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The long trace of inequality: evidence from Cundinamarca, Colombia

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December 22, 2010

Abstract

This paper uses historic data from Cundinamarca, Colombia to empirically assess the impact of land inequality persistence, inherited from the colonial rule, on economic development in the long run. Based on the Engerman & Sokoloff hypothesis and the use of GIS, I use plausible exogenous variation in land endowments to design an instrumental variable strategy. In contrast to recent studies, I find that more unequal municipalities in the XIX and XX century are associated with better growth, human capital and public goods provision measures today. Political economy channels instead of agricultural productivity gains can explain these results. In municipalities where land was historically more concentrated, powerful landowners were more successful in solving their collective action problem of accessing political power to influence the allocation economic resources in their interests.

Key words: Land inequality, growth, public goods, political economy.

JEL codes: O13, D31, N36

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** I am very grateful to Guillermo Perry and Pablo Querubín for their extraordinary help and access to valuable information. I thank comments and help from Thomas Hutchenson, Ana María Ibañez, María del Pilar López, James Robinson, Juan Fernando Vargas and seminar participants at Econ Estudio. Finally, I would also like to thank Gobernación de Cundinamarca for their assistance. All errors are mine. Contact: ju-galan@uniandes.edu.co.

In the past decade, the new growth literature has sought to better understand the historical origins of long-term economic development among New World economies. During the last five centuries, countries in the Americas have experienced a divergence in development paths, what some academics refer to as a "reversal of fortune". Colonies that were relatively rich at the beginning of the XVI century, namely Latin American and Caribbean countries, are now relatively poor compared to their northern counterparts. The seminal work by Engerman & Sokoloff (2000, 1997) argued that factor endowments in labor and land at the time of colonization may explain differences in the initial type of institutions set up by Europeans, human capital accumulation and public goods provision among former colonies.

Some colonies, such as those established in Latin America, enjoyed climate and soil conditions that were well suited for growing large scale crops and extracting rich mineral resources - that were highly valued on world markets - with the help of cheap indigenous or slave labor. In contrast, small, family-sized farms were the rule in the colonies of North America, where climatic conditions favored a regime of mixed farming centered on crops that exhibited limited economies of scale in production and used few slaves (Engerman & Sokoloff, 2000, 1997). E&S suggest societies in the Americas that began with more extreme inequality or heterogeneity in the population were more likely to develop institutional structures –which persisted over time - that greatly advantaged members of elite classes by providing them with more political influence and access to economic opportunities.

Empirical work by Acemoglu, Johnson & Robinson (2005, 2002, 2001) and La Porta, Lopez-de-Silanes, Shleifer & Vishny (1998, 1997) provided the first evidence of the impact of the colonial rule on the domestic institutions that persisted after independence. Colonies where Europeans established institutions that respected property rights to support private investment exhibit better institutional quality measures and levels of economic development today than colonies where Europeans set up rent-seeking or extractive institutions. Recent empirical studies also suggest within country presence of institutional persistence in Colombia (Duque, 2008; García, 2005) as well as in other neighboring countries such as Peru, Bolivia (Dell, 2008) and Puerto Rico (Bobonis & Morrow, 2010).

Similarly, E&S document how the elite in Latin America opposed mass investment in human capital and other public goods services, trailing behind North America in establishing universal free schooling and raising literacy. Many Latin American country studies – particularly in Colombia - have recorded a long history of underinvestment in these areas (Ramírez & Salazar, 2007). Also, Galor, Moav & Vollrath (2008) provided evidence on how elites could delay the emergence of human capital institutions by blocking educational reforms through the "State capture" phenomenon and Glaeser, La Porta, Lopez-de-Sinales & Shleifer (2004) recently underlined that European colonizers might have brought with them to the Americas not only their institutions but also their human capital.

Whilst the literature acknowledges the importance of institutions and human capital for the development process, and because institutions happen in history, so history matters, much less empirical exercises have been done in trying to understand the role of historic inequality persistence in shaping long-run growth as suggested by the E&S hypothesis, possibly as a consequence of lacking reliable data and endogenity problems when assessing this link. This mechanism, through which the extent of inequality affects the way institutions and human capital accumulation evolve, may not only help to explain the long-term persistence of differences in inequality among countries in the Americas, but it may also play a role in accounting for the divergence in the long-run growth paths over the last two centuries.

There is some evidence of this but it has also been challenged. The initial cross-section work by Alessina & Rodrik (1994), Persson & Tabellini (1994) and Perroti (1996) found a statistically significant negative relationship between inequality and economic growth through worse institutional quality and lower human capital accumulation, arguing that causation runs from inequality to growth because the poorer majority of the population constantly votes for redistributive policies, taxing investment and growth-enhancing activities in order to redistribute income[1]. Other possible explanations point to the presence of imperfect capital markets, where the poor cannot access educational services (Galor & Zeira, 1993) or the scarce social mobility in certain societies due to the marriage-matching problem, where differences in wealth distribution accentuate over time (Fernandez, Guner, & Knowles, 2005; Fernandez, & Rogerson, 2001).

[1] Earlier theoretical work by Lewis (1954) and Kaldor (1961) actually considered economic inequality favorable for growth because it concentrated wealth in those who could save and invest. Kuznets (1966) later formulated his well-known inverted U curve hypothesis linking inequality to income at different stages of the development process.

While the above studies try to overcome endogeneity issues by using instrumental variables, serious doubts remain over the validity of such instruments - lagged inequality, fertility rates, etc. - for they might be causally linked to unobserved characteristics that also help to explain institutional or educational measures. These doubts were reinforced by recent papers that exploit panel data from a large sample of countries to question these results. Deninger & Squire (1998), first, and then Forbes (2000) and Barro (2000), found that inequality could have either statistically significant negative or positive impacts on development. Banerjee & Duflo (2003) justify these findings by arguing that inequality has a non-linear relationship, in any direction, with changes in growth measures. However, a common limitation on the discussed papers is the time-span for most of them: it is too short for evaluating long-term effects.

On the other hand, Bruhn & Gallego (2008) and Easterly (2005) empirically examined the E&S hypotheses. They used a measure of factor endowments for each country as an instrumental variable for predicting colonial inequality in the Americas. They found that even after controlling for other related innate sources of growth such as geography or cultural characteristics, inequality has notably restricted long-run growth in the Americas. Recent within country cases in the US (Galor et al 2008), Brazil (Summerhill, 2010) and Colombia (Acemoglu, Bautista, Querubín & Robison, 2007) have also dealt with mixed evidence. In particular, Acemoglu et al (2007) provide very useful first hand evidence of Cundinamarca, Colombia, finding positive impacts of economic inequality on human capital accumulation and urbanization. Nevertheless, the mentioned studies only establish correlations, unable to find indication of causal relations.

In summary, while the state of knowledge is mixed, the general consensus in the literature - in accordance with the E&S story - regards inequality as being detrimental for long-run growth. Most studies present cross-country estimates but few focus on country level cases and even less on long-run evidence. This paper broadens the existing literature by examining an instance of the E&S hypothesis in the case of Cundinamarca, Colombia to empirically assess the impact of land inequality persistence, inherited from the colonial rule, on economic development in the long-run. My objective is twofold: first, to establish a causal relationship between historic land inequality and economic prosperity, and second, to explore the intermediating mechanisms through which landownership inequality impacts current development outcomes. To my knowledge, these questions have not been treated in the Colombian economic literature. In many

ways – that will be evident along the paper - Colombia constitutes a unique place for studying these topics.

With the help of Geographic Information Systems (GIS)[2], I use plausible exogenous variation in land endowments to design an instrumental variable strategy that allows establishing causal relationships. The paper also explores agricultural productivity and political economy channels of persistence using unique historic municipality-level data for Cundinamarca, where I look at landowners´ historical influence on the dynamics of regional politics and the allocation of public resources. My findings not only contribute to our knowledge of why inequality across Latin American economies has persisted for centuries, but also to the study of processes of long-run economic growth in Colombia and Latin America. The rest of the paper is organized as follows. Section 2 presents a brief history of Cundinamarca, Section 3 describes the data and summary statistics, Section 4 and 5 examine the empirical strategy and the econometric evidence and Section 6 explores the channels of persistence. Finally, some final concluding remarks are presented.

2. Persistence of landownership inequality in Cundinamarca

When the Nueva Granada was colonized by the Spanish Crown in the early XVI century, it was a mosaic of regions, each one separated by large distances and difficult topography. Colonization centered on the Andean highlands, far from the influence of maritime trade, where cultural differences from the premature mixture of Europeans, native populations and African slaves made the Nueva Granada an ethnic hybrid society quite dissimilar from other Hispanic colonies. During the colonial rule, the Nueva Granada was a relatively poor economy; other colonies in the Americas enjoyed far better competitive advantages in the extraction of rich minerals (Peru or Bolivia) or exports of agricultural products (ej: sugar in Brazil, leather in Argentina) highly valued in the world markets. These facts fostered the fragmentation of local markets and delayed the insertion of the country into the world economy until the late XIX century (Bushnell, 2002; Safford & Palacios, 2002).

[2] In the simplest terms, GIS is the merging of cartography, statistical analysis, and database technology for analyzing all forms of geographically referenced information. GIS uses spatio-temporal location as the key index variable for editing data (hydrology, topography, geology, etc) and creating digital maps.

In the province of Santa Fé – the political capital of the Nueva Granada and what today is Cundinamarca - the majority of the population was scattered in the rural areas. Daily economic activity was based on agriculture because there were no significant mineral extraction businesses in the region[3]. In the cold high-land areas, the most important crops were potato, wheat, barley and corn; livestock grazed in the hills and valleys. At lower elevations, in template land areas, farmers grew, besides food for local consumption, sugar cane, tobacco, anise and cotton. An alternative to agriculture was cloth manufacturing, but it did not have a substantial market. While the region possessed many fertile lands and produced a wide variety of products, agricultural markets were highly segmented since the proximity to different climatic zones allowed for a large range of crops being produced in different small areas (Colmenares, 1987).

Landownership was far from being homogenous. In the first areas of colonization, near Santa Fé, large properties that emerged as a result of colonization policies coexisted with small family-sized farms. Specifically, the Spanish established the *encomiendas* system, a sort of civil contract which required the natives to sell their labor force to the Crown. It was a grant of limited sovereignty by the Crown to the *encomendero* allowing him to tax the natives but imposing on him the obligation to evangelize them; the natives were not party to the deal. By 1560, when indigenous land in the province of Santa Fé had decreased to less than 5% of the territory they previously had, almost half of the available land, including the best plains, had been appropriated by colonizers. *Encomiendas* were established in many of today´s municipalities in Cundinamarca, notably in Guatavita, Ubate and Ubaque (McFarlane, 1997; McGreevy, 1975).

Meanwhile, the formation of *haciendas* was very advanced by the late XVI century, when a decrease of the native population and the expansion of *encomiendas* titles by the Spanish Crown diminished the value of existing *encomiendas* and encouraged elites to accumulate extensive land properties. Land titles were negotiated in large units – of about 10 square kilometers – which favored the emergence of large private properties. The other half of the land was distributed during the XVII under a reduced average negotiation unit, which allowed the emergence of small to medium sized farmers known as *estancieros* or *labradores*. As the native population decreased and with a weak definition of property rights, white and *mestizo* peasants invaded lands that the Crown

[3] In other parts of the Nueva Granada, such as the Caribbean or Pacific coast regions, and much alike in other colonies in Latin America, Spanish activities were directed at exploiting rich mineral resources such as gold or silver.

had reserved for indigenous communities under the *resguardos*: more communal land was sold, some to small farmers and other to local large landowners (McFarlane, 1997).

The power of large landowners was cemented in the allocation of forced native labor, which provided them with permanent as well as temporary labor supply. This power did not diminish when forced native labor was abolished in 1720, since much of the traditional customs persisted as well as the landowner's control over local labor supply (Tovar, 1994). Also, with very few exceptions, the *hacienda* influenced the political power (Ocampo, 1997, 1984). In the XVIII century, landownership concentration not only persisted but deepened. Large agricultural enterprises - integrated by numerous *haciendas* - became more common, basically because continental Spaniards that established in the province of Santa Fé bought land titles from ancient families or the Church. In 1777, a colonial official emphasized how there were "two kinds of people: one that possesses his own land and belongs to the gentleman´s class and one that is poor and lives in the lands of the first […] suffering a servitude worse than that of slaves" (McFarlane, 1997, p.101).

Despite landownership concentration, agriculture was severely underdeveloped in the province of Santa Fé. Rich landowners had no incentives to farm in high quality arable land but to use it for livestock grazing. The agricultural frontier and technology did not change much during the colonial rule. Even Crown officials blamed the land structure for the abysmal agricultural productivity. In 1776, the Viceroy of the Nueva Granada, Guirior, warned of "the grave damage that emerges from the fact that some, by reason of old concessions or other titles, consider themselves owners of vast territories that do not exploit […] and do not allow others to do it" (Posada & Ibañez, 2002, p. 144). As a comparison, the province of Guarentá – nowadays Santander and Norte de Santander – had worse terrains but presented much better productivity measures (Kalmanovitz, 2010, 2006). However, the backwardness of agriculture cannot be exclusively attributed to the landownership structure. The rich landowners´ preference to raise livestock was a rational answer to market conditions, where the majority of food was supplied by small peasants, and also reflected the difficulties to control a landless labor force.

In the aftermath of Independence, the country was devastated. Transport infrastructure and communications were still primitive, prices were unpredictable, capital and credit were scarce

and labor force was difficult to obtain. The continuing civil wars during the XIX century added another risk: political violence often involved the breakdown of trade and the destruction of properties. Nevertheless – unlike other regions in Colombia – this did not destroy the *haciendas* regime in Cundinamarca. Driven by the first coffee and quinoa export boom, the XIX century witnessed the second big expansion of the agricultural frontier. New wealthy elites - most of them with political connections in the newly-born Republic - strived to establish secure private property rights over large vacant lands and convert farmers in dependent workers (Safford & Palacios, 2002).

In Cundinamarca, many new land titles were forged based on old titles and *haciendas* - inherited from the colonial rule – continued to expand during the XIX and XX century, frequently with speculative purposes instead of agricultural activities. The possession of vacant land was not a burden as land taxes were low and taxation did not encourage landowners to sell their properties or even exploit them. Land investment constituted a refuge against inflation as well as collateral for obtaining loans to finance other businesses. In 1882, an investigative commission appointed by Congress stated that "landownership is generally acquired on a large scale by the rich through the dispossession of poor settlers […] around a speculative trade that has for its only purpose the purchase of immense terrains to exclude farmers or reduce them to a servant status", (LeGrand, 1986, p. 92)

Subsequent constitutional amendments in 1874 and 1882 had little impact on landownership distribution because the central government in Bogotá lacked effective control over municipal disputes. The illicit conversion of communal land into private property benefited large landowners at the expense of settlers due to imperfect property rights and a weakly institutionalized environment; many had to arrange leasing or sharecropping contracts. It was not until 1926 that the central government specified the legal requirements to distinguish between vacant lands and private property. Ten years later, in 1936, as agrarian conflicts between small peasants and landowners surged, President López Pumajero enacted the first, and until today, most ambitious agrarian reform in the country, seeking to design secure property rights for settlers and regulate farmers leasing contracts and labor conditions. However, the reform was aimed at regulating land markets, not distributing wealth among the population, so landownership concentration changed little over the first half of the XX century.

3. Data and summary statistics

To assess the impact of landownership inequality on today´s economic prosperity, this study uses historic and present information for 100 municipalities in the department of Cundinamarca, Colombia for different periods between the 1880´s and 2000´s. There is a difference of more than 120 years between the two extreme dates, a period long enough to evaluate very long-term effects. Since there are currently 116 municipalities in the department, but a few were established after 1890, only municipalities which had already been founded at the end of the XIX century are considered. Information from the XIX century and beyond at such a disaggregated level is rather rare, therefore parts of the dataset was constructed from primary sources at the historical archives of the Biblioteca Luis Ángel Arango from the Banco de la República and the Biblioteca Nacional de Colombia.

I use land gini coefficients calculated form micro data records of the *Catastros de Cundinamarca* between 1879 and 1890, kindly provided by Acemoglu et al (2007). The cadastral data reports the landowners´ names, number, extension and value of farms in each municipality, for properties valued over $25 pesos at the time. Moreover, I use primary sources from the Governor´s office to construct historic measures of economic development outcomes. These reports include municipality-level information on the state of education and transport infrastructure in Cundinamarca for different moments in the XIX and XX century. Also, for political data – used in the last Section of the paper - I rely on information that I collected from primary sources such as the *Anales del Congreso* and *Gaceta de Cundinamarca* in the XIX and XX century. These official newspapers contain historic information on the names, number, origin and dates of political office appointments at regional and national level. A precise description of how each variable was constructed from the various sources can be found in Annex 1. Provide

On the other hand, a variety of sources is used to assemble information on contemporary economic development outcomes. Human capital and other development measures come from the Colombian 2005 Census and the Departamento Nacional de Planeación (DNP). Land gini coefficients and landownership information – constructed from the micro data cadastral records of the Instituto Geográfico Agustin Codazzi (IGAC) - were helpfully provided by Ibañez &

Múñoz (2009)[4]. Also, per capita expenditure and poverty indexes come from Fernández, Hernández, Ibáñez & Jaramillo (2009). Geographical and agricultural information come from the Gobernación de Cundinamarca and the IGAC. A full explanation of how the different variables were constructed can be found at the Annex 1. Even given the high uncertainty and many methodological problems involved in using information from many different sources, this data is valuable to test the E&S story in Cundinamarca.

Table 1: Summary statistics

Variable	Obs	Mean	S.D	Min	Max
Land gini 1879-1890	100	0,65	0,10	0,35	0,85
Land gini 2000-2005	100	0,71	0,09	0,50	0,88
Contemporary outcomes (in 2005):					
Expenditure per capita (in logs)	100	12,42	0,19	12,09	13,00
Poverty (%)	100	0,44	0,07	0,24	0,60
Illiteracy (%)	100	0,11	0,06	0,03	0,30
Secondary school enrollment (%)	100	0,64	0,15	0,34	1,38
Electricity coverage (%)	100	0,90	0,07	0,53	0,98
Density of road networks (km/km²)	100	0,19	0,14	0,03	0,58
Agricultural productivity (ton/hec) (in logs)	100	2,05	0,92	0,02	5,24
Agricultural HHI (%)	100	0,48	0,27	0,10	0,99
Geographic characteristics:					
Extensive-moderate farming suitability ratio (in logs)	100	0,03	0,27	-0,57	0,67
Altitude (mts above sea level)	100	1.796	795	180	2.980
Distance to Bogotá (km)	100	87,4	42,3	1,0	212,0
Annual average rainfall (mm)	100	1.331	616	82	3.620
Forest land (%)	100	0,41	0,20	0,00	0,84
Foundation date	100	1.675	120	1.536	1.886
Area (km²)	100	188	176	41	1.197
Population	100	21.183	44.731	1.947	402.007

Sources: Acemoglu et al (2007), DNP, Gobernación de Cundinamarca, Ibañez & Muñoz (2009), IGAC, author´s estimates.

Table 1 reports the summary statistics. A first thing to notice is that Cundinamarca has a historically-rooted landownership concentration. Inequality likely reflects cross-sectional

[4] I thank both Acemoglu et al (2007) and Ibañez & Muñoz (2009) for giving me access to their cadastral data.

differences that have been present for some time since it is very path dependant; average land gini 1879-1890 was 0.65, but land gini 2000-2005 was even higher, 0.71. During the past century, the land gini concentrated even more but the standard deviation varied remarkably little, suggesting a considerable variation across landownership (around 0.1).

Overall, these values are relatively large when compared, for example, with the United States, whose average land gini in 1880 was 0.47 and in 1990 was 0.53 (Galor et al, 2008). Nonetheless, they are notably inferior with respect to other regions of Colombia – especially the ones in the Caribbean coast - whose average land gini 2000-2005 was 0.87 (Ibañez & Mejía, 2010). Cundinamarca was neither the most nor the least unequal of places, an important fact to keep in mind when interpreting the findings of this paper. Evidence on the persistence of land inequality is somehow similar to other findings in the literature (Easterly, 2005; Lindert & Williamson, 2001; Lindert, 2000). Still, one has to keep in mind that the land gini coefficient only takes into account inequality within landowners and not across the whole population. This is not a negligible fact; if, for example, there were only two landowners in a municipality with identical land properties, the land gini would show a highly equal distribution of wealth between landowners even though landownership was indeed very uneven across the population.

Table 2: Correlations matrix

Variable	Land gini 1879-1890	Land gini 2000-2005
Land gini 2000-2005	0,41	
Expenditure per capita (in logs)	0,54	0,49
Poverty (%)	-0,55	-0,47
Illiteracy (%)	-0,41	-0,52
Secondary school enrollment (%)	0,47	0,36
Electricity coverage (%)	0,48	0,29
Density of road networks (km/km²)	0.46	0.39

Sources: Acemoglu et al (2007), DNP, Gobernación de Cundinamarca, Ibañez & Muñoz (2009), author´s estimates.

Although my sample size is not ideally large, municipalities in Cundinamarca are quite different from one another. Geographic and development characteristics in Table 1.A vary widely. For example, average altitude is 1796 mts above sea level, but the standard deviation is 795 mts.

Since temperature is highly correlated with altitude in Colombia, one can find municipalities as dissimilar as the cases of Pasca and Tausa. The first is located at 180 mts above sea level with an annual average temperature of 27°C while the second is situated at 2931 mts with an annual average temperature of 12°C. As another example, one can find very rich and very poor municipalities, even when compared to national standards. Chía has a 2005 poverty index of 23.6% while Yacopí has one close to 60%, well above the average Colombian municipality of 44%. This allows me to have some variance in data, relevant when adjusting the E&S hypotheses to Cundinamarca.

Likewise, because I use information only from Cundinamarca, I am able to implicitly control for other plausible alternatives to the inequality hypothesis mentioned in the literature – harder to account for in cross-country studies - such as cultural or religious features, ethnic fractionalization or legal origin of the colonizer. In 2005, over 96% of the population had a *mestizo* or white origin and were Roman Catholic believers, a homogenous distribution of ethnic diversity across municipalities. Lastly, in Table 2, the land gini 1879-1890 and 2000-2005 are positively correlated with most development outcomes in 2005, a surprising first feature.

4. The empirical strategy

I now examine the impact of historical land inequality on long-run development exploiting the cross-sectional variation within the municipalities in Cundinamarca. In a first suggestive step, one could estimate ordinary least squares (OLS) regressions of the following form:

$$Y_i = \beta_0 + \beta_1 G_i + \beta' X_i + \mu_i \qquad [1]$$

where Y_i is a recent development outcome in municipality i, G_i the historic or contemporary land gini, X_i a set of exogenous characteristics and μ_i an error term, that is assumed to be independent and normally distributed N~(0,1). However, although the land gini 1879-1890 has a difference of more than one century with today´s development, endogeneity is still a serious concern. The historic land gini may be correlated with time invariant omitted variables in the error term that also influence current economic results. For instance, land concentration in municipalities could have been influenced by soil quality, property rights and rule of law or other

wealth measures as suggested by the Colombian historiography in Section 2. In addition, land inequality is highly persistent over time; contemporary land gini varies very little with respect to historic land gini (as shown in Section 3). The causality could be the reverse, maybe historically wealthy municipalities could have afforded redistribution. In addition, historical information may suffer from measurement error.

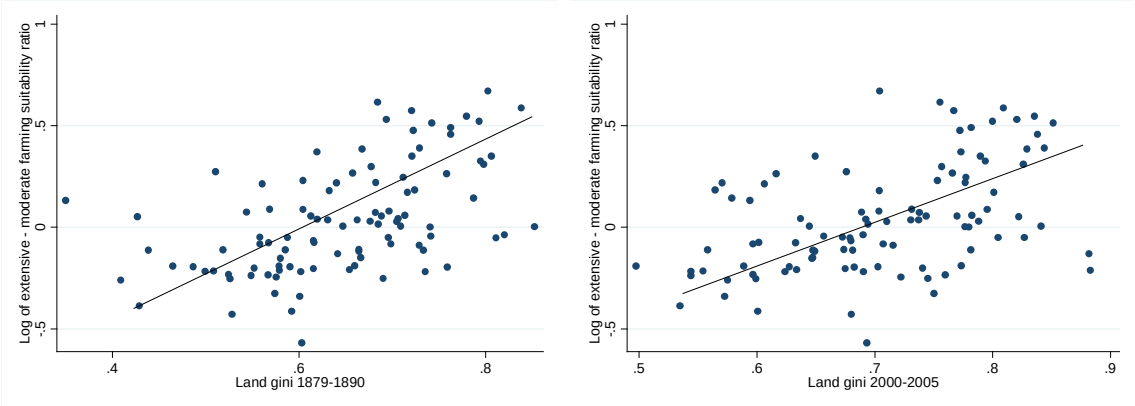
Estimating OLS regressions would certainly bias the coefficients since $E(G_i, \mu_i) \neq 0$. Measurement error would most likely bias the results downward; however, given the other sources of endogeneity, there is no theoretical reason to believe the bias should go either downward or upward. One way to address this problem is to design an instrumental variable strategy. A valid instrument should be relevant such as to predict land inequality $E(I_i, G_i) \neq 0$, but also exogenous $E(I_i, \mu_i) = 0$. In other words, the basic assumption is that the instrument must be orthogonal to any dependent variable $I_i \perp Y_i$. E&S argued factor endowments were a central determinant of inequality at the time of colonization, and inequality in turn was a determinant of less democratic institutions, low human capital investment, and long-run underdevelopment. This suggests a natural instrument for the land gini coefficient that can be used to assess the causal land inequality and development relationship: the exogenous land suitability for extensive farming versus moderate farming.

I use Geographic Information Systems (GIS) from the Gobernación de Cundinamarca to classify land types produced by IGAC (2000) from 1:1.000.000 IDEAM satellite image maps and compute for each municipality the percentage of land suitable for extensive and moderate farming. The evaluation is based on the combined effects of climate and unchangeable soil and geoforms characteristics – which are very persistent over long periods - such as soil use limitations, production capacity, soil risk deterioration and management requirements. Then, I construct the instrument as shown in [2] in order to adapt the E&S hypothesis to Cundinamarca: the log of the extensive –moderate farming ratio in municipality i. A complete description of how I constructed this variable can be found in Annex 1. With this instrument, one can address one important piece of evidence that has been under-emphasized in this debate.

$$I_i = log\left(\frac{1 + \%\, extensive \;\; farming \;\; land_i}{1 + \%\, moderate \;\; farming \;\; land_i}\right) \qquad [2]$$

A few things should be noted about this variable. First, the variable captures the percentage of land in a municipality that is suitable for either forms of farming but not the past or actual specific uses of land, as this would be endogenous. Furthermore, given that soil and geographical characteristics do not vary much over time, this variable should help to predict historic as well as contemporary landownership inequality. A first look at the data suggests that the log ratio of land suitable for extensive farming to that for moderate farming has considerable predictive power over historic and current land inequality (Figure 1). A higher value of this ratio is associated with higher land gini. Correlation between the instrument and land gini 1879-1890 is 0.54 and slightly weakens when compared with land gini 2000-2005 to 0.48, both significant at 1% confidence level.

Figure 1: Agricultural endowments and land inequality



Source: Catastros and Gobernación de Cundinamarca, Ibañez & Mejía (2010), author´s estimates.

These preliminary results suggest that, as explained in Section 2, and emphasized by E&S, landownership concentrated more in municipalities that were relatively more endowed with extensive farming land that may have exhibited economies of scale in agricultural production. This vision concurs with the Colombian historiography (Bushnell, 2002; Safford, 2002; Deas, 1993) for crops such as coffee or quinoa – known for their large *haciendas* in Cundinamarca at the end of the XIX century - and with similar cross-country or country studies (Easterly, 2005; Galor, 2005) that use similar instruments. With this in mind, I use a two-step least squares estimation of equation [3] and reduced form equation [4].

$$G_i = \alpha_0 + \alpha_1 I_i + \alpha' X_i + \varepsilon_i \qquad [3]$$

$$Y_i = \beta_0 + \beta_1 \hat{G}_i + \beta' X_i + \mu_i \qquad [4]$$

In the first step, G_i is the historic or contemporary land gini in municipality i, I_i is the log of the extensive – moderate farming suitability ratio, X_i a set of exogenous characteristics and ε_i an error term that is assumed to be independent and normally distributed N~(0,1). In the second step, Y_i is a recent development outcome in municipality i, $\hat{G}_i$ the predicted value of the historic or contemporary land gini from the first step, X_i a set of exogenous characteristics and μ_i an error term, that is also assumed to be independent and normally distributed N~(0,1). The E&S hypothesis has predictions for some of the intermediating mechanisms that promote development, so while using measures of long-run performance, I will also evaluate measures of human capital accumulation and supply of public goods.

5. Econometric evidence

5.1 OLS results

Table 3 presents the first results. I run OLS regressions using different exogenous municipality characteristics as additional controls (altitude above sea level, distance to Bogotá, average annual rainfall, foundation date, municipality area, etc). The results offer strong support for a long run land inequality effect on contemporary development outcomes. In columns (1) and (2), one can notice that on average a one point raise of the land inequality 1879-1890 lowers poverty by 20 percentage points whereas the expenditure per capita coefficient is 0.49, both measures being proxies for cumulative economic growth. The coefficients are significant at 1% confidence level and the R^2 are close to 60%, suggesting that municipalities with an initial high inequality level exhibit better economic performances today.

Also, columns (3) and (4) show that, in the long run, land inequality positively impacts human capital accumulation – which the literature recognizes as a channel of persistence – as it lowers the illiteracy rate by 9 percentage points and increases secondary school enrollment by 54 percentage points. Nevertheless, while the effect on illiteracy is negative, it is not statistically significant, probably due to low variance in the data. On the contrary, the effect on secondary school enrollment is significant at 1% and it´s magnitude considerable. Finally, I evaluate the

impact of historic land inequality on other important public goods. Columns (5) and (6) provide evidence that historic land inequality also affects current supply of public goods. A one point increase in the land gini 1879-1890 increases the density of road networks by 46 percentage points and the coverage electricity services by 21 percentage points, both coefficients significant at a 1% confidence level. Inequality not only affects economic growth directly but also the channels that promote it.

Table 3: OLS regressions

Dependent variable in 2005	Growth		Human Capital		Public Goods	
	Expenditure per capita (in logs)	Poverty	Illiteracy	Secondary school enrollment	Electricity coverage	Density of road networks
	(1)	(2)	(3)	(4)	(5)	(6)
Land gini 1879-1890	0.487**	-0.204**	-0.0888	0.537**	0.209**	0.463**
	[0.135]	[0.0519]	[0.0535]	[0.137]	[0.0506]	[0.171]
Constant	12.30**	0.524**	0.110	0.589**	0.793**	0.0763
	[0.220]	[0.0760]	[0.0840]	[0.201]	[0.0943]	[0.258]
Observations	100	100	100	100	100	100
Adjusted R^2	0.566	0.597	0.526	0.320	0.608	0.131

Note: All regressions include the following controls: altitude, distance to Bogotá, average annual rainfall, foundation date, area and population. Robust standard errors in brackets. ** denotes significance at 1%, * denotes significance at 5% and + denotes significance at 10%.

These first results are somehow counterintuitive when compared to the E&S hypothesis, a surprising feature since historic high economic inequality has often been regarded as being at the root of Latin America´s poor long-run performance. Even more shocking, they radically differ from within country results in Galor et al (2008), who found a statistically negative significant relationship between land inequality and the emergence of human capital institutions for US counties in the XIX and early XX century. They are, however, very similar to the ones found by Acemoglu et al (2007), in the sense that historically more land concentrated municipalities in Cundinamarca seem to have better economic performances today. Nonetheless, if historic inequality was also correlated with historic high wealth, maybe all we are seeing is both patterns self replicating with no necessary causation either way.

5.2 IV results

Table 4 presents the first stage regressions using the instrument exposed in equation [2] Section 4. In column (1), the baseline first stage regression shows a highly significant relationship between the extensive-moderate farming endowment ratio and land inequality in 1879-1890. The extensive-moderate farming endowment ratio is 0.17, highly significant at 1% and with an R^2 of 36%. Similar results, which are not shown for simplicity, were obtained when running the same regression using the land gini 2000-2005. However, the magnitude of the coefficient slightly declines, something that coincides with the preliminary evidence exposed in Figure 1, Section 4. Arguably, the intuition behind this is that historic land concentration depended more heavily on agricultural endowments than contemporary land inequality.

Table 4: IV first stage regressions

Dependent variable: Land gini 1879-1890	(1)	(2)
Instrument	0.169**	0.134**
	[0.0360]	[0.0348]
% of forest land		-0.121*
		[0.0491]
Agricultural HHI		-0.0618+
		[0.0339]
Agricultural productivity (in logs)		0.0121
		[0.00973]
Constant	0.782**	0.778**
	[0.146]	[0.131]
Observations	100	100
F statistic	22.42	18.19
Adjusted R^2	0.362	0.439
Weak identification test (Kleibergen-Paap Wald F statistic)	21.97	15.04

Note: All regressions include the following controls: altitude, distance to Bogotá, average annual rainfall, foundation date, area and population. Robust standard errors in brackets. ** denotes significance at 1%, * denotes significance at 5% and + denotes significance at 10%.

In column (2), these results remain fairly the same when additional controls such as the percentage of forest land, agricultural HHI index and agricultural productivity –which will be

explained later- are included. The Kleibergen-Paap F statistics for the first stage regressions - the Cragg-Donald F statistic version after correction for heteroscedasticity - are well above the critical values identified by Stock & Yogo (2002) as indicating a problem with weak instruments[5]. They are also above the earlier rule of thumb suggested by Staiger & Stock (1997): that the F-statistic in the first stage regression exceeds 10. The first part of the E&S hypothesis seems to be satisfied in Cundinamarca. More than five centuries after the European colonization process began, initial factor endowments are a central determinant of the historic and contemporary land gini.

Table 5: IV second stage regressions

	Growth		Human Capital		Public Goods	
Dependent variable in 2005	Expenditure per capita (in logs)	Poverty	Illiteracy	Secondary school enrollment	Electricity coverage	Density of road networks
	(1)	(2)	(3)	(4)	(5)	(6)
Land gini 1879-1890	1.845**	-0.667**	-0.266*	1.175**	0.233*	0.665*
	[0.463]	[0.167]	[0.109]	[0.394]	[0.0963]	[0.337]
Constant	11.18**	0.906**	0.256*	0.0635	0.773**	-0.0688
	[0.445]	[0.154]	[0.117]	[0.376]	[0.111]	[0.357]
Observations	100	100	100	100	100	100
Haussman test	0,000	0,000	0,001	0,024	0,043	0,031
Adjusted R^2	0.189	0.305	0.486	0.222	0.635	0.165

Note: All regressions include the following controls: altitude, distance to Bogotá, average annual rainfall, foundation date, area and population. Robust standard errors in brackets. ** denotes significance at 1%, * denotes significance at 5% and + denotes significance at 10%.

After analyzing the relevance of my instrument, I turn to estimate the second stage regressions as specified in equation [4]. If the link is causal from land inequality to development, it provides further evidence that there is a long-run association between growth and inequality, but in a direction that contradicts most of the recent literature. From Table 5, one can see that the historic land gini predicts better growth measures, human capital accumulation and public goods provision. The magnitude of the relationships is notably higher in instrumental variables than in

[5] The Stock & Yogo critical value is determined by the IV estimator, the number of instruments, the number of included endogenous regressors, and how much relative bias the researcher will tolerate. In this case, the Stock & Yogo weak identification critical values for one endogenous regressor at a 10% maximal IV size bias is 16.38 and for 15% maximal IV size bias is 8.96. These critical values are for Cragg-Donald F statistic and i.i.d. errors.

OLS, suggesting that the causal effect of land inequality on development is actually underestimated by the OLS relationship. Also, the significance when using instrumental variables improves or remains the same when compared to OLS, another argument in favor of the instrument´s relevance.

Furthermore, I perform a Haussman specification test to see whether there is a statistically significant difference between OLS and IV coefficients. This should give a suggestive idea on the exogeneity of my instrument; if the null hypothesis is rejected, the test would indicate the use of instrumental variables in favor of OLS. For columns (1)-(6) reported in Table 5, I find that all coefficients differ at 5% and 1% confidence levels, supporting the use of instrumental variables. Even so, one should look at these inferences with caution as the sample size is relatively small. Besides, there are many potential issues about omitted variables and the exclusion restriction on the extensive-moderate farming endowment in the second stage regression, to which the paper will turn next.

5.3 Robustness checks

There are some plausible competing alternatives, not necessarily exclusive, to historical land inequality that my instrumental variable is capturing. For example, municipalities with a larger extensive-moderate farming ratio endowment may have better historical agricultural productivity, since they may have developed scale economies in production. Or, they may have developed a more concentrated crop structure (ej: large coffee *haciendas*) that reflects historically accumulated richness derived from these activities. Thus, I may not be evaluating the effect of historical or contemporary land inequality but that of agricultural productivity or crop concentration. Also, given how I constructed my instrumental variable, the land gini may simply be proxying the effect of having no land suitable for agricultural activities.

A basic IV assumption, with respect to the exclusion restriction, is that my instrument should not have any impact on contemporary development outcomes except through the effects of the historical or contemporary land gini. Hence, I continue to run an IV regression of development outcomes but introducing these characteristics as additional exogenous controls. I construct the agricultural productivity for the period 2000-2005 – measured as agricultural output

(in ton) per hectare cultivated - as the mean of the sum of the weighted average productivities of each crop m for each municipality i in every year t in Cundinamarca. This should correct for any potential temporary covariate or idiosyncratic shocks to agricultural productivity in a specific year o region (ej: *Fenómeno del Niño* or a plague) and capture the structural productivity.

Table 6: Robustness check 1

	Growth		Human Capital		Public Goods	
Dependent variable in 2005	Expenditure per capita (in logs)	Poverty	Illiteracy	Secondary school enrollment	Telephone coverage	Density of road networks
	(1)	(2)	(3)	(4)	(5)	(6)
Land gini 1879-1890	1.884**	-0.627**	-0.267*	1.387*	0.242+	0.675*
	[0.579]	[0.199]	[0.134]	[0.589]	[0.142]	[0.323]
% of forest land	0.0319	0.0195	-0.00368	0.132	0.00763	-0.0986
	[0.129]	[0.0452]	[0.0346]	[0.134]	[0.0439]	[0.116]
Agricultural HHI index	0.0971	-0.0328	-0.0187	0.0492	0.00690	0.0213
	[0.0934]	[0.0324]	[0.0199]	[0.0615]	[0.0174]	[0.0609]
Agricultural productivity (in logs)	-0.0163	0.00166	-0.00221	0.0132	0.00738	0.0274
	[0.0233]	[0.00799]	[0.00708]	[0.0165]	[0.00646]	[0.0211]
Constant	11.16**	0.883**	0.272*	-0.169	0.741**	0.0141
	[0.511]	[0.170]	[0.135]	[0.509]	[0.145]	[0.427]
Observations	100	100	100	100	100	100
Adjusted R^2	0.182	0.369	0.492	0.144	0.639	0.220

Note: All regressions include the following controls: altitude, distance to Bogotá, average annual rainfall, foundation date, area and population. Robust standard errors in brackets. ** denotes significance at 1%, * denotes significance at 5% and + denotes significance at 10%.

I do a similar exercise to construct an agricultural Herfindahl-Hirschman index (HHI) to measure crop concentration. Finally, using Geographic Information Systems (GIS), I am also able to compute the percentage of land suitable for forest and conservation for each municipality, a time invariant characteristic that indirectly measures non-agricultural land. Recall form Table 4 column (2) that the instrument´s first stage regression coefficient slightly decreases but does not loose significance. Surprisingly, only the percentage of forest land is significant at a 5% confidence level, having a negative effect on the historical land gini. This result is intuitive, meaning that municipalities with a large proportion of non-arable land have less unequal landownership distribution. Agricultural productivity and HHI have positive and negative coefficients

respectively, but only the HHI remains significant at a 10% confidence level. These results do not vary when using the land gini 2000-2005.

Table 6 presents the IV second stage regressions with the inclusion of these additional controls. One can see that the coefficients signs remain identical and the magnitudes vary astonishing little. In fact, apart from the secondary school enrollment coefficient in columns (4), all the other land gini 1879-1890 coefficients in the development regressions remain almost the same. The coefficients of the expenditure per capita, poverty, illiteracy, electricity coverage and density of road networks remain at 1.9, -0.62, 0.27, 0.24 and 0.68 respectively, while the secondary school enrollment increases a bit to 1.4. Also, significance remains unchanged in the growth regressions in columns (1)-(2) while it weakly decreases through the human capital and public goods regressions, columns (3)-(6). Still, all coefficients continue to be significant at a 5% confidence level. These results provide further proof on the validity of using of the extensive-moderate farming endowment ratio as an instrument.

Table 7: Robustness check 2

	Growth		Human Capital		Public Goods	
Dependent variable 2005	Expenditure per capita (in logs)	Poverty	Illiteracy	Secondary school enrollment	Telephone coverage	Density of road networks
	(1)	(2)	(3)	(4)	(5)	(6)
Land gini 2000-2005	2.346**	-0.780**	-0.332+	1.722*	0.301	0.594*
	[0.834]	[0.295]	[0.173]	[0.815]	[0.222]	[0.301]
% of forest land	-0.250+	0.113*	0.0362	-0.0706	-0.0286	-0.167*
	[0.128]	[0.0445]	[0.0239]	[0.0963]	[0.0367]	[0.0809]
Agricultural HHI index	0.0705	-0.0240	-0.0149	0.0305	0.00347	0.0188
	[0.0854]	[0.0283]	[0.0180]	[0.0700]	[0.0185]	[0.0616]
Agricultural productivity (in logs)	-0.00987	-0.000465	-0.00312	0.0182	0.00820	0.0347+
	[0.0322]	[0.00939]	[0.00610]	[0.0233]	[0.00788]	[0.0207]
Constant	10.89**	0.971**	0.310+	-0.370	0.706**	-0.0681
	[0.690]	[0.238]	[0.157]	[0.700]	[0.195]	[0.567]
Observations	100	100	100	100	100	100
Adjusted R^2	0.166	0.356	0.548	0,156	0.567	0.124

Note: All regressions include the following controls: altitude, distance to Bogotá, average annual rainfall, foundation date, area and population. Robust standard errors in brackets. ** denotes significance at 1%, * denotes significance at 5% and + denotes significance at 10%.

As an additional robustness check, I run the same regressions in Table 6 using the land gini 2000-2005. Shown in Table 7, the results support empirical evidence suggesting the persistence of land inequality´s effects. Signs and significance remain equal while the magnitudes increase in all regressions (1)-(6). However, a last issue remains unsolved. Controlling for agricultural productivity is not enough if it is correlated with my instrumental variable since the exclusion restriction would be violated. Post estimation bias would be evident and there is no way to know where the upper and lower bond would be. Consequently, a last robustness check is shown in Table 8. I run a regression to test whether my instrument is correlated with contemporary agricultural productivity, something that would bias the coefficients in Tables 5-7. As can be seen, once geographical controls in the baseline regressions are introduced, the extensive-moderate farming suitability ratio has no predictive power over agricultural productivity or HHI. This result is highly robust, since the t-statistics are very small and should be understood as another proof of the exogeneity of my instrument.

Table 8: Robustness check 3

Dependent variable in 2005	Agricultural productivity (in logs) (1)	Agricultural HHI (2)
Instrument	-0.151	0.129
	[0.295]	[0.108]
Constant	3.02**	0.421
	[0.938]	[0.370]
Observations	100	100
Adjusted R^2	0,582	0,246

Note: All regressions include the following controls: altitude, distance to Bogotá, average annual rainfall, foundation date, area, population and % of forest land. Robust standard errors in brackets. ** denotes significance at 1%, * denotes significance at 5% and + denotes significance at 10%.

In summary, Tables 4 through 8 strongly support a valid IV regression design, showing an economically meaningful positive impact of historic and contemporary land inequality on prosperity today. How much is historic land inequality important for long-run development? An increase of one standard deviation in the land gini 1879-1890 is associated with decreases in 14% and 24% in illiteracy rate and poverty and increases of 21% in secondary school enrollment and

35% in density of road networks. These results are of considerable magnitude and highly robust but are not consistent with the cross-country literature (Nunn, 2008; Easterly, 2005; Acemoglu et al., 2001, 2002), or even with country level evidence (Galor et al, 2008), and seem to cast doubt on the E&S hypotheses. Now the question becomes: why would the historic land inequality affect economic prosperity more than 100 years later? I turn to an investigation of channels of persistence.

6. Channels of persistence

6.1 Agricultural productivity

A first, and maybe obvious intermediating mechanism, would be to explore agricultural productivity. E&S do not discuss whether land inequality had any direct impact on productivity in the Americas. A plausible explanation to results found in Section 5, is that more land-concentrated municipalities benefited from scale economies in agriculture. Indeed, technological and structural changes are likely associated with economies from both scale of agricultural production and output composition, so that larger and more diversified farms are increasingly more efficient than small farms (Heshmati & Kumbhakar, 1997; Brewster, 1950). In the long run, more productive, and thus wealthy, municipalities were to able to attract economic resources and invest in public goods, promoting growth and lowering the poverty of their population. An alternative vision could be that richer on average individuals invested in their own human capital.

I run different regressions using equation [1] to see, if in fact, historic or contemporary landownership inequality has any impact on agricultural productivity today. Endogeneity issues are of greater importance here, more so since the instrument used in Section 5 might not be completely valid in this case. Even if the extensive-moderate farming endowment ratio is not correlated with agricultural productivity as shown in Table 8, it might still be correlated with other topographic or soil time invariant unobservable characteristics that also influence contemporary agricultural productivity or output. Consequently, I limit myself to establishing correlations through OLS regressions. Results are reported in Table 9.

Table 9: Agricultural productivity channel

Dependent variable: Agricultural productivity in 2005	(1)	(2)
Land gini 1879-1890	0,392	
	[0.531]	
Land gini 2000-2005		0,224
		[1.921]
Constant	2.368*	2.522*
	[1.035]	[1.169]
Observations	100	100
R^2	0,606	0,607

Note: All regressions include the following controls: altitude, distance to Bogotá, average annual rainfall, foundation date, area, population, agricultural HHI and % of forest land. Robust standard errors in brackets. ** denotes significance at 1%, * denotes significance at 5% and + denotes significance at 10%.

A first thing to notice is that neither the historic nor the contemporary land gini coefficients, in columns (1)-(2), are significant in any of the regressions: the t-statistics are very low. Moreover, the coefficients signs and magnitudes are positive, but not large; 0.36 with land gini 1879-1890 and 0.3 with land gini 2000-2005. Historic and contemporary land inequality seems to have no impact on agricultural productivity in Cundinamarca. While these results may seem counterintuitive at first, they actually concur with developing country cases in India or Ghana - where historically landlord-dominated districts actually fare worse on agricultural productivity than small-holder districts - or even cross-country evidence in the economic literature (Vollrath, 2007; Banerjee & Iyer, 2005; Goldstein & Udry, 2005; Banerjee, Gertler & Ghatak, 2002). More importantly, they coincide with the Colombian historiography presented in Section 2.

6.2 Political economy

Another way to look at this issue is through a political economy perspective. If landownership concentration did not translate into agricultural efficiency gains, then perhaps its relationship with the distribution of political power – which in turn determines the distribution of economic resources – can account for contemporary development outcomes. Indeed, "with very

few exceptions, the *hacienda* was the support of the political power" (p. 258, Jaramillo, 1994). In a society, whichever group has more political power is likely to secure the set of economic institutions that it prefers. The literature commonly distinguishes between two components of power: *de jure* or institutional and *de facto* political power (Acemoglu, Simon & Robinson, 2004). While the first one refers to power that originates from the political institutions, the second depends on the ability of the group in question to solve its collective action problem to ensure that people act together, even when any individual may have an incentive to free ride and on its economic resources.

In the weakly institutionalized setting of Cundinamarca, rich landowners could have accessed political power – either by monopolizing the *de jure* political power or exerting influence in politics by increasing their collective action (*de facto*). Municipalities with more concentration of land, even if not richer on average, could have attracted more public investment from the central government that led to better contemporary outcomes. As historian LeGrand (p.121, 1986) puts it, at the time "the government existed primarily to satisfy the economic and political interests of a relatively small group of powerful families that […] were the only ones provided with political influence", so that political power should have concentrated in the hands of those who were rich. Unlike its neighbors, in Colombia, democracy was the formal way to access political power. As historian Deas (1993) states "this country has been the scene of more elections […] than any other American or European country that would intend to dispute this title". In spite of all the political turmoil from continuing bipartisanship conflicts, there was "a profound respect for the elections, whichever the results […] the political elite had clear conscience of the solemnity they deserved" (Ramírez Bustos, 2002).

Nevertheless, for a long time, the right to vote was restricted to a minority of the population; those who were literate and owned a certain level of assets. Peasants, indigenous populations, women and even merchants were excluded from the political process; universal suffrage for men was not established until 1936 and for women until 1957. When reading the electoral reports from the *Gaceta de Cundinamarca*, it was relatively frequent to see that the number of constituents varied from just 30 to a few hundred – less than 0.5% of the adult male population - for a whole province. To illustrate this point better, take the example of *Olegario Martinez*. Native from the Facatativa province, he was elected to the house representative in 1892

with just 16 out of the 38 votes casted for the whole province. The low number of constituents and the conditions of voting reduced the relative costs of landowners to solve their collective action problem.

To explore this channel, I collect micro data on the first names, last names and origins of political appointments in Cundinamarca during 1876 – 1894 and use an already constructed dataset of local politicians from Acemoglu et al (2007). I classify politicians into three categories: national, regional and municipal politicians depending on whether they were municipal mayors, deputies to Municipal or Departmental Assemblies, governors, or senators and house representatives to Congress. The sample has approximately 127 national, 502 regional and 6,948 municipal political appointments. Some politicians repeated political office appointments or changed from one office to another. For example, *Abraham Aparicio* went from being deputy to the Municipal Assembly of Bogotá in 1888, to deputy of the Departmental Assembly in 1890, to house representative to Congress in 1894.

From the micro data of *Catastros de Cundinamarca*, I am able to match by last and first name how many municipal, regional or national politicians were also landowners. I report these findings in Table 10, where one can see a clear distinction between these three categories. While less than half of the municipal politicians possessed official land tenure - as registered in the *Catastros* - over 73% of the regional or national politicians were landowners. Furthermore, of those regional or national politicians with land properties, around 75% belonged to the higher quintile of the land value distribution, the richest landowners. As supported by Acemoglu et al (2007), landownership and municipal politics presents low correlation. However, this fact considerably changes when compared to regional or national political offices, suggesting that landowners in fact did accessed the *de facto* political power, or at least partially solved the collective action problem of being represented in the political sphere.

Being a municipal politician was very different from a regional or national politician, because the last ones had far more political power and social influence in the society. First, government spending and public investment policies such as the construction of roads, schools and sewage systems, among others, needed the approval of the regional government and were financed with regional or national revenues since investments were relatively high for

municipalities to disburse alone. For example, in 1890, only 15% of the aggregate public education budget in Cundinamarca was financed by the municipalities, the rest was divided between the regional (35%) and the national government (50%). Also, municipal political appointments were designated by the regional government body - the Governor´s office or the Departmental Assembly - and this continued to be true for most of the XX century until the first municipal general elections were held in 1986.

Table 10: % of politicians 1876-1894 with land properties by quintiles

Quintile	1	2	3	4	5	No property
Municipal political office	3,7	8,1	14,1	24,4	49,7	47,0
Regional political office	0,9	4,1	7,5	17,6	69,9	36,5
National political office	0,0	4,3	5,4	16,1	74,2	26,8

Source: Catastros de Cundinamarca, Gaceta de Cundinamarca, author´s estimates.

For these reasons, I look at the relationship of historic land inequality on political representation at regional and national level. This proposed channel of transmission is not only dissimilar from the E&S hypothesis, but it differs from the story exposed in Acemoglu et al (2007). Indeed, when looking at the dynamics of municipal politics, Acemoglu et al (2007) argued that, in weakly institutionalized environments, such as XIX and XX century Colombia, powerful landowners may be a useful counterbalance against the policies that may be pursued by municipal political elites. In more land concentrated municipalities, landowners could solve their collective action problem more easily in order to control politicians´ actions. They also showed that politically powerful individuals at the municipal level appear to have been much more likely to become landowners. Their interpretation implied that landowners and municipal mayors were somehow two opposing sides.

On the contrary, I explore political dynamics at the regional or national sphere, which calls for a different - though not completely excluding – interpretation. I construct measures of regional and political representation as the percentage of regional or national political appointments from each municipality i out of the total political appointments between 1876 and 1894. In addition, I try to see whether historically land-concentrated municipalities received more

public economic resources, a clear sign of landowners influence in politics. From the Governor´s office historical reports, I am able to calculate for each municipality i the education expenditure per student in 1890 and 1946 as well as the public investment per capita in 1912 and 1937, which included roads, sewage and electrical plants investments.

I then run regressions as the one explained in equation [4]. Since the distribution of political power in society is also endogenous, I use the instrument designed in Section 4 to overcome this issue and the results are reported in Table 11. Access to political power is influenced by wealth, but politicians can also increase their assets by holding a political office through rent-seeking activities. Consistent with the suggestive information exhibited in Table 10, in column (1), the land gini 1879-1890 has a positive and statistically significant at 5% confidence level impact on regional or national political representation in the late XIX century. Likewise, in columns (2)-(5), the historic land gini also has important positive effects on education expenditure per capita and public investment per capita, even after 50 or 60 years. Most of the results, except the one presented in column (3), are significant at 5% or 1%.

Table 11: Political economy channels

	Politics		Human capital investment		Public investment	
Dependent variable	National politicians 1874-1896 as % of total	Regional politicians 1874-1896 as % of total	Education expenditure per capita in 1890 (in logs)	Education expenditure per capita in 1946 (in logs)	Public investment per capita in 1912 (in logs)	Public investment per capita in 1937 (in logs)
	(1)	(2)	(3)	(4)	(5)	(6)
Land gini 1879-1890	3.333*	2.807*	1.727*	1.698**	0.872*	1.031**
	[1.441]	[1.239]	[0.724]	[0.644]	[0.429]	[0.353]
Constant	1.500	0.410	0.933	3.268**	2.352**	1.489**
	[2.118]	[1.728]	[1.071]	[1.045]	[0.573]	[0.406]
Observations	100	100	94	100	99	100
Adjusted R^2	0.119	0.125	0.159	0.193	0,275	0,314

Note: All regressions include the following controls: altitude, distance to Bogotá, average annual rainfall, foundation date and area. Robust standard errors in brackets. ** denotes significance at 1%, * denotes significance at 5% and + denotes significance at 10%.

As an additional robustness check of this channel of transmission, I look into the persistence of political dynasties over time. Political institutions allocate *de jure* political power, and those who hold political power influence the evolution of political institutions, and they will generally opt to maintain the political institutions that give them political power. However, *de facto* political power occasionally creates changes. I collect identical information for regional and national politicians between 1931 and 1947. Though I cannot distinguish precisely political dynasties over time nor where they come from, I can, nonetheless, see how persistent the last names of politicians are; I match all the last names from the 1876-1894 dataset with the last names from dataset of 1931-1947. Around 45% of the last names match, suggesting a certain persistence of political representation by the same families.

Concluding remarks

Numerous studies find a long-run impact of history on comparative development, but few offer empirical evidence on how the effects persist over time. This paper documents the impact of historic land inequality persistence on contemporary economic development in Cundinamarca, Colombia and exploits plausible exogenous variation in agricultural endowments based on the Engerman & Sokoloff (1997, 2000) hypothesis as an instrument to overcome recurrent endogeneity problems when assessing this link. Contrary to recent evidence in the literature, but much in line with earlier work by Acemoglu et al (2007), I find that more unequal municipalities in the XIX and XX century enjoy today higher expenditure per capita and levels of education, less poverty and better public goods provision. The interpretation I offer does not necessarily discredit the conventional wisdom of E&S; neither does it advocate that higher inequality is actually beneficial for long-run development.

While E&S account for cross-country differences in long-run paths of development, especially between North and South America, this paper presents a country level case of Cundinamarca, Colombia. The results are, nevertheless, rather inconsistent with new findings in the literature for the US case as argued by Galor et al (2008). How to interpret this counterintuitive piece of evidence? One should always keep in mind the setting. When analyzing the case of Cundinamarca - which is more similar to the rest of Latin America - the counterfactual in all regressions was found between municipalities in an already weakly institutionalized

environment, as exposed in Section 2. In contrast, the work of Galor et al (2008) on US counties was based on the strongly institutionalized setting of the United States. As such, when comparing country level studies, one could still suffer from potential omitted variables specific to each country or region (ej: institutions, structure of government) that may help explain such particular divergent outcomes.

When initial institutions and property rights are badly defined as in the case of Cundinamarca, the elites can take advantage of more political influence and access to economic resources. This is precisely what comes to light in the second part of this paper, where I provide first hand evidence of possible channels of transmission. The results found are not explained by market driven agricultural efficiency gains derived from landownership concentration but by political economy mechanisms. In municipalities where land was historically more concentrated, the evidence – supported by the Colombian historiography and the empirical analysis - suggests powerful landowners were more successful in solving their collective action problem of accessing regional or national political offices - either by monopolizing the political power or exerting pressure in politics – to influence public investment decisions and the allocation economic resources in their interests.

Much work remains in acquiring a general understanding of how inequality persists as well as the overall impacts of inequality on development in Latin America, and even within Colombia. The role of the institutional environment and the government in explaining the puzzling irregularity between the separate evidence found in Cundinamarca and the United States provides an interesting avenue for future research.

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Data annex

Instrument: The instrument was constructed based on the *Estudio General de Suelos y Zonificación de Tierras* (2000) of the Gobernación de Cundinamarca. Their work, in turn, is based on a

methodology from the Soil Conservation Service of the Department of Agriculture of the United States. Land type classification is an interpretation based on facts from climate, geoforms, geographical and soil characteristics, soil use limitations, output capacity, soil risk deterioration and land management requirements. The evaluation is done for each of the 1: 1000000 (1 unit, 1 km) cartographic units from IDEAM satellite images. The grouping of soil types is relative and does not provide absolute values of economic activities, but rather an association by number and grade of soil limitations.

The system classifies soils in 3 categories: 9 types, 22 sub types, and 47 management groups. I only concentrate on types since they provide information on land characteristics that are less likely to change over long periods of time (ex: terrain roughness, water scarcity). On the contrary, sub types, and especially management groups, do change over time for they capture time-variant soil conditions (ex: land quality or erosion). The system recognizes the existence of 7 types in Cundinamarca: from 2 to 3, land suitable for intensive farming or livestock; from 4 to 6, land suitable for moderate farming or livestock; and from 6 to 8, non-arable land, such as forests or recreational conservation. I use this classification to construct the instrument exposed in Section 4 of this paper.

Land gini: This measure comes from the *Catastros de Cundinamarca* (1879 & 1890) was constructed based on the common land gini expression, where, y is the land value of individual i at time t:

$$gini_{i,t} = \frac{1}{n^2 \bar{y}} \sum_{i=1}^{n} \sum_{j=1}^{n} |y_{i,t} - y_{j,t}|$$

Political representation: This measure comes from the *Gaceta de Cundinamarca, Anales del Congreso* and *Registro del Estado* (1876-1894), all from the Biblioteca Luis Ángel Arango. It was constructed as national or regional politicians from municipality i as percentage of total politicians from each category in Cundinamarca durgin 1876-1894:

$$political\ reprentation_i = \frac{\#\ politicians_i}{\#\ politicians}$$

Education expenditure per student: This measure comes from the *Tercer Informe del Secretario de Instrucción Pública al Gobernador* (1890) and *Informe de la Dirección de Educación de Cundinamarca* (1946), the first from the Biblioteca Luis Ángel Arango and the second from Biblioteca Nacional de Colombia. It was constructed as the the education expenditure from municipality i over the total number of students recorded at municipiality i at time t:

$$education\ expediture\ per\ student_{i,t} = \frac{education\ expenditure_{i,t}}{number\ of\ students_{i,t}}$$

Public investment per capita: This measure comes from reports in the *Folio Eduardo Santos, Caja 2, Carpetas 001-003*, from the Biblioteca Luis Ángel Arango. It was constructed as the the public invesment expenditure from municipality i over the total population recorded at municipiality i at time t from the Census of 1912 and 1937:

$$public\ investment\ per\ capita_{i,t} = \frac{public\ investment\ expenditure_{i,t}}{population_{i,t}}$$