mohammed and Williamson (2004), we use the one by Isserlis (1938). Remember that the first improves upon this last index as it uses the same source but more information. Accordingly results are weaker. But they are still significant and close to the benchmark estimates, showing that results are not driven by a specific feature of the Mohammed and Williamson's index.

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 due to labor coercion were significant causes for the divergence observed within the region in terms of political institutions.

6 Conclusions

This paper develops a theoretical model where the risk of conflicts due to labor coercion interacts with technical change in shaping endogenous political institutions. Economy-wide technical change

[47] These influenced the incentives for settlement by colonialists and the distribution and level of income per capita during colonial times (Engerman and Sokoloff, 1997, 2002; Acemoglu et al., 2001, 2002; Easterly and Levine, 2003). Distance to markets is included because they may have influenced the effect of TT on political institutions.

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 due to their exploitation the risk of uprisings from non-whites was important, and some evidence reviewed in the paper suggests that these risks meet the conditions required by the theoretical model. On the other hand the region experienced a deep structural change in the second half of the last century, when a transport revolution allowed integration with the developed world. 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 availability of labor to be coerced 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. 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.

Evidence presented in the paper shows that this institutional gap has significant explanatory power for income per capita today, not only due to its subsequent effect on contemporaneous institutions but also trough additional channels not accounted by them. Therefore 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.

References

Acemoglu, D., C. García-Jimeno, and J. A. Robinson (2012): "Finding Eldorado: Slavery and long-run development in Colombia," *Journal of Comparative Economics*, 40(4), 534–564.

Acemoglu, D., S. Johnson, and J. Robinson (2001): "The Colonial Origins of Comparative Development: An Empirical Investigation," *American Economic Review*, 91, 1369–1401.

——— (2002): "Reversal of Fortune: Geography and Institutions in the Making of the Modern World Income Distribution," *The Quarterly Journal of Economics*, pp. 1231–1244.

Acemoglu, D., S. Johnson, and J. A. Robinson (2005): "Institutions as a Fundamental Cause of Long-Run Growth," in *Handbook of Economic Growth*, ed. by P. Aghion, and S. N. Durlauf, vol. 1A, chap. 6, pp. 385–472. Elsevier.

Acemoglu, D., and J. Robinson (2012): *Why Nations Fail: The Origins Of Power, Prosperity, And Poverty*. Crown Business.

Acemoglu, D., and J. A. Robinson (1969): "Persistence of power, elites and institutions," *American Economic Review*, 98(1).

Acemoglu, D., and J. A. Robinson (2000): "Why did the West extend the Franchise? Democracy, inequality, and growth in historical perspective," *Quarterly Journal of Economics*, 115(4), 1167–1199.

——— (2006): *Economic Origins of Dictatorship and Democracy*. Cambridge.

Acemoglu, D., and A. Wolitzky (2011): "The economics of labor coercion," *Econometrica*, 79(2), 555–600.

Aguirre, A. (2013): "Rebellions, Technical Change, and the Early Development of Political Institutions in Latin America," Unpublished manuscript: //www.alvaroaguirre.weebly.com/.

Aguirre, A. (2016): "The risk of civil conflicts as a determinant of political institutions," *European Journal of Political Economy*, 42, 36–59.

Anderson, P. (1974): *Lineages of the absolutist state*. NLB London.

Arellano, M., and S. Bond (1991): "Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations," *The review of economic studies*, 58(2), 277–297.

Bates, R. H., J. H. Coatsworth, and J. G. Williamson (2007): "Lost Decades: Postindependence Performance in Latin America and Africa," *The Journal of Economic History*, 67(4), 917–943.

Bauer, A. (1986): "Rural Spanish America, 1870-1930," in *Cambridge History of Latin America*, ed. by L. Bethell, vol. IV, pp. 153–186. Cambridge Univ Press.

Besley, T. J., and T. Persson (2010): "State Capacity, Conflict, and Development," *Econometrica*, 126(3), 1411–1445.

Bockstette, V., A. Chanda, and L. Putterman (2002): "States and markets: The advantage of an early start," *Journal of Economic Growth*, 7(4), 347–369.

Boix, C. (2003): *Democracy and Redistribution*. Cambridge Univ Press.

Bolland, O. N. (1981): "Systems of domination after slavery: The control of land and labor in the british west indies after 1838," *Comparative Studies in Society and History*, 23(04), 591–619.

Brenner, R. (1976): "Agrarian class structure and economic development in pre-industrial Europe," *Past & present*, (70), 30–75.

——— (1982): "The agrarian roots of European capitalism," *Past & Present*, (97), 16–113.

Bulmer-Thomas, V. (1995): *The Economic History of Latin America since Independence*. Cambridge Univ Press.

Calderón, C., N. Loayza, and P. Fajnzylber (2005): "Economic Growth in Latin America and The Caribbean: Stylized Facts, Explanations, and Forecasts," in *The World Bank Latin America and the Caribbean Regional Studies Program*, vol. 156. The World Bank.

Chevalier, F. (2005): *América Latina: De La Independencia a Nuestros Días*. Fondo de Cultura Económica.

Coatsworth, J. H. (1988): "Patterns of Rural Rebellion in Latin America: Mexico in Comparative Perspective," in *Riot, Rebellion, and Revolution: Rural Social Conflict in Mexico*, ed. by F. Katz, pp. 21–62. Princeton University Press.

Coatsworth, J. H. (1998): *Latin América and the World Economy since 1800*chap. Economic and Institutional Trajectories in Ninteenth-century Latin America, pp. 23–54. Harvard University Press.

Coatsworth, J. H. (2005): "Structures, endowments, and institutions in the economic history of Latin America," *Latin American Research Review*, 40(3), 126–144.

——— (2008): "Inequality, institutions and economic growth in Latin America," *Journal of Latin American Studies*, 40(03), 545–569.

Coatsworth, J. H., and A. Torres (1975): "Los orígenes del autoritarismo moderno en México," *Foro internacional*, 16(2 (62), 205–232.

Collier, R. B., and D. Collier (1991): *Shaping The Political Arena. Critical junctures, The Labor Movement, and Regime Dynamics in Latin America*. Princeton University Press.

Colomer, J. M. (2004): "Taming the Tiger: Voting Rights and Political Instability in Latin America," *Latin American Politics and Society*, 46(2), 29–58.

Dippel, C. (2014): "Autocracy as a Safety Valve for Democracys Elites: Evidence from British Colonies," Discussion paper, mimeo.

Drake, P. W. (2009): *Between Tyranny and Anarchy: A History of Democracy in Latin America, 1800-2006*. Stanford University Press.

Eakin, M. C. (2007): *The History of Latin America: Collision of Cultures*. Palgrave Macmillan.

Easterly, W. (2007): "Inequality does cause underdevelopment: Insights from a new instrument," *Journal of Development Economics*, 84(2), 755–776.

Easterly, W., and R. Levine (2003): "Tropics, Germs, and Crops," *Journal of Monetary Economics*, 50(1), 3–39.

Efron, B. (1979): "Bootstrap methods: another look at the jackknife," *The annals of Statistics*, pp. 1–26.

——— (1982): *The jackknife, the bootstrap and other resampling plans*. SIAM.

Engerman, S. (2007): *Slavery, Emancipation and Freedom*. LSU Press.

Engerman, S., and K. Sokoloff (1997): "Factor Endowments, Institutions, and Differential Paths of Growth among New World Economies: A View from Economic Historians of the United States," in *How Latin America Fell Behind*, ed. by S. Haber, pp. 206–304. Stanford University Press.

——— (2002): "Factor Endowments, Inequality, and Paths of Development among New World Economies," *Economia*, (Fall), 41–109.

Estevadeordal, A., B. Frantz, and A. M. Taylor (2003): "The rise and fall of world trade, 1870–1939," *The Quarterly Journal of Economics*, 118(2), 359–407.

Galor, O., O. Moav, and D. Vollrath (2009): "Inequality in landownership, the emergence of human-capital promoting institutions, and the great divergence," *The Review of economic studies*, 76(1), 143–179.

García-Jimeno, C., and J. A. Robinson (2011): "The Myth of the Frontier," in *Understanding Long-Run Economic Growth: Essays in Honor of Kenneth L. Sokoloff*, ed. by D. L. Costa, and N. R. Lamoreaux. University of Chicago Press.

Gargarella, R. (2004): "Towards a Typology of Latin American Constitutionalism, 1810-60," *Latin American Research Review*, 39(2), 141–153.

Hall, M., and H. A. Spalding (1986): "The urban working class and early Latin American labour movements, 1880-1930," in *Cambridge History of Latin America*, ed. by L. Bethell, vol. IV, pp. 325–365. Cambridge University Press.

Harley, C. K. (1988): "Ocean freight rates and productivity, 1740–1913: the primacy of mechanical invention reaffirmed," *The Journal of Economic History*, 48(04), 851–876.

Hartlyn, J., and A. Valenzuela (1998): *Latin America: politics and society since 1930*chap. Democracy in Latin America since 1930. Cambridge.

Heise, J. (2007): *150 años de evolución institucional*. Andrés Bello.

Hilton, R. (1976): *The Transition from Feudalism to Capitalism.* Verso Editions.

Horowitz, D. L. (1985): *Ethnic Groups in Con ict.* University of California Press.

Horowitz, D. L. (2002): "Constitutional Design: Proposals versus Processes," in *The Architecture of Democracy*, ed. by A. Reynolds. Oxford University Press.

Isserlis, L. (1938): "Tramp shipping cargoes, and freights," *Journal of the Royal Statistical Society*, 101(1), 53–146.

Katz, F. (1988): "Rural Rebellions after 1810," in *Riot, Rebellion, and Revolution: Rural Social Conflict in Mexico*, ed. by F. Katz, pp. 521–560. Princeton University Press.

La Porta, R., F. L. de Silanes, A. Shleifer, and R. Vishny (1998): "Law and Finance," *Journal of Political Economy*, 106(6), 1113–1155.

——— (1999): "The Quality of Government," *The Journal of Law, Economics & Organization*, 15(1), 222–279.

Lange, M., J. Mahoney, and M. Vom Hau (2006): "Colonialism and Development: A Comparative Analysis of Spanish and British Colonies 1," *American Journal of Sociology*, 111(5), 1412–1462.

Maddison, A. (2008): "Historical Statistics," from http://www.ggdc.net/maddison/.

Mahoney, J. (2001): *The Legacies of Liberalism: Path Dependence and Political Regimes in Latin America.* The John Hopkins Press.

Mahoney, J. (2003): "Long-Run Development and the Legacy of Colonialism in Spanish America," *American Journal of Sociology*, 109(1), 50–106.

Marshall, M. G., and K. Jaggers (2007): *POLITY IV Project: Dataset Users' Manual.* Polity IV Project, Center for Global Policy, School of Public Policy, George Mason University, and Center for Systemic Peace.

Mohammed, S. I. S., and J. G. Williamson (2004): "Freight rates and productivity gains in British tramp shipping 1869–1950," *Explorations in Economic History*, 41(2), 172–203.

Moore, B. (1966): *Social Origins Of Dictatorship And Democracy: Lord And Peasant In The Making Of The Modern World.* Bacon Press.

Naidu, S., and N. Yuchtman (2013): "Coercive Contract Enforcement: Law and the Labor Market in Nineteenth Century Industrial Britain," *The American Economic Review*, 103(1), 107–144.

North, D. (1958): "Ocean Freight Rates and Economic Development 1730-1913," *The Journal of Economic History*, 18(04), 537–555.

North, D., and P. Thomas (1973): *The Rise of the Western World: A New Economic History.* Cambridge Univ Press.

North, D., J. Wallis, and B. Weingast (2009): *Violence and Social Orders*. Cambridge.

North, D. C., W. Summerhill, and B. Weingast (2000): *Governing for Prosperity*vol. 19, chap. Order, disorder and economic change: Latin America vs. North America, pp. 17–58. Yale University Press New Haven.

North, D. C., and R. P. Thomas (1970): "An Economic Theory of the Growth of the Western World1," *The Economic History Review*, 23(1), 1–17.

Nugent, J. B., and J. A. Robinson (2010): "Are factor endowments fate?," *Journal of Iberian and Latin American Economic History*, 28(1), 45–82.

Nunn, N., and D. Puga (2012): "Ruggedness: The blessing of bad geography in Africa," *Review of Economics and Statistics*, 94(1), 20–36.

Olson, M. (1993): "Dictatorship, Democracy, and Development.," *American Political Science Review*, 87(03), 567–576.

Orourke, K. H., and J. G. Williamson (2002): "When did globalisation begin?," *European Review of Economic History*, 6(1), 23–50.

Paige, J. M. (1998): *Coffee and power: Revolution and the rise of democracy in Central America.* Harvard University Press.

Parker, P. M. (1997): *National Cultures of the World: A Statistical Reference*. Greenwood Press.

Pérez Brignoli, H. (1995): *Coffee, society, and power in Latin America*chap. Indians, communists, and peasants: The 1932 rebellion in El Salvador, pp. 232–61. John Hopkins.

Puga, D., and D. Trefler (2014): "International trade and institutional change: Medieval Venices response to globalization," *The Quarterly Journal of Economics*, pp. 753–821.

Putterman, L., and D. N. Weil (2010): "Post-1500 population flows and the long-run determinants of economic growth and inequality," *The Quarterly journal of economics*, 125(4), 1627–1682.

Rosenblat, A. (1945): *La población indígena de América: desde 1492 hasta la actualidad*. Institución Cultural Española.

Rouquié, A. (2010): *À l'ombre des dictatures: la démocratie en Amérique latine*. Albin Michel.

Rueschemeyer, D., E. H. Stephens, and J. D. Stephens (1992): *Capitalist development and democracy*. Cambridge, UK.

Sánchez, F., M. d. P. López-Uribe, and A. Fazio (2010): "Land Conflicts, Property Rights, and the Rise of the Export Economy in Colombia, 1850–1925," *The Journal of economic history*, 70(02), 378–399.

Skocpol, T. (1979): *States And Social Revolutions: A Comparative Analysis Of France, Russia And China.* Cambridge Univ Press.

Summerhill, W. (2010): "Colonial institutions, slavery, inequality, and development: Evidence from São Paulo, Brazil," .

Thach, Jr, C. C. (1969): *The Creation of the Presidency, 1775-1789: A Study in Constitutional History*. The John Hopkins Press.

Tilly, C. (1992): *The Creation of the Presidency, 1775-1789: A Study in Constitutional History*. Blackwell Publishing.

Vanhanen, T. (2004): *Democratization: A comparative analysis of 170 countries*. Routledge.

Wiarda, H. J. (2005): *Dilemmas of Democracy in Latin America*. Rowman & Littlefield Publishers.

Williamson, E. (2009): *The Penguin History of Latin America*. Penguin Books.

Williamson, J. G. (2006): *Globalization and the Poor Periphery before 1950*. The MIT Press.

Appendix A: Data

Variable	Source	Notes
Executive Constraints	Polity Project, Marshall and Jaggers (2007)	Instances of "standardized authority codes" (i.e., -66, -77, and -88) are converted to conventional scores with a linear interpolation.
GDP per capita, 1900, 1920, 1950, and 2008.	Maddison (2008)	Maddison (2008) only presents estimates of GDP per capita for 8 Latin American countries for 1900, and 12 in 1920. We add data for Ecuador (1900 and 1920) and Dominican Republic (1920) from the Montevideo Oxford Latin American Economic History (MOxLAD) Database, after fitting an OLS regression using the countries that are included in both databases to impute the values for these two countries.
Indians and blacks as a fraction of total population, circa 1800.	Mahoney (2003), Putterman and Weil (2010), Engerman (2007), and Rosenblat (1945).	Mahoney (2003) collects data from third sources for indians as a fraction of total population around 1800, for all the countries except for Brazil and Dominican Republic. Since data on blacks is scarce we compute the ratio of blacks and indians descendants in current populations computed by Putterman and Weil (2010), and define the fraction of blacks such that the same ratio is obtained using Mahoney's estimates of indians. For blacks in Dominican Republic there are good estimates by Engerman (2007). He reports 56% and 58% for 1750 and 1850, respectively, so we use 57%. Then we impute numbers for indians using the ratio reported by Putterman and Weil (2010). For Brazil we use data for each group reported by Rosenblat (1945).
Transport Technology	Harley (1988) and Mohammed and Williamson (2004).	Negative value of the Freight Rate Index.
Wheat-sugar ratio	Easterly (2007)	
Land Inequality	Vanhanen (2004)	
Population Density in 1500	Acemoglu et al. (2002)	
Urbanization in 1500	Acemoglu et al. (2002)	
Settler Mortality	Acemoglu et al. (2001)	
State Antiquity Index	Bockstette et al. (2002)	Average 1500 to 1800.
Distance to UK	sea-distance.com	Ln of sea distance in nautical miles from London to each country via the Strait of Magellan (when the port was in the Pacific). For Brazil the port is Bahía, for Colombia Cartagena, for Venezuela Puerto Cabello, for Costa Rica Limón, for Guatemala Puerto Barrios, and for Bolivia Antofagasta. For Paraguay we use the value for Uruguay, for El Salvador the value for Honduras, and for Nicaragua the average between the values for Costa Rica and Honduras.
Atlantic		1 if access to the Atlantic Ocean, 0 otherwise.
Latitude	La Porta et al. (1999)	Absolute value.
Fertile Soil	Nunn and Puga (2012)	% of total land.
Size	Parker (1997)	

Appendix B: Proofs

Proof of Proposition 1

We can apply the Implicit Function Theorem (IFT) to expression (8) to get,

$$\frac{\partial F}{\partial z} = \left(\frac{F}{z}\right)\frac{(\lambda - F)}{(1+\beta)(\lambda - F) + F} = \left(\frac{F}{z}\right)s(z,\lambda) > 0 \tag{C.1}$$

$$\frac{\partial F}{\partial \lambda} = \frac{F}{(1+\beta)(\lambda - F) + F} > 0 \tag{C.2}$$

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 (5) and (7) as

$$k = (1-\lambda)\Big(m\delta\alpha z\frac{(1-\gamma)}{(1-\gamma m)}\Big)^{\frac{1}{1-\alpha}} \tag{C.3}$$

Hence $k^* > 0$ is unique (of course $k^* = 0$ and $\tau_{\text{WC}} = 1$ is always an equilibrium). Moreover

$$\frac{\partial k}{\partial m} = \frac{k}{m(1-\alpha)(1-\gamma m)} > 0 \tag{C.4}$$

$$\frac{\partial k}{\partial z} = \frac{k}{z(1-\alpha)} > 0 \tag{C.5}$$

and $\partial k/\partial\lambda = 0$. Since labor is priced at its marginal productivity $\pi = i + z(1+\beta f^{1-\beta})$ and $T = \pi(1-m(1-\tau_{\text{WC}})) = \pi(1-m)/(1-\gamma m)$. Because k and F are strictly increasing in z, π and T are strictly increasing as well. To see the effect of m on T we differentiate T and use (C.4) to get,

$$\frac{\partial T}{\partial m} = \frac{(1-\gamma)}{(1-\gamma m)^2}\Big[\frac{\alpha}{(1-\gamma)(1-\alpha)}\frac{(1-m)i}{m} - \pi\Big] \tag{C.6}$$

Using (C.3),

$$\frac{(1-m)i}{m} = (1-\lambda)z^{\frac{1}{1-\alpha}}(\delta\alpha(1-\gamma))^{\frac{\alpha}{1-\alpha}}\frac{1-m}{(1-\gamma m)^{\frac{\alpha}{1-\alpha}}}m^{\frac{\alpha}{1-\alpha}-1}$$

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 $lim_{m\to 0}\pi = z(1+\beta f^{1-\beta}) > 0$, and $\partial T/\partial m = -\pi/(1-\gamma) < 0$ when $m = 1$. The existence of $\underline{m}$ as defined in the proposition comes from the fact that the term inside brackets is strictly decreasing in m as $\partial\pi/\partial m > 0$. ***QED.***

Proof of Proposition 2

The FOC of (9) with respect to m is,

$$\frac{\alpha i(1-m)}{(1-\alpha)m}\Big(1+\phi n\bar{\gamma}\Big) = (1-\gamma)\pi\Big(\phi n\bar{\gamma} - (1-\gamma)/\gamma\Big) \tag{C.7}$$

Since $\partial(i(1-m)/m)/\partial m < 0$ (see proof of Proposition 1) and $lim_{m\to 0}((1-m)i/m) = \infty$, the LHS in (C.7) is strictly decreasing in m and goes from ∞ when $m \to 0$ to 0 when $m = 1$. In the RHS the only term depending on m is π. Since $\partial\pi/\partial m = \partial i/\partial m > 0$ the RHS is increasing in m, and since $lim_{m\to 0}\pi = z(1+\beta f^{1-\beta}) > 0$ and $lim_{m\to 1}\pi > 0$, its value is finite, so we have a unique solution, m^*. If the term inside the last parenthesis is strictly positive this solution is lower than 1. This happens if $\phi n\bar{\gamma} > (1-\gamma)/\gamma$, or $\bar{\gamma} > \gamma^* = (1-\gamma)/(\kappa n\gamma) > 0$. This last condition is sufficient. More generally γ^* is a function of λ and z, which raise ϕ and hence lower γ^*.

To show $\partial m/\partial\lambda < 0$ when $\bar{\gamma} > \gamma^*$, i.e. when (C.7) holds, we can define H as $LHS - RHS$ of (C.7) and use the IFT to obtain $\partial m/\partial\lambda = -(\partial H/\partial\lambda)/(\partial H/\partial m)$. Because $\partial H/\partial m < 0$ (see above), we need to show $\partial H/\partial\lambda < 0$:

$$\begin{aligned}\frac{\partial H}{\partial\lambda} &= n\bar{\gamma}\frac{\partial\phi}{\partial\lambda}\Big(\frac{\alpha i(1-m)}{(1-\alpha)m} - (1-\gamma)\pi\Big) - \frac{\partial\pi}{\partial\lambda}(1-\gamma)\Big(\phi n\bar{\gamma} - (1-\gamma)/\gamma\Big) \\ &= -n\bar{\gamma}\frac{\partial\phi}{\partial\lambda}\frac{\alpha i(1-m)}{(1-\alpha)m}\Big(\frac{1+(1+\gamma)/\gamma}{\phi n\bar{\gamma} - (1-\gamma)/\gamma}\Big) - \frac{\partial\pi}{\partial\lambda}(1-\gamma)\Big(\phi n\bar{\gamma} - (1-\gamma)/\gamma\Big) < 0.\end{aligned}$$

where we have used (C.7) for the second equality, and where the inequality follows from $\partial\pi/\partial\lambda = \partial a/\partial\lambda > 0$, $\partial\phi/\partial\lambda > 0$, and $\bar{\gamma} > \gamma^*$ (which implies $\phi n\bar{\gamma} > (1-\gamma)/\gamma$).

Now we show the relationship with z when $\bar{\gamma} > \gamma^*$. Applying the IFT, $\partial m/\partial z = -(\partial H/\partial z)/(\partial H/\partial m)$, where

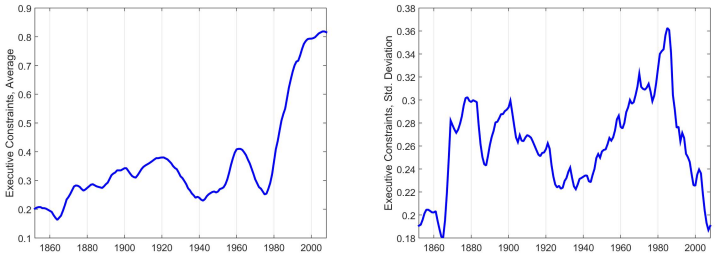
$$\frac{\partial H}{\partial z} = (1+\phi n\bar{\gamma})\Big[\frac{\alpha i}{1-\alpha}\frac{\alpha(1-m)}{(1-\alpha)m} - \Big(\frac{\alpha i}{1-\alpha} + (1-\beta)\beta F^{1-\beta}s(z,\lambda)\Big)(1-\gamma)c(\phi) + \Big(\frac{\phi' s(z,\lambda)(F/z)n\bar{\gamma}}{1+\phi n\bar{\gamma}}\Big)\Big(\frac{\alpha i(1-m)}{(1-\alpha)m} - (1-\gamma)\pi\Big)\Big]$$

$$\frac{\partial H}{\partial m} = \frac{(1+\phi n\bar{\gamma})\alpha i}{(1-\alpha)m}\Big[\frac{1}{1-\gamma m}\Big(\frac{\alpha(1-m)}{(1-\alpha)m} - (1-\gamma)c(\phi)\Big) - \frac{1}{m}\Big]$$

and where $s(z,\lambda)$ was defined in (C.1), and $c(\phi) = (\phi n\bar{\gamma} - (1-\gamma)/\gamma)/(1+\phi n\bar{\gamma})$. The term $(1+\phi n\bar{\gamma})$, which is in the two expressions, cancels out, so we don't take it into account. Since F, $s(z,\lambda)$, and π are strictly increasing in λ, since $\phi' > 0$, $\phi'' > 0$, and $c' > 0$, since $\phi' F = \epsilon\phi$ (and hence the second to last term in parenthesis of the first expression is increasing in λ), and since the last term in parenthesis in the first expression is negative, as shown in the derivation of $\partial H/\partial\lambda$ above, both terms are strictly decreasing in λ. Because $\partial H/\partial m < 0$, this means $\partial m/\partial z$ is strictly decreasing in λ. Notice also that

$$lim_{\lambda\to 0}\Big(\frac{\partial H}{\partial z}\Big) = (1+\phi n\bar{\gamma})\frac{\alpha i}{1-\alpha}\Big(\frac{\alpha(1-m)}{(1-\alpha)m} - (1-\gamma)c(\phi)\Big) = (1+\phi n\bar{\gamma})\frac{\alpha i}{1-\alpha}\frac{\alpha(1-m)}{(1-\alpha)m}\Big(1-\frac{i}{\pi}\Big) > 0$$

because $lim_{\lambda\to 0}s(z,\lambda) = 0$, $lim_{\lambda\to 0}F = 0$, and $\phi' \geq 0$, and where the second equality comes from (C.7). This implies $lim_{\lambda\to 0}\partial m/\partial z > 0$. Finally notice that the only positive term in $\partial H/\partial z$ is the first one, and so, for instance for small α and when $\lambda = 1$, $\partial H/\partial z < 0$ implying $\partial m/\partial z < 0$.



Notes: 5 year moving average of average executive constraints (left panel) and its standard deviation (right panel) in Latin America (see footnote 10).

Figure 1: Executive Constraints, Latin America 1850-2010

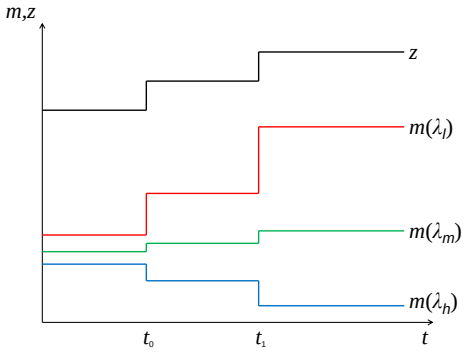
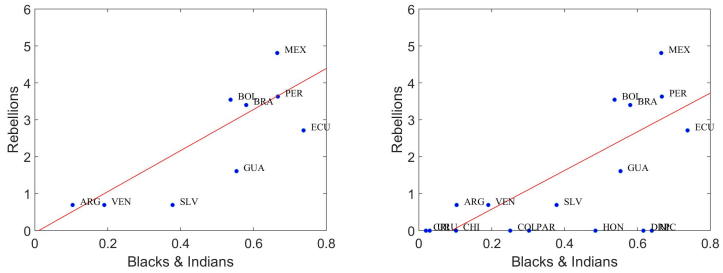
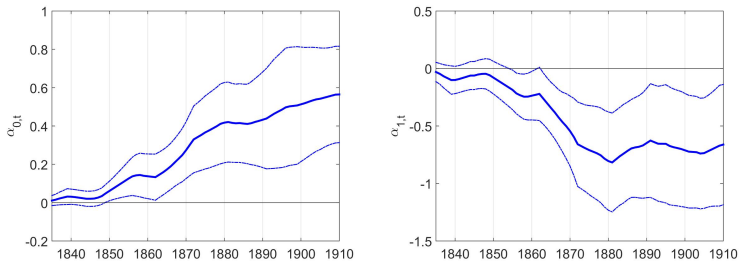


Figure 2: Executive Constraints, Technical Change, and Coerced Labor



Rebellions as reported by Coatsworth (1988). The number is the sum of "Village Riots and Uprisings" for 1820-1899 (Coatsworth, 1988, Table 2.2), "Regional, Peasant, and Caste Wars", for 1810-1899 (Table 2.3), and "Plantation Uprisings", for 1810-1889 (Table 2.5). For "Village Riots and Uprisings" the episodes for Peru and Bolivia are reported together, so we assign half of them to each country. In the left panel we include only countries for which Coatsworth (1988) reports at least one episode, and in the right panel we include all the countries. The variable Rebellions is the log of 1 plus the number of episodes.

Figure 3: Natives, Blacks, and Rebellions in Nineteenth Century Latin America



Notes: Regression results from estimating equation (10). Dotted lines are 90% CI based on robust standard errors.

Figure 4: Natives, Blacks, and Political Institutions: Regression Results

	Indians	Blacks	BI
Chile	9.8 %	0.4 %	10.2 %
Argentina	7.4 %	3.0 %	10.4 %
Brazil	9.0 %	49.0 %	58.0 %
Uruguay	1.5 %	1.5 %	3.0 %
Peru	61.3 %	5.4 %	66.7 %
Colombia	17.1 %	8.0 %	25.1 %
Venezuela	13.1 %	5.9 %	19.0 %
Mexico	60.0 %	6.5 %	66.5 %
Costa Rica	1.5 %	0.4 %	1.9 %
El Salvador	37.8 %	0.0 %	37.8 %
Guatemala	52.3 %	3.0 %	55.3 %
Honduras	46.7 %	1.8 %	48.5 %
Paraguay	29.6 %	0.6 %	30.2 %
Bolivia	53.1 %	0.7 %	53.8 %
Dominican Rep.	4.6 %	57.0 %	61.6 %
Ecuador	66.3 %	7.5 %	73.8 %
Nicaragua	52.2 %	11.7 %	63.9 %

Notes: Own construction based on Mahoney (2003), Putterman and Weil (2010), Rosenblat (1945), and Engerman (2007). See Appendix A for details.

Table 1: Black and Indians as a Fraction of Total Population, circa 1800

	Dep. Var.: Executive Constraints (XC)				
	In levels			*In differences*	
	OLS *(1)*	*OLS* *(2)*	*GMM* *(3)*	*OLS* *(4)*	*GMM* *(5)*
Blacks & Indians (BI) × *Transport Technology (TT)*	-0.158^{**} *0.070*	-0.120^{***} *0.043*	-0.154^{***} *0.035*	-0.094^{**} *0.038*	-0.093^{***} *0.033*
Blacks & Indians (BI) × *Time trend*		0.034^{*} *0.021*	0.058^{***} *0.014*		
Dep. Var. Lagged		0.74^{***} *0.05*	0.97^{***} *0.10*		-0.02 *0.09*
Observations	221	221	221	221	219
Countries	17	17	17	17	17
R^2	0.23	0.60		0.07	
Sargan p-value			0.73		0.46
AR(2) p-value			0.32		0.27

Notes: GMM refers to the estimator proposed by Arellano and Bond (1991). Time and fixed effects are included in all specifications (the GMM estimator, in columns 3 and 5, removes fixed effects). Robust standard errors (in italics) are clustered at a country level. * means significant at 10%, ** significant at 5%, and *** significant at 1%. $AR(2)$ refers to the test for second-order autocorrelation.

Table 2: Executive Constraints and Transportation Technology, Regression Results.

	Dep. Var.: Executive Constraints (XC)			
	In levels, GMM		*In differences, OLS*	
	Coeff. $BI \times TT$ *(1)*	*p-value clustered se (2)*	*Coeff.* $BI \times TT$ *(4)*	*p-value clustered se (5)*
Baseline	−0.154	0.000	−0.094	0.024
Argentina	−0.161	0.000	−0.101	0.027
Bolivia	−0.152	0.000	−0.089	0.035
Brazil	−0.146	0.000	−0.091	0.037
Chile	−0.156	0.000	−0.096	0.035
Colombia	−0.139	0.000	−0.072	0.029
Costa Rica	−0.162	0.000	−0.096	0.048
Dominican Rep.	−0.159	0.000	−0.100	0.028
Ecuador	−0.169	0.000	−0.110	0.022
Guatemala	−0.175	0.000	−0.109	0.012
Honduras	−0.137	0.000	−0.078	0.035
Mexico	−0.158	0.000	−0.097	0.038
Nicaragua	−0.151	0.000	−0.087	0.046
Peru	−0.145	0.000	−0.095	0.041
Paraguay	−0.153	0.000	−0.095	0.025
El Salvador	−0.155	0.000	−0.094	0.026
Uruguay	−0.152	0.000	−0.107	0.023
Venezuela	−0.156	0.000	−0.088	0.036

Notes: Results from taking the country in the first column out of the sample. GMM refers to the estimator proposed by Arellano and Bond (1991). Time and fixed effects are included in all specifications (the GMM estimator removes fixed effects). The estimation in levels additionally includes the interaction between BI and a time trend and a lag of the dependent variable. *p-value clustered se* is the p-value for the significance test of the interaction between BI and TT based on clustered standard errors at the country level.

Table 3: Executive Constraints and Transportation Technology, Regression Results.

	Dep. Var.: Executive Constraints												
	Dep. Var.: Executive Constraints												
	Initial Constraints (1)	*Wheat-sugar ratio* (2)	*Land Inequality* (3)	*Pop Density 1500* (4)	*Urbanization 1500* (5)	*Settler Mortality* (6)	*State Antiquity 1500-1850* (7)	*Distance to the U.K.* (8)†	*Atlantic Coast* (9)	*Latitude* (10)	*Fertile Soil* (11)	*Size* (12)	*Principal Component* (13)
BI × *TT*	−0.147***	−0.192***	−0.150***	−0.167***	−0.160***	−0.150***	−0.185**	−0.170***	−0.148***	−0.171***	−0.154***	−0.151***	−0.185***
	0.049	*0.043*	*0.037*	*0.036*	*0.050*	*0.042*	*0.076*	*0.049*	*0.035*	*0.050*	*0.047*	*0.038*	*0.052*
BI × *Time trend*	0.058***	0.074***	0.054***	0.063***	0.059***	0.056***	0.079**	0.061***	0.051***	0.058***	0.054***	0.058***	0.072***
	0.020	*0.018*	*0.015*	*0.013*	*0.021*	*0.019*	*0.032*	*0.020*	*0.014*	*0.018*	*0.018*	*0.016*	*0.020*
Control × *TT*	−0.052	−0.087	−0.011	0.007	0.053	−0.013	0.003	0.007	−0.001	−0.143	−0.065	−0.003	0.015
	0.135	*0.076*	*0.017*	*0.012*	*0.316*	*0.037*	*0.004*	*0.017*	*0.036*	*0.159*	*0.141*	*0.006*	*0.011*
Control × *Time trend*	0.002	0.009	0.001	−0.001	−0.001	0.001	0.000	0.000	0.001	0.014	0.006	0.000	−0.002*
	0.010	*0.006*	*0.001*	*0.001*	*0.025*	*0.002*	*0.000*	*0.001*	*0.003*	*0.012*	*0.009*	*0.000*	*0.001*
Dep. Var. Lagged	0.963***	0.907***	0.936***	0.952***	0.961***	0.966***	0.983***	0.951***	0.916***	0.880***	0.905***	0.975***	0.884***
	0.101	*0.098*	*0.096*	*0.109*	*0.101*	*0.125*	*0.120*	*0.172*	*0.083*	*0.124*	*0.092*	*0.107*	*0.110*
Observations	221	221	221	221	221	221	221	219	221	221	221	221	221
Countries	17	17	17	17	17	17	17	17	17	17	17	17	17
Sargan p-value	0.248	0.294	0.337	0.287	0.291	0.348	0.422	0.262	0.325	0.368	0.380	0.271	0.325
AR(2) p-value	0.385	0.324	0.298	0.311	0.319	0.328	0.293	0.918	0.321	0.250	0.286	0.335	0.287

Notes: Regression results using the GMM estimator proposed by Arellano and Bond (1991). †: two lags of the dependent variable are included. The coefficient for the second lag is negative and not significant. When including only one lag the coefficient is slightly larger than 1. For each column the variable *Control* corresponds to the variable defined in the second row of the table. Time effects are included in all specifications (the GMM estimator removes fixed effects). Robust standard errors (in italics) are clustered at a country level. * means significant at 10%, ** significant at 5%, and *** significant at 1%.

Table 4: Executive Constraints and Transportation Technology, Regression Results.

	Dep. Var.: Difference in Executive Constraints												
	Initial Constraints (1)	*Wheat-sugar ratio* (2)	*Land Inequality* (3)	*Pop Density 1500* (4)	*Urbanization 1500* (5)	*Settler Mortality* (6)	*State Antiquity 1500-1850* (7)	*Distance to the U.K.* (8)	*Atlantic Coast* (9)	*Latitude* (10)	*Fertile Soil* (11)	*Size* (12)	*Principal Component* (13)
$BI \times dTT$	-0.092^{**}	-0.132^{**}	-0.094^{**}	-0.115^{***}	-0.102^{**}	-0.087^{**}	-0.144^{**}	-0.100^{**}	-0.095^{**}	-0.134^{**}	-0.102^{**}	-0.093^{**}	-0.146^{**}
	0.044	*0.053*	*0.039*	*0.039*	*0.049*	*0.039*	*0.071*	*0.045*	*0.038*	*0.053*	*0.048*	*0.041*	*0.059*
$Control \times dTT$	-0.013	-0.077	-0.008	0.009	0.066	-0.024	0.005	0.007	-0.006	-0.214^{*}	-0.067	-0.001	0.020^{*}
	0.106	*0.061*	*0.014*	*0.010*	*0.253*	*0.033*	*0.004*	*0.014*	*0.028*	*0.127*	*0.111*	*0.004*	*0.011*
Observations	221	221	221	221	221	221	221	221	221	221	221	221	221
Countries	17	17	17	17	17	17	17	17	17	17	17	17	17
R^2	0.07	0.07	0.07	0.07	0.07	0.07	0.08	0.07	0.07	0.08	0.07	0.07	0.08

Notes: Regression results using the OLS estimator. For each column the variable *Control* corresponds to the variable defined in the second row of the table. dTT is the first difference of TT (BI and $Control$ don't vary over time). Time and fixed effects are included in all specifications. Robust standard errors (in italics) are clustered at a country level. * means significant at 10%, ** significant at 5%, and *** significant at 1%.

Table 5: Executive Constraints and Transportation Technology, Regression Results.

	Dep. Var.: Executive Constraints (XC)			
	BI: only indians		*TT: Isserlis Index*	
	level GMM (1)	*diff. OLS (2)*	*level GMM (3)*	*diff. OLS (4)*
BI × TT	-0.128^{**}	-0.092^{*}	-0.100^{*}	-0.087^{*}
	0.064	*0.052*	*0.057*	*0.050*
BI × Time trend	0.051^{**}		0.040^{**}	
	0.024		*0.020*	
Dep. Var. Lagged	0.972^{***}		0.959^{***}	
	0.096		*0.094*	
Observations	221	221	221	221
Countries	17	17	17	17
R^2		0.07		0.07
Sargan p-value	0.55		0.66	
AR(2) p-value	1.00		1.04	

Notes: GMM refers to the estimator proposed by Arellano and Bond (1991). Time and fixed effects are included in all specifications (the GMM estimator, in columns 1 and 3, removes fixed effects). Robust standard errors (in italics) are clustered at a country level. * means significant at 10%, ** significant at 5%, and *** significant at 1%.

Table 6: Executive Constraints and Transportation Technology, Regression Results.