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Resumen

Las economías de reciente asentamiento europeo se caracterizan por su abundancia de recursos naturales. Sin embargo, el capital natural no es homogéneo y ello induce diferencias en términos de desempeño económico. En este trabajo se discute el efecto de los recursos naturales agrícolas sobre la producción y la distribución del ingreso en el sector agropecuario en la tradición de la hipótesis de la maldición de los recursos naturales, desde mediados del siglo XIX hasta la Primera Guerra Mundial. Se considera la interacción entre los recursos naturales que poseen las economías, el tipo de tierra y la calidad institucional en términos de la apropiabilidad de los recursos. Se proponen dos enfoques. El primero refiere a la estimación de la relación estadística entre desempeño, recursos naturales e instituciones. El segundo considera la descripción histórica de la distribución de los derechos de propiedad de la tierra in el Río de la Plata y Australasia. En el primero, se rechaza la hipótesis de la maldición de los recursos naturales sobre la producción agropecuaria, pero se la sostiene cuando se considera la distribución del ingreso dentro de la actividad. Las dimensiones técnica e institucional de la apropiabilidad no operan en el caso de la producción, pero sí lo hacen en la distribución. Esto es, extender la frontera por las mejores tierras empeora la distribución, pero la acción de la calidad institucional es diferente por tipo de tierra, mejorándola en el caso de aquellas de mayor aptitud agrícola. El segundo enfoque procura dar contexto histórico al anterior análisis. Se consideran los arreglos institucionales relacionados con la propiedad de la tierra, los cuales resultaron propicios para obtener altos niveles de ingreso agrícola, pero inadecuados para promover sociedades más igualitarias. Los problemas de apropiabilidad fueron más intensos en las excolonias hispánicas que en las británicas donde, adicionalmente, las instituciones resultaron más propicias para moderar la concentración de la tierra (y sus rentas asociadas).

Palabras clave: maldición de los recursos naturales, hipótesis de apropiabilidad, economías de reciente asentamiento europeo, Primera Globalización.

Código JEL: N50, O13, Q15.

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Abstract

Settler economies are characterized for the abundance of natural resources. However, natural capital is not homogeneous and it induces differences in terms of economic performance. I discuss the effect of agricultural natural resources on production and income distribution in the agriculture in the tradition of the curse (and blessing) of the natural resources hypothesis, from the mid-19th century to WWI. I consider the interaction between natural resources that a country posses, the type of land according to the agricultural aptitude and the quality of its institutions in terms of the concept of appropriability of a resource. I propose two approaches. One of them is based on the estimation of the statistical relationship between economic performance, natural resources and institutions. The other one is based on the historical description of the distribution of land rights in the River Plate and Australasia. In the first one, I reject the curse of the abundance of natural resources on the agricultural production but I do not reject it as regards income distribution. Nor technical neither institutional dimension of appropriability hypothesis work for agricultural production but both operate in terms of inequality; i.e. expanding the frontier by the best lands makes worse income distribution but the action of institutional quality on high land aptitude improve equality. The second approach proposes to give historical context to my analysis. I consider the institutional arrangements related to the land property, and they seemed suitable for obtaining high levels of income but inadequate to promote more egalitarian societies. Therefore, appropriability problems were more intense for Hispanic ex-colonies than for British ex-colonies which, in addition, enjoyed institutions more favourable for reducing inequality.

Key words: curse of the natural resources, appropriability hypothesis, settler economies, First Globalization.

JEL code: N50, O13, Q15.

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Introduction

In recent debates in Development Theory, the study of adverse effects of the abundance of natural resources on economic growth constitutes a main issue. Inspired by the work of Sachs & Warner (1995), a new literature has emerged that focuses on the so-called "resource curse hypothesis", a puzzling paradox suggesting that resource-rich countries tend to grow more slowly than resource-poor ones. However during a long period there had a consensus among economists to identify abundant natural resource endowments with economic strength. Natural resources (coal, iron) played a central role in the emergence of the so-called "modern economic growth" since the 18th century, with Great Britain as the leader and several areas of Europe (Belgium, Germany, France) and America (US) as followers. Additionally, in the 19th century wide areas of the planet were incorporated to the expansion of the world capitalism and participated actively in the international trade showing that not only mineral resources might be relevant to economic growth (not only mineral resources were a blessing). Second Industrial Revolution induced deep consequences in extensive regions of the world periphery (many areas of South America, Australasia and the north and the south of Africa) combining determinant technological changes (railway, refrigeration, reduction in the cost of inter-oceanic transport) with temperate climate and fertile soils especially suitable to the production of diverse commodities (wheat, wool, beef). The abundance of natural resources was understood as a blessing characterized by the possibility of some countries to participate in international trade with resources almost unexploited and that met a strong and dynamic external demand (from Europe).

Therefore, instead of considering the curse as a general pattern, it seems subject to the influence of supply and demand conditions, technological advance and institutional structure, constituting a process with a strong historical specificity. Settler economies, characterized as abundant-natural resource regions, represent an interesting "natural experiment" in this sense. I select six economies –Argentina, Australia, Canada, Chile, New Zealand and Uruguay ("settler club")– and evaluate a period –the First Globalization (1870-1913)– of strong economic expansion (Denoon, 1983; Lloyd & Metzer, 2013) based on a dynamic participation in international trade (Schedvin, 1990) and characterized by increasing income inequality (Greasley et al., 2007; O'Rourke et al., 1996; Williamson, 2000, 2007).

While intensity of First Globalization and its consequences for settler economies followed a common pattern, when we deal with particular situations and evolutions it results notorious that countries reacted in different ways, and this probably determined their economic performance in subsequent decades. These economies based their production on primary activities but in spite of this, at around the time of First World War (WWI), they achieved levels of development close to the (industrial) "core". However, income per capita was higher and inequality was worsening less in ex-British possessions (Australia, New Zealand, Canada) than in the South American Southern Cone (Argentina, Chile and Uruguay) (Williamson, 2002; Willebald, 2013a), and in the former group economic specialization was relatively less concentrated on primary activities (Willebald, 2007). In terms of the curse/blessing of natural resources, ex-British colonies were more blessed and less damned by their abundance of natural resources than the other ex-colonies.

One of the main analytical branches of the curse of the natural resources hypothesis is associated with the role of institutions on economic relationships. In this sense, I use appropriability hypothesis to consider the idea that different types of natural resources interact

with institutional quality to render dissimilar economic results. Literature usually refers to the curse (or the blessing) considering the evolution of GDP per capita. However, I want to go beyond this (restricted) concept to consider an idea closer to development in a broader definition that incorporates notions of growth and inequality in a sectorial approach. Then I evaluate the curse in terms of productive expansion and income distribution, considering the economic activity more intensive in the use of the main natural resource of settler economies —land— to participate in commodity international markets.

According to the more extended literature, settler economies would have similar natural resources. However, it is important to consider the idea of "quality" to identify diverse "types" of natural resources. I consider different types of land —according to agricultural aptitude— to incorporate a gradient of appropriability possibilities that move from land of high quality (with higher chances to create differential rents to appropriate) to low quality. My conclusion is that the economic application of abundance of natural resources was, in productive terms, a blessing for settler economies, but they suffered the curse of increasing inequality. Dissimilar intensity of both processes within the club was explained by differences in the productive use by type of land. Economies that moved their frontiers by high agricultural aptitude lands welcomed the blessing of an expressive agricultural expansion, but they received the curse of concentrating agrarian rents in small and privileged classes. However, natural resources did not perform alone but they interacted with diverse institutional arrangements as different kinds of governmental actions and, specifically, with the establishment of ownership land rights. Institutional quality is approximated in terms of enforcement of contracts and property rights —that I call "macro level", using the contract intensive money (CIM) indicator as a proxy— and the configuration of land ownership system (considering agents' behaviour in a sense closer to a "micro level").

Therefore, I propose two methodological approaches. One of them is based on the estimation of relationships between growth, income distribution, natural resources and institutions. For this analysis I use panel data estimation and include the interaction between the two latter variables, studying six economies and considering annual data from 1869 to 1913. These exercises are not conclusive but help to identify interesting insights in the matter. The other approach is based on historical description of distribution of land rights —from the beginning of the 19th century to WWI— and institutional arrangements related to land property in the River Plate (Argentina and Uruguay) and Australasia (Australia and New Zealand). Discussion focuses on the role of national authorities (state) and the definition and enforcement of land rights, and attempt to identify two "models" —the "British" and the "Hispanic" models— that determine different distributive patterns (considering land and income related to agriculture).

First, I review the concept of the curse of natural resources and present the appropriability hypothesis (Section 1). Afterwards, considering my first approach, I present empirical strategy, analytical model and explicative variables (Section 2) and statistical results (Section 3). According to the main shortcomings of my analysis, I propose a second approach and consider the notion of appropriability to guide the depiction of historical formation of land ownership systems (Section 4). This analysis allows identifying two models of distribution and creation of institutional arrangements related to land property, which generate different distributive patterns of assets (land) and incomes (within agriculture). I evaluate their main similarities and differences in terms of the appropriability hypothesis. Then, I conclude and propose some final remarks (Section 5).

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1. Institutional quality and appropriability hypothesis

Since the end of the 20th century economic growth is no longer considered to be only dependent on accumulation of physical and human capital. Scholars now point that there is a third form of "capital" relevant to the performance of economic system: the natural and environmental resource endowment available, and commonly referred to as "natural capital". Despite the importance of natural capital for a sustainable economic development, increasing economic dependence on natural resources exploitation appears as an obstacle to growth in the majority of low and middle-income economies (Barbier, 2005). Literature shows a negative relationship between economic growth per capita (in general, from the 1960s to the end of the 20th century) and some measures of natural capital considered as the "curse" of natural resources (Auty, 2001a; Gylfason, 2006, 2007; Sachs & Warner, 1995, 1999a,b, 2001).

Why the abundance of natural resources often appears related to deficient economic performance? Is the abundance of natural resources a curse to economic growth? Is the curse a general pattern or it depends on technological and institutional factors? Can the blessing of certain historical circumstances moves to a curse?

1.1. The curse: institutional explanation

Large natural resource rents, especially in combination with property rights wrongly defined, imperfect markets and permissive legal structures may guide to uncontrolled rent seeking behaviour among producers. These actions divert resources away from economic activities more fruitful in social terms and affect economic growth. Economic and political power concentration may be explained by bulky rental incomes in hands of the elites that, once in power, use these resources to act in their favour and secure their permanence. Persistence of high levels of inequality, poor democracies and political instability are the usual results. Besides, abundant natural resources may induce a false sense of security for people and governments and miss the opportunity to construct good economic management and institutional quality. Governments are tempted to spoil markets by granting enterprises, privileging the access to common-property natural resources, offering tariff protection or other prerogatives to producers, creating competition among rent seekers to obtain such favouritisms. Extensive rent seeking may generate corruption in private and public sectors, distort the resource allocation, weaken the investment, increase the public spending and reduce the economic efficiency as well as social equity. Abundant natural capital may crowd out social capital through corruption, inequality and the absence of political liberties, all factors that hinder economic growth and lead to persistence of poorness (see an extensive literature review in Willebald, 2011; Van der Ploeg, 2011).

Auty (2001b) indicates that different kinds of natural resources may present different effects on economic performance and distinguishes between "point resources" (activities with intensive use of capital as mineral and energy resources) and "diffuse resources" (activities with low concentration as cropland and livestock). "Point resources" generate larger opportunities for rent-seeking and corruption and the consequences on economic growth are more adverse.[1] Isham, et al. (2005) state that export concentration on point resources is strongly associated with weak public institutions which are, in turn, robustly related to slower economic growth. Woolcock, et al. (2001) show that natural resource-rich economies and different types of resources place diverse pressures on community structures, institutional capacity and state-

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[1] This view has common points with that presented in the tradition of Latin American Structuralism economic thought in the 1950s-1970s (Cardoso & Faletto, 1969; Furtado, 1969; Prebisch, 1950, 1959).

society relations. With natural resources more easily captured and controlled by a narrow elite being most likely undermine economic growth. Bulte et al. (2005) propose similar exercises but evaluating the curse in terms of indicators of human welfare. Resource-intensive countries tend to suffer lower levels of human development, implying that the resource curse is a phenomenon that occurs at a broader scale than just economic growth, and countries that rely on "point resources" tend to perform worse. In these explanations, abundance of natural resources is associated with a deficient institutional structure that affects economic growth. This institutional explanation has focused on the intrinsic characteristics of the natural resources but, additionally, other scholars are concern with the quality of institutions according to their capacity to open appropriability possibilities of incomes generated by natural capital.

1.2.   Appropriability hypothesis

Why do some economies seem to gain relative more from their endowments and others obtain bad outcomes when countries with similar natural resources are compared? Boschini et al. (2005) show that the effect of natural resources on economic development is not determined by resource endowments alone, but rather by the interaction between the type of resources and the quality of institutions. Conceptually, "appropriability" alludes to the environmental factors that control the innovator's ability to get returns generated by an innovation. In economies where resources —and the corresponding rents— are highly appropriable, it might be expected that the abundance could difficult the economic development, while in countries where resources are less appropriable, its abundance may contribute with the progress of society.

The appropriability hypothesis may be conceived in terms of technical and institutional dimensions. Technical dimension refers to the "intrinsic" character of natural resources and institutional dimension refers to the capacity of institutions, in the interaction with natural resources, to counteract the curse. Institutional dimension of appropriability refers to the idea that natural resource abundance is negative for economic performance only under poor institutions. Technical dimension refers to the idea that the impact of low institutional quality and abundant natural resources is more pronounced as the more technically appropriable are natural resources.

Boschini et al. (2005) test these hypotheses with the following specification for country i:

$$g_i = X'_i \alpha_0 + \alpha_1 NR_i + \alpha_2 Inst + \alpha_3 (NR_i \times Inst_i) + \varepsilon_i \qquad (1)$$

Where g is the average annually growth rate of GDP (1975-1998), X' is a vector of control variables, NR is a measure of natural resources, and $Inst$ is a measure of institutional quality. $NR \times Inst$ represents the interaction between natural resources and institutional quality. Authors use four different measures of natural resources to capture a gradual increase in physical and economical appropriability (the technical dimension) from the broadest to the narrowest measure (share of primary exports; of ores and metals exports; of mineral production; of gold, silver, and diamonds on gross product) (referred to α_1). To capture institutional quality, they employ the average of indexes for quality of the bureaucracy, corruption in government, rule of law, the risk of expropriation of private investment, and the repudiation of contracts (Knack & Keefer, 1995, 2002) (referred to α_2). They show that whether natural resources are good or bad for a country's development depends crucially on the interaction between institutional setting and the type of resources possessed by the country (α_3). Some natural resources are, for technical reasons, more likely to cause problems such as rent-seeking and conflicts than others. However, this potential problem can be countered by good institutions. In contrast to the traditional resource curse hypothesis, they show that the impact of natural resources on economic growth is non-monotonic in institutional quality. Countries rich in minerals are cursed only if they have low quality institutions, while the curse is reversed

if institutions are sufficiently good (in terms of the model, when negative impact of *NR* is countered by the positive effect of *Inst* and the joint effect of *NRxInst*). Mehlum et al. (2006) and Robinson et al. (2006) also present concepts in terms of non-monotonic relationship between natural resources and economic growth in terms of institutional quality.

Mehlum et al. (2006) develop a model where entrepreneurs choose between becoming "producers" or "grabbers". The relative payoff from these activities depends on how "grabber friendly" the institutions are, which also determines the effect of natural resources. More natural resources raise the national income if institutions are "production friendly", but reduce it if they are "grabber friendly". Robinson et al. (2006) develop a model with similar predictions but where political incentives generated by resources are the key explicative factor. In countries with good institutions resources are positive because the perverse political incentives are mitigated, but in countries with bad institutions resources remain a curse. With different analytical options it is possible to arrive at compatible conclusions through other channels. This is the case of a recent article –García-Jimeno & Robinson (2011)– that shows a renewed interest in the land frontier expansion.

As land frontier expansion is associated with incorporation of land (natural resource) to the production and it constitutes a process that is accompanied by the constitution of a new system of property rights (institutional arrangements), relationship with my issue is immediate.[2] These authors analyse the classical view corresponding to F.J. Turner as the "Frontier (or Turner) Thesis" for North, Central and South America from the middle of 19th century to 2007. They suggest,

> *"that if political institutions were bad at the time of frontier settlement, the existence of such frontier land might actually lead to worse development outcomes, probably because it provides a resource which non-democratic political elites can use to cement themselves in power"* (García-Jimeno & Robinson, 2009, p.18).

In these terms, bad institutions and abundant natural resources might lead to lower economic performance, and the abundance may be approximated by land frontier.

In García-Jimeno & Robinson (2009), a model similar to the following is proposed:

$$g_i = \beta_0 + \beta_1 F_{i,t} + \beta_2 C_{i,t} + \beta_3 (F_{i,t} \times C_{i,t}) + \varepsilon_i \qquad (2)$$

Where g_i is the dependent variable of interest for country *i* considering GDP per-capita in 2007; average democracy score of *Polity IV* (1950-2007 and 1990-2007); and average Gini coefficient for 1990-2007. $F_{i,t}$ is the proportion of the country which was frontier land in period *t* and $C_{i,t}$ is the constraints on the executive from *Polity IV* in *t*, with *t=1850* (or a period around 1850). If this analytical relation is reinterpreted considering that the occupied territory represents a measure of the natural resources available to productive application, the model is comparable with that used in Boschini et al. (2005).

1.3. Natural resources and land frontier expansion

Natural resources are special economic goods because they are not produced. In consequence, natural resources will yield economic profits –rents– if properly managed. Exhaustible resources, once discovered, can only be depleted and consuming rents from exhaustible resources is, literally, consuming capital. Living resources are different because they are a

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[2] There is a resurgence of interest in land frontier expansion in recent literature about the Atlantic economy in the late 19th century (see Harley, 2007). See Juambeltz & Willebald (2013) as illustration.

potentially sustainable source of resource rents (a true "gift of nature"). Sustainable management of these resources will be the optimal policy, but the question of the optimal stock size is complex. In these terms, natural resources may be conceptualized as *"stocks of materials that exist in the natural environment that are both scarce and economically useful in production or consumption, either in their raw state or after a minimal amount of processing"* (WTO, 2010, p. 46).

A critical driving force behind global economic development throughout much of history has been the answer of society to the scarcity of natural resources (Barbier, 2011). Increasing scarcity raises the cost of exploiting existing natural resources and encourages economies to conserve, innovate and obtain "new" natural resources. Since the agricultural transition (over 12,000 years ago), exploiting new sources, or "frontiers," of natural resources has often proved to be a pivotal human response to natural resource scarcity (Barbier, 2011, p. 7). "Frontier" refers to an area or source of unusually abundant natural resources and land relative to labour and capital. It is the relative scarcity, or abundance, of natural resources that matters to economic development, not their absolute physical availability. The process of frontier expansion, or frontier-based development, thus means exploiting or converting new sources of relatively abundant resources for production purposes.

Expansion of the frontier represents incorporation of "new" land into the production therefore a measure of land frontier expansion is a good proxy of the abundance of natural resources.

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2. Empirical strategy

Settler economies are characterized by the abundance of land and excellent conditions for a competitive production of agricultural commodities. Some of them presented, as well, significant mineral deposits that meant important effects on the social-economic context and the population dynamics. However, I focus the analysis on land abundance as I want to emphasize land as a productive factor in the generation of agricultural products (foods and raw materials).[3]

During the First Globalization, settler economies experienced a process of strong expansion and, simultaneously, a worsening in the income distribution. We look for evidence to show that the incorporation of abundant land in production would have had a significant incidence on both evolutions within the agriculture and the intensity of the effects was related to the land aptitude. We test two hypotheses: (i) different degree of appropriability determines the magnitude of the impact of abundant resources on economic performance; (ii) "good" institutions, and especially in interaction to natural resources, induce the reversion of the curse (or reinforce the blessing). I consider different types of land –according to agricultural aptitude– to incorporate a gradient of appropriability possibilities that move from land of high agricultural aptitude (with higher chances to create differential rents to appropriate) to land of low aptitude. Therefore, in terms of the curse hypothesis, we should expect "worse" long-run results when economies incorporate more intensively high quality lands than low quality ones.

2.1 Empirical model

To operationalize the notion of "economic performance" three dimensions are considered for agriculture: level and growth of income (product) per worker and income distribution (measured by rents/wages ratio derived from the functional income distribution).

A theoretical approach to conceptualize the equations to estimate is necessary. In a previous study (Willebald, 2011), I present an analytical model that describes three main stylized facts of settler economies –primary export-led growth, worsening income distribution, and deindustrialization (or primarization)– in the tradition of specific factors models. I propose modifications in the theoretical formulation of Findlay & Lundahl (2001) and Findlay (1995) to introduce the incidence of different land qualities in the results. I consider a primary (agriculture) sector (A) with two sub-sectors (A_H) and (A_L) that work, respectively, in high quality (N_H) and low quality land (N_L), and labour endowment,[4] respectively, L_H and L_L where the technology is represented by a homogeneous of degree one production function,

$$A_H = A_H(N_H, L_H) \qquad\qquad (3)$$

$$A_L = A_L(N_L, L_L) \qquad\qquad (4)$$

In intensive terms, product per worker is a function of the corresponding land-labour ratio (η),

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[3] Even in the case of Chile, evolution previous to incorporation of mineral wealth –which happened in the 1880s– presented several features common to economies that produce food and raw materials. Denoon (1983) argues that Chile and South Africa constitute *"limit cases"* of settler economies.

[4] The model includes two "types" of labour for agriculture and one for manufacturing.

$$\frac{A_H}{L_H} = a(\eta_H) \tag{5}$$

$$\frac{A_L}{L_L} = a(\eta_L) \tag{6}$$

Therefore, the product per worker of agriculture (*A/L*) could be represented as a weighted average of the product per worker for high and low land quality that depends on the corresponding land-labour ratios.

In addition, land is a finite resource and the possibility for incorporating each type of land depends on the respective availabilities. Therefore, I take into account an indicator of quantities of land incorporated into the agriculture to represent these restrictions (shares of already incorporated land by type, year by year). These conditions represent a notion of initial endowments and indicate the scale of production.

Finally, I incorporate indicators of institutional quality to evaluate the direct and indirect incidence of institutions on income per worker. I compare parameters of estimations with institutions acting alone and with institutions acting together with natural resources. By construction, our institutional indicator –a ratio that moves between 0 and 1 which presents few changes in several countries of the club– "induces" collinearity problems in the estimation. Therefore, and following the suggestion of García Gimeno & Robinson (2011), the concepts of Boschini et al. (2005), and my theoretical proposal, I estimate five specifications to test the curse of natural resources. I use panel data along the period 1869-1913 (annual data).

$$agdppw_{it} = \gamma_0 + \gamma_1\,nh_{i,t} + \gamma_2\,nl_{i,t} + \gamma_3\,hw_{i,t} + \gamma_4\,lw_{i,t} + \gamma_5\,Inst_{i,t} + \varepsilon_{it} \tag{7}$$

$$agdppw_{it} = \gamma_0 + \gamma_1\,nh_{i,t} + \gamma_2\,nl_{i,t} + \gamma_3\,hw_{i,t} + \gamma_4\,lw_{i,t} + \gamma_5\,(nh_{i,t} * Inst_{i,t}) + \varepsilon_{it} \tag{8}$$

$$agdppw_{it} = \gamma_0 + \gamma_1\,nh_{i,t} + \gamma_2\,nl_{i,t} + \gamma_3\,hw_{i,t} + \gamma_4\,lw_{i,t} + \gamma_5\,(nl_{i,t} * Inst_{i,t}) + \varepsilon_{it} \tag{9}$$

$$agdppw_{it} = \gamma_0 + \gamma_1\,nh_{i,t} + \gamma_2\,nl_{i,t} + \gamma_3\,hw_{i,t} + \gamma_4\,lw_{i,t} + \gamma_5\,(hw_{i,t} * Inst_{i,t}) + \varepsilon_{it} \tag{10}$$

$$agdppw_{it} = \gamma_0 + \gamma_1\,nh_{i,t} + \gamma_2\,nl_{i,t} + \gamma_3\,hw_{i,t} + \gamma_4\,lw_{i,t} + \gamma_5\,(lw_{i,t} * Inst_{i,t}) + \varepsilon_{it} \tag{11}$$

Where *agdppw$_{it}$* is the (log) agricultural output per worker in 1913 constant dollars for country *i* in period *t*, with *t=1869, 1870, ...1913* (from Willebald, 2013a). I consider four explicative variables related to land quality: the land-labour ratios corresponding to high (*nh*) and low (*nl*) quality and the proportion of land incorporated to the production corresponding to high (*hw*) and low (*lw*) quality (weighted by the total endowments; see below and Appendix for details). Finally, I include an indicator of institutional quality (*Inst*) to capture the direct effect of institutions on agricultural income level –equation *(7)*– and evaluate its indirect effect through natural resources in equations *(8)* to *(11)* (interaction terms).

Considering land expansion –referred to land-labour ratios because the abundance is always a relative concept–, the appropriability hypothesis of the curse of the natural resources in terms of the technical dimension will not be rejected under the following results:

$\gamma_1 < 0$, $\gamma_2 < 0$ and $\gamma_1 < \gamma_2$: the effect of the land-labour ratio is negative and the incidence of the impact is higher ("more negative") in the case of the more appropriable natural resources, i.e. the high quality land which generates the higher rents to appropriate.

$\gamma_1 < 0$, $\gamma_2 > 0$: the effect of the land-labour ratio is negative for the high quality land and positive for low quality land.

In other words, we do not reject the hypothesis of the curse of the natural resources if the evidence shows that expanding the land frontier (in relation to labour) by better lands yield the worst results in the long run (or in brief, the richest economies in terms of natural resources would obtain the worst results).

As it is usual in the literature, we expect that better institutions present a positive effect on income level ($\gamma_5 > 0$) and we test the institutional dimension of the curse comparing these parameters. When the parameters in equations *(8), (9), (10)* and *(11)* exceed the one of equation *(7)* we prove that the higher incidence of institutions on income level occurs indirectly through the natural resources.

Finally, considering absolute land expansion I evaluate the effects of scale factors in the evolution of agricultural income. I expect positive coefficients in both cases but with a higher influence for land of high quality,

$\gamma_3 > 0$, $\gamma_4 > 0$ and $\gamma_3 > \gamma_4$: the effect of the high quality land is positive and the impact is higher in the case of the more appropriable land (the high quality land).

Annual change in agricultural income per worker (*ga*) can be expressed as the weighted sum of the corresponding rates of variations (*g*) of the components related to land in equation *(7)* (*nh, nl, hw* and *lw*) and to incorporate the interactions of levels to consider the effect (direct and indirect) of institutions on growth of agricultural product per worker.

$$ga_{it} = \gamma_0 + \gamma_1\, gnh_{i,t} + \gamma_2\, gnl_{i,t} + \gamma_3\, ghw_{i,t} + \gamma_4\, glw_{i,t} + \gamma_5\, Inst_{i,t} + \varepsilon_{it} \qquad (12)$$

$$ga_{it} = \gamma_0 + \gamma_1\, gnh_{i,t} + \gamma_2\, gnl_{i,t} + \gamma_3\, ghw_{i,t} + \gamma_4\, glw_{i,t} + \gamma_5\, (nh_{i,t} * Inst_{i,t}) + \varepsilon_{it} \qquad (13)$$

$$ga_{it} = \gamma_0 + \gamma_1\, gnh_{i,t} + \gamma_2\, gnl_{i,t} + \gamma_3\, ghw_{i,t} + \gamma_4\, glw_{i,t} + \gamma_5\, (nl_{i,t} * Inst_{i,t}) + \varepsilon_{it} \qquad (14)$$

$$ga_{it} = \gamma_0 + \gamma_1\, gnh_{i,t} + \gamma_2\, gnl_{i,t} + \gamma_3\, ghw_{i,t} + \gamma_4\, glw_{i,t} + \gamma_5\, (hw_{i,t} * Inst_{i,t}) + \varepsilon_{it} \qquad (15)$$

$$ga_{it} = \gamma_0 + \gamma_1\, gnh_{i,t} + \gamma_2\, gnl_{i,t} + \gamma_3\, ghw_{i,t} + \gamma_4\, glw_{i,t} + \gamma_5\, (lw_{i,t} * Inst_{i,t}) + \varepsilon_{it} \qquad (16)$$

Initially, the hypotheses are the same to those tested in the case of income level. However, some warnings are necessary. Land is a finite resource and therefore, it can not increase indefinitely (the components related to *hw* and *lw* would tend theoretically to zero in the long-run).

Finally, I compare total land rents (*R*) and total wages (*W*) in the agriculture to represent the evolution of income distribution (*RW*).[5] On the one hand, total land rents depend on quantity of land incorporated in production and land rental rates (q_j) considering both types of land:

$$R = q_H N_H + q_L N_L \qquad (17)$$

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[5] Instead of comparing wages and land rental rates as it is proposed in the more extended literature (Williamson, 2000, 2002), I contrast the evolutions of total wages and rents. This approach differs from the traditional analysis because my ratios include the double effect of changes in earning rates (wage and land rental rates) and in the number of earners (workers, hectares) (Willebald, 2013a). Increasing trends mean worsening in income distribution.

On the other hand, assuming perfect labour market and an agricultural sector where the wage rate (*w*) is given by the manufacture (urban) sector, differences between the qualities of lands are related to the quantity of labourers working in the land.

$$W = wL_H + wL_L \tag{18}$$

I consider indicators of income distribution by type of land:

$$\frac{R_H}{W_H} = \frac{q_H N_H}{wL_H} = \frac{q_H}{w}\eta_H \tag{19}$$

$$\frac{R_L}{W_L} = \frac{q_L N_L}{wL_L} = \frac{q_L}{w}\eta_L \tag{20}$$

Therefore, rents-wages ratio of agriculture is a weighted average of the rents-wages ratios for high and low land quality which depends on the corresponding land-labour ratios. As before, as land is a finite resource and, in practical terms, the possibility for incorporating each type of land depends on the respective availabilities, I consider shares of land yet incorporated in agriculture to represent these conditions. Finally, the direct and indirect impact of quality of institutions on income distribution is considered. I propose the following model (variables in original values) with different specifications:

$$RW_{it} = \gamma_0 + \gamma_1\, nh_{i,t} + \gamma_2\, nl_{i,t} + \gamma_3\, hw_{i,t} + \gamma_4\, lw_{i,t} + \gamma_5\, Inst_{i,t} + \varepsilon_{it} \tag{21}$$

$$RW_{it} = \gamma_0 + \gamma_1\, nh_{i,t} + \gamma_2\, nl_{i,t} + \gamma_3\, hw_{i,t} + \gamma_4\, lw_{i,t} + \gamma_5\,(nh_{i,t} * Inst_{i,t}) + \varepsilon_{it} \tag{22}$$

$$RW_{it} = \gamma_0 + \gamma_1\, nh_{i,t} + \gamma_2\, nl_{i,t} + \gamma_3\, hw_{i,t} + \gamma_4\, lw_{i,t} + \gamma_5\,(nl_{i,t} * Inst_{i,t}) + \varepsilon_{it} \tag{23}$$

$$RW_{it} = \gamma_0 + \gamma_1\, nh_{i,t} + \gamma_2\, nl_{i,t} + \gamma_3\, hw_{i,t} + \gamma_4\, lw_{i,t} + \gamma_5\,(hw_{i,t} * Inst_{i,t}) + \varepsilon_{it} \tag{24}$$

$$RW_{it} = \gamma_0 + \gamma_1\, nh_{i,t} + \gamma_2\, nl_{i,t} + \gamma_3\, hw_{i,t} + \gamma_4\, lw_{i,t} + \gamma_5\,(lw_{i,t} * Inst_{i,t}) + \varepsilon_{it} \tag{25}$$

According to the appropriability hypothesis, in terms of the technical dimension, I expect positive effects on inequality (worsening in income distribution as the curse) and $\gamma_1 > \gamma_2$ associated with the higher degree of appropriability of the rents of the most productive land.

The coefficient γ_5 should present a negative effect on *RW* that will indicate an improving in equality derived from "good" institutions. How can we evaluate the institutional dimension of the appropriability problem? Evidence in favour of this hypothesis would require finding more intensive effects of institutions when we estimate equation *(22), (23), (24)* and *(25)* —with interaction variable—, so my aim will be to compare γ_5-coefficients.

Finally, I expect positive effects of scale factors ($\gamma_3 > 0;\ \gamma_4 > 0$). As higher is the proportion of land in production less land is available for new landowners —less "free land" is available in Turner's sense— and economies face higher rents related to other factor retributions. I expect that this process is more intensive in the case of high quality land ($\gamma_3 > \gamma_4$) because they are the most attractive land for production.

2.2 Explicative variables

Natural resources

In a previous work (Willebald, 2011) I propose several measures of land frontier expansion according to land aptitude. Initial motivation was the *F* index of García-Jimeno & Robinson (2011). However, my indicators differ because I measure the proportion of occupied land according to land proper to allocate grassland and to raise animals instead of all non-occupied land in relation to the national (current) territory. In this sense, my indicators are closer to a concept of abundance of land (they represent land economically useful for production). In addition, in Juambeltz & Willebald (2013) we construct indicators for 10-year periods form 1860 to 1920 to reflect the dynamism of the process (a feature absent in García Jimeno-Robinson's approach). I use these indicators as proxies for the econometric exercises.

I propose representing the gradient of different appropriability conditions with indicators corresponding to different types of land in accordance with land aptitude. I classify the area in high and low aptitude[6] and I analyse the evolution of each frontier according to the type of endowment (Willebald, 2011). On the one side, I consider the total land of high (N_h) and low (N_l) aptitude by 1,000 km[2] incorporated to the production and, on the other side, the relationship between these surfaces and the population settled on these areas to represent the land-labour ratio —n_h and n_l— by type of land. In accordance with the standard in the literature (García-Jimeno & Robinson, 2011), I classify land with less than 2 people per square mile (0.7722 people per square kilometre) as frontier land ("open frontier") and, in consequence, the land incorporated to the production is that corresponding to the "close frontier". Original figures correspond to 10-year periods and I interpolate lineally these data to obtain annual information.[7] The "direction" of appropriability is given by technical conditions of different lands. Better lands —the most productive lands— open the possibility to generate and appropriate rents when they are applied to production and then they are more prone to generate appropriability problems.[8]

Additionally, I consider the shares of land incorporated in the production by type of land (N_h and N_l) in relation to the total endowments of each type of land (N_H and N_L) to obtain ratios of land used in the production (*h* and *l*). These ratios are weighted by the structure of endowments corresponding to each country (*hw* and *lw*).

Institutional quality

Boschini et al. (2005) and García-Jimeno & Robinson (2011) use indicators of institutional quality derived from the *IRIS* data and *Polity IV* programme.[9] *IRIS* measures do not cover the period under study. The *Polity IV* indicators are not available for all the members of the "club" (the data for Australia begin in 1900) and are focused on executive constraints, democracy and autocracy, which give an excessively political character to my approach. I consider other indicators more suitable for my object.

Clague et al. (1999, p.187) say that the government has four crucial roles to play in contract enforcement and the protection of property rights: (i) it provides third-party enforcement when

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[6] I classify land according to aptitude to allocate grassland in terms of biome types of potential vegetation presented in Klein Goldewijk & Van Drecht (2006).
[7] Thanks to Prof. Isabel Sanz Villaroya by this suggestion.
[8] I use the term "aptitude" instead of "quality" because this last concept would include considerations about distance to "centres of gravity" in the territory (see Juambeltz & Willebald, 2013).
[9] IRIS: www.iris.umd.edu/; Polity IV Project: www.systemicpeace.org/polity/polity4.htm

no self-enforcing mechanism exists; (ii) it may be the entity that communicates the branches of the contract; (iii) it may enforce the arrangement that private agents apply to constitute themselves as a formal group; and (iv) the government ensure peace. Precisely, these characteristics are applicable to the creation and distribution of the landowner rights and the enforcement of the property system. To capture the potential gains of those activities intensive in contract enforcement and property rights I consider the relative use of currency applying the concept of "contract-intensive money". This indicator is the ratio of non-currency money to the total money supply, or $CIM=(M_2-Curr)/M_2$, where M_2 is a broad definition of the money supply and $Curr$ is currency maintained by people. Application of these ideas to settler economies is not new. Prados de la Escosura & Sanz-Villarroya (2009) use the same concept to evaluate the role of institutional arrangements in the long-run decline of Argentina, comparing with Australia and Canada. Fleitas et al. (2012) replicate similar exercises for Uruguay for 1870-2012. These studies argue about the goodness of the fit of these indicators and the evidence is convincing. *"CIM is a reflection or measure of the type of governance that improves economic performance rather than a cause of that performance"*(Clague et al., 1999, p. 189) and, in this sense, it can operate as an index of the contract enforcement in the historical analysis (*CIM* is my variable *Inst*).

Interaction between natural resources and CIM

Due to economic and technical reasons, different land qualities are more likely than others to cause problems such rent-seeking and conflicts for obtaining the better location (in terms of aptitude and distance to markets). However, this problem could be countered by "good" institutions and whether natural resources are good or bad for a country's development can depend on the interaction between the prevailing institutional arrangements and the type of resources. I consider the joint action of natural resources and *CIM* to test this question introducing the multiplication of both indicators as additional variable.

3. Results

My sample includes six economies and annual data from 1869 to 1913 and I use panel data analysis. The sample is small and, in consequence, estimators can present consistency problems; then my objective is to find indicative evidence and complement it with historical facts and trajectories of the members of the club to support the results.

I estimate different models, fixed effects (FE), random effects (RE) and ordinary least square (OLS) and performed specific tests to choose the more suitable model for each equation. I test the correlation between individual effects and the other regressors with the Hausman test to determine whether the results allow us to reject the null hypothesis of no correlation and use fixed effects model or do not reject it, and estimate the model of random effects. In addition, I test the significance of individual effects computing Breusch-Pagan for random effects, and the F test statistic for the fixed effects. For those cases that individual effects were not significant, I would use OLS. For all cases I use robust standard errors to control for heteroscedasticity and Stata version 11.0. At the end the discussion is based on the FE models as this was the best model after the tests. Initially, I test equations *(7)* to *(11)* referred as models *(1)* to *(5)* in Table 1 (I include a year time trend to control for the tendency in the dependent variable[10]).

The land-labour ratios (η_j) present statistically significant coefficients in all specifications, with positive sign for high aptitude land and negative effect for low aptitude land ($\gamma_1>0$ and $\gamma_2<0$). Therefore, the abundance of natural resources is a curse only in the case of low quality while high aptitude land is a blessing. In this sense we reject the technical dimension of the appropriability hypothesis because the lands (potentially) subject to higher degrees of appropriability are the best to achieve higher levels of income per worker. This last condition includes also the high aptitude land in absolute terms (*hw*) while low quality is positive but significant only in one case –model (2)– and with at a significance level of 10 per cent.

The incidence of institutional quality is positive and statistically significant (at 10 per cent) when it is in interaction with land-labour ratios (*nhcim* and *nlcim*). The impact of institutions is similar independently on the degree of appropriability of the resources (independently on the type of land) (3.9 and 4.5[11]) and, in consequence, we do not find evidence in favour of institutional dimension of the curse. However, the direct effect of institutional quality is not significant (*cim*) and neither when it interacts with the availability of land (*hwcim*, *lwcim*). Institutional quality acts through the land-labour ratio and not through the available land. This means that institutions are relevant for agricultural performance not by their impact alone, but when they are affected by the relationship between land and labour. In other words, quality of institutions is relevant for the abundance but not for the scale of production.

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[10] Boyce & Emery (2011) do a similar control.

[11] We contrast the confidence intervals, which at 95 per cent are, respectively, [-0.65 8.46] and [-0.52 9.58] , and the difference between the coefficients is not statistically significant.

Table 1. Agricultural gross product per worker, natural resources and institutions. Panel data analysis, FE (Fixed Effects Model)

Dependent variable: Agricultural gross product per worker [lngdpapw]

Variables	(1) FE	(2) FE	(3) FE	(4) FE	(5) FE
nh	8.194***	6.037***	7.967***	8.222***	8.742**
	[1.361]	[1.349]	[1.456]	[1.508]	[2.345]
nl	-9.406***	- 10.47***	-12.95***	-9.498**	-9.956**
	[1.608]	[1.903]	[2.870]	[2.388]	[2.917]
hw	3.905***	4.183***	4.058***	4.323**	3.947**
	[0.696]	[0.731]	[0.648]	[1.470]	[1.189]
lw	7.152	7.187*	6.242	8.082	7.394
	[3.971]	[3.446]	[3.545]	[4.288]	[4.204]
year	0.00119	0.000447	0.00104	0.00262	0.00184
	[0.00437]	[0.00423]	[0.00361]	[0.00527]	[0.00613]
cim	0.382				
	[0.267]				
nhcim		3.903*			
		[1.771]			
nlcim			4.528*		
			[1.967]		
hwcim				-0.842	
				[2.313]	
lwcim					0.682
					[1.686]
Constant	3.673	5.362	4.361	1.173	2.650
	[7.971]	[7.830]	[6.773]	[9.786]	[11.34]
Rsq					
Within	0.85	0.85	0.86	0.84	0.84
Between	0.33	0.30	0.29	0.41	0.36
Overall	0.11	0.10	0.09	0.15	0.13
F-stat	242.82	252.05	259.38	221.86	223.52
(Prob)	0.00	0.00	0.00	0.00	0.00
F all u_i=0	161.33	179.12	180.09	151.77	158.92
(Prob)	0.00	0.00	0.00	0.00	0.00
Hausman	655.33	996.90	885.84	714.48	1308.15
(Prob)	0.00	0.00	0.00	0.00	0.00
Observations	270	270	270	270	270
Number of countries	6	6	6	6	6

Robust standard errors in brackets. p-values indicated with asterisk where *** $p<0.01$, ** $p<0.05$, * $p<0.1$

To estimate the effects on economic growth per worker, I test equations *(12)* to *(16)* (Table 2). The coefficients of land-labor ratios (*gnh* and *gnl*) are not statistically significant – with only one exception of the coefficient of *gnh* significant at 10 per cent in model (2)– so we reject the technical dimension of appropriability hypothesis because the abundance of land by type does

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not explain growth. Contrasting with this outcome the growth rate of high aptitude land (*ghw*) results positive and significant to explain agricultural economic production (per capita). In other words, the determinant factor of growth in agriculture of settler economies is the increasing use of high aptitude land (changes in the scale of use of the main factor) independent on its relation with labour.

Table 2. Growth of agricultural gross product per worker, natural resources and institutions. Panel data analysis, FE (Fixed Effects Model)

Dependent variable: Growth rate of agricultural product per worker [g]

Variables	(1) FE	(2) FE	(3) FE	(4) FE	(5) FE
gnh	-1.912	-1.711*	-1.928	-1.805	-1.937
	[1.094]	[0.794]	[1.056]	[0.932]	[1.027]
gnl	2.077	1.770	2.132	1.868	2.108
	[1.423]	[1.041]	[1.408]	[1.241]	[1.355]
ghw	1.982**	1.831**	2.005**	1.879**	1.999**
	[0.757]	[0.547]	[0.745]	[0.651]	[0.717]
glw	-1.829	-1.509	-1.873	-1.600	-1.838
	[1.265]	[1.007]	[1.252]	[1.181]	[1.204]
cim	-0.000688				
	[0.0156]				
nhcim		-0.308*			
		[0.152]			
nlcim			0.0568		
			[0.146]		
hwcim				0.0892**	
				[0.0311]	
lwcim					0.0412
					[0.0919]
Constant	0.00698	0.0245	0.00311	-0.00234	0.00392
	[0.0152]	[0.0159]	[0.0151]	[0.0126]	[0.0121]
Rsq					
Within	0.93	0.93	0.93	0.93	0.93
Between	0.96	0.74	0.96	0.90	0.92
Overall	0.91	0.88	0.91	0.90	0.91
F-stat	668.96	695.95	669.91	685.44	670.97
(Prob)	0.00	0.00	0.00	0.00	0.00
F all u_i=0	7.00	8.26	7.04	8.30	7.22
(Prob)	0.00	0.00	0.00	0.00	0.00
Hausman	36.94	44.63	22.68	26.82	26.62
(Prob)	0.00	0.00	0.00	0.00	0.00
Observations	264	264	264	264	264
Number of Countries	6	6	6	6	6

Robust standard errors in brackets. p-values indicated with asterisk where *** $p<0.01$, ** $p<0.05$, * $p<0.1$

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As before, the direct effect of institutional quality (*cim*) is not statistically significant while the interaction with natural resources results significant –models (2) and (4)– when we consider high land aptitude. This effect is negative for the relative indicator (land-labour ratio, *nhcim*) and positive for the index in absolute terms (*hwcim*). In other words, institutional quality contributes positively with agricultural growth when it acts through the expansion of land of high aptitude. However, it influences negatively when it acts through land-labour ratio, which would show the existence of decreasing returns in the agriculture (this would be the sense of the curse). Institutions only are relevant in the case of land of high aptitude which would constitute evidence of the institutional dimension of the appropriability hypothesis (differential effects by type of land exist).

Finally, the exercises referred to income distribution show how the specification of abundant resources presents significant and positive coefficients that do not reject the curse hypothesis (see Table 3).

Table 3. Income distribution, natural resources and institutions. Panel data analysis, FE (Fixed Effects Model)
Dependent variable: Land rents/Wages [rw]

VARIABLES	(1) FE	(2) FE	(3) FE	(4) FE	(5) FE
nh	13.42*	18.22**	13.85*	13.58	9.391
	[5.398]	[5.125]	[6.398]	[8.228]	[5.009]
nl	-5.674*	-3.644	0.900	-3.652	-2.955
	[2.270]	[3.147]	[6.443]	[4.507]	[2.644]
hw	5.573***	5.197***	5.292***	6.847**	4.779***
	[0.466]	[0.640]	[0.629]	[2.534]	[0.585]
lw	22.37*	22.22*	23.18*	21.38*	23.88**
	[9.046]	[10.05]	[10.29]	[9.962]	[7.385]
cim	-1.061*				
	[0.416]				
nhcim		-8.444*			
		[3.384]			
nlcim			-7.490		
			[6.356]		
hwcim				-2.091	
				[3.456]	
lwcim					-5.554***
					[1.182]
Constant	-0.550	-1.336	-1.521	-1.405	-0.929
	[1.297]	[1.300]	[1.383]	[1.499]	[1.068]
Rsq					
Within	0.5196	0.5156	0.5022	0.4819	0.5365
Between	0.5346	0.5707	0.5318	0.4995	0.5846
Overall	0.4305	0.4589	0.4262	0.4038	0.4761
F-stat	54.72	53.85	51.04	47.06	58.57
(Prob)	0.00	0.00	0.00	0.00	0.00
F all u_i=0	40.12	33.73	40.29	34.11	22.58
(Prob)	0.00	0.00	0.00	0.00	0.00
Hausman	862.24	299.65	468.3	287.96	127.75
(Prob)	0.00	0.00	0.00	0.00	0.00
Observations	264	264	264	264	264
Number of country	6	6	6	6	6

Robust standard errors in brackets. p-values indicated with asterisk where *** $p<0.01$, ** $p<0.05$, * $p<0.1$

The land-labour ratio for high land aptitude (n_h) results positive and significant in three models —*(1)*, *(2)* and *(3)*— and the corresponding ratio for low quality (*nl*) in only one —model *(1)* at 10 percent— and with a negative sign. The coefficients for high land aptitude show more intense effect on the worsening of income distribution. Therefore we find evidence in favour of the appropriability hypothesis of natural resource abundance because expanding the frontier by better lands, in relation with the labour used in the production, deteriorates the inequality more intensively. The first trend repeats for the absolute indicators where both coefficients —of high

(*hw*) and low land aptitude (*lw*) – are positive and significant but the last result higher. In other words, as I expected, higher quantity of land in production are "bad" for income distribution because the absolute availability reduces. However, and contrary with what I expected, the impact of low aptitude land is more intense.[12] A conjecture to explain this paradox result is related with the timing of the expansion. Land frontier expansion was not a lineal process and sometimes it is possible to find "islands" of movements in the territory. For instance, considering the productive specialization and the key role of ports, the progressive and radial expansion from Buenos Aires that Argentina underwent was an expected process. But the way to take possession of the high aptitude land of the Pampas and the South was precisely to incorporate low aptitude land. This was similarly in Australia, where the land became more arid the farther from the coast the producer moved, or Canada, where the exceptional prairies were all far 2,000 km from the eastern coast. Then we find evidence that the manner to incorporate the best lands was to people land of lower quality and, together with the timing of the process (Willebald, 2011, 2013b), this affected income distribution.

As I expected, institutional quality improves directly the income distribution –negative coefficient of *cim* in model *(1)*– and the institutions maintain their incidence when we evaluate the indirect effect of *CIM* interacting with the land-labour ratio of high aptitude – *nhcim* in model *(2)*– with a higher coefficient (-1.1 vs -8.4). However, the interaction coefficient for low quality (*nlcim*) is not significant. This means that it is relevant the type of land through land frontier expansion occurs and this offers evidence favourable for the institutional dimension of the appropriability hypothesis. Finally, the coefficient of the interaction with the absolute land expansion of low aptitude for grassland –*lwcim* in model *(5)*– results negative and significant counteracting –at least partially– the worsening in income distribution.

Then, I consider five highlights of the analysis:

(i)   I reject the curse of the abundance of natural resources (land) on the agricultural production of settler economies during the First Globalization (considering income per worker and growth rates) but I do not reject the curse hypothesis as regards income distribution.

(ii)   The technical dimension of the appropriability hypothesis does not operate for agricultural production but it appears as a significant issue in terms of income distribution. In other words, better lands –those capable to generate greater rents to appropriate– are more favourable for agricultural production but they increase inequality more intensively.

(iii)   Institutional quality would not imply higher incomes per worker or growth rates in the agriculture acting alone, but it would induce positive effects on level income interacting with high and low quality land equally. In other words, institutional quality results important for agricultural income beyond the type of land.

(iv)   Institutional quality offers different effects on agricultural economic growth of high aptitude land, resulting negative for land-labour ratios and positive for absolute expansion of this type of land.

(v)   Institutional quality would improve the agricultural income distribution acting alone, and the interaction with high aptitude land intensifies the positive effects. Therefore, institutional dimension of the appropriability hypothesis operates in distributive terms.

These exercises are far from conclusive –basically because the data base is small– but they indicate interesting insights. The most important shortcomings derive from the analytical

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[12] For instance, taking model (2) the confidence intervals at 95 per cent for the coefficient *hw* [3.55 6.84] does not include the number 22.2 of *lw*.

treatment of the institutions. At least, it is possible to identify three clear limitations of this approach.

First, the complexity of the institutional arrangements (in structure and change) is reduced to "one number". It is clearly questionable whether we can add up all kinds of different institutions into a composite concept and measure its quality. It is true that it may be useful to study some economic relationships, but it minimizes the analytical and explicative power of institutions in economic development.[13] Besides, identifying an indicator of the enforcement of the contracts (*CIM*) as an index of institutional quality is an additional critic to my approach because it reduces the "quality" to only one narrow dimension (Fleitas et al., 2012).

Second, in my analysis, I consider institutions as an exogenous component, but an extensive literature exists that emphasizes the endogeneity of the institutions.[14] A classical discussion in the study of settler economies is about the *latifundia* and the huge damage on economic growth of this property structure (i.e. CIDE, 1965, for Uruguay; Heaton, 1925, for Australia).[15] However, several authors argue that those large estates are not given structures but the results of economic and technological forces (i.e. Williams, 1975, for Australia); this is an analysis perfectly compatible with the notion of institutional endogeneity that will be faced in deep in future stages of the research.

Finally, statistical exercises based on a "macroeconomic" level do not deal with the different decision behaviours of the agents.[16] It is true that in settler economies agrarian interests were early in contact with political power inducing decisions or participating directly in the government. My approach would capture the expressions of the relationships among agents in a macro level. However, with this approach is unlikely that we understand the specific actions of different groups.

The way to solve, at least partially, these deficiencies is to propose a complementary approach. A first step in this direction is to identify the specific institutional arrangements that regulate —formal or informally— the appropriability conditions of the land (and, as consequence, of the rents). Following previous works (Álvarez & Willebald, 2013; Willebald, 2013b) I describe the process of the distribution of land property rights and the characteristics of the land tenure systems in a historical and comparative perspective considering, as illustration, four economies of the "club": Argentina, Australia, New Zealand and Uruguay. Therefore, I will pay attention to the previous shortcomings in three complementary directions.

First, it is possible to give additional dimensions to improve the representativeness of the institutional indicator. Second, I consider elements that characterize the endogenous formation of institutions in the society as political confrontations, influence of different power groups or the incidence of technological issues. Finally, when I describe the process of distribution of land property rights I propose an approach to the agents' decisions.

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[13] For a critical overview, see Chang (2011).

[14] See Alston & Mueller (2005) and Chang (2011) for a literature review.

[15] It is not matter of this paper but the characterization of the respective productions (type of specialization) contributed with the explanation of the landownership concentration degree (Willebald, 2013b).

[16] Strictly, in my model I assume behaviours identified with representative agents (for agriculture and manufacturing) that, obviously, can not represent the actions and interests of different groups.

4. Appropriability and the formation of the land ownership system

In the 19th century one of the main social and economic processes in the settler economies was frontier expansion and the creation of institutions (formal and informal) that determined wealth distribution and conditions of income inequality (Álvarez & Willebald, 2013; Willebald, 2013b).

Land tenure refers to the collection of rights and obligations under which land is held, used, transferred and inherited. The meaning of the concept varies with the social and historical context. It is used to allude to land tenure prescribed by statutory or common law, to customary land tenure, and to practices or routines (Alston & Mueller, 2005; Shivji et al., 1998). Specification (definition and interpretation) and enforcement of land ownership rights constitute two fundamental dimensions in the process of the appropriability of natural resources because they affect the timing of settlement and the use of land. From a conceptual point of view, formation of land ownership system is as important as the role of the state in establishing land ownership rights and I consider the relation between both components to make concept of appropriability more precise.

Land ownership systems can be categorized in line with three essential points: (i) presence or absence of formal land deeds, defined as the registration of land ownership rights with a government authority; (ii) the extent of landowner and landholder rights to contract voluntarily for use of the land; and (iii) the spectrum of private-communal ownership rights to the land; in this there are two extremes, one is the independent farmer owning land with freehold deeds, and the other is bound labourers working on plots of land temporarily assigned to them by the authorities in a communal system.

Arrangements governing land ownership rights vary depending on who specifies them and who enforces them. In these two dimensions the possible actors range from the first person that claimed ownership of the land in question (the claimant) —or a group of claimants who act collectively— to the state that is interested in the "agrarian question" and acts on the matter.

Usually it is the state that defines, interprets and enforces land ownership rights. The definition of these rights is a legislative function of the state, the interpretation is a judicial function and enforcement is a police function. These functions entail costs and in consequence the state may leave some rights as open access (*de jure* or *de facto*). There are incentives for individuals or groups to expropriate the right to use land exploiting attributes that the state leaves as open access. In many situations, actors use violence as a strategy to capture land ownership rights. By individual enforcement we mean the efforts that individuals make to maintain their rights (putting a fence around the land, posting "no trespassing" signs in "strategic" places, etc.). Governments enforce land ownership rights through the police and courts (Alston & Muller, 2005).

In the economies of recent European settlement, the colonizer state (Crown) had an additional function. The doctrine underlying the traditional view of settlement was that in the age of discovery the "new" areas were *"terra nullis"*. European rulers adopted the position that territories without political organization, systems of authority or legal codes could legitimately be annexed. This view, with slight differences, embodied the idea that Europeans were superior to native peoples because they were civilized and Christian (Reynolds, 1987). For decades there was debate about land ownership, tenure systems, prices, conditions of tenure and land taxes, and the authorities established a variety of frameworks and instruments, which yielded differing results.

As regards the typology of political states, some authors (Auty & Gelb, 2001; Leftwich, 1995) differentiate between "developmental" states and "predatory" states. Developmental states act in an autonomous manner and pay attention to long run welfare maximization, while predatory states have factions and act in the service of section interests. Participation of state in the distribution of land ownership rights and the creation of a land ownership system provides interesting ways in which states can be characterized. It is not my aim to find evidence about this, but the description will shed some light on the matter. In particular, I identify two models.[17] One of them —which is closer to the "British model"— is characterized by an active state with developmental features that promotes a pattern of greater equality. The other — "Hispanic model"— is dominated by a state pressured by financial difficulties, recurring disorder in the administration of public land, and a high degree of intervention by the agrarian oligarchy in political power, all of which promoted income concentration.

4.1 Australasia vs. River Plate systems

It is possible to identify two land distribution patterns in settler economies that derived in different ownership structures and land tenure systems.

Australasian historiography has emphasized that the process of land distribution in Australia and New Zealand was highly idiosyncratic, representing a factor that contributed to the emergence of an agrarian society with high standards of living and democratic values. Distribution of land constituted a political and economic resource that state used widely in the 19th century (especially in the second half) to promote better uses of land and the intensification of settlement. British colonial regime established a strong state that regulated settlement of European colonists and attempted to promote equitable land distribution. This process was governed by a legal framework that transferred property rights from the Crown to colonists, and this ensured the effective ownership of land and moderated land concentration. These objectives were achieved because both states had enough political and institutional power to guarantee secure property rights and it favoured a suitable functioning of the productive factor markets. Markets working accurately are related with the high salarization in the agrarian activity (Willebald, 2013a) and it constitutes an evident difference with the River Plate.

Land was considered as an important economic resource in economies like Australia and New Zealand that were based on agricultural production and that needed immigrants in order to develop, and this importance was expressed in public policies. Land was also important as a source of fiscal income, together with the transference of land ownership rights, and different tenure regimes were set up (leasing, grants, sale by auction, etc.). Leasing systems made it possible for small agricultural producers without enough capital to become owners to access land. In addition, state limitations on the size of estates moderated the trend towards land ownership concentration (Álvarez, 2007).

In Argentina and Uruguay land distribution started before the wars of independence and therefore developed under the Spanish legal regime.[18] In that period land was not very valuable as the main economic resource was wild cattle. Large estates (*latifundia*) came into being because populations were very small and the Spanish forces in the Viceroyalty of the River Plate were politically weak and mainly concerned with combating resistant native populations to the west and the south and the Portuguese Empire in the east. According to the Spanish land distribution laws, colonists were supposed to physically occupy the land and to produce on it but, in fact, these conditions were not fulfilled.

Most land frontier expansion and the transfer and distribution of land ownership rights occurred after Argentina and Uruguay became independent. This process involved the transfer

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[17] For New Zealand and Uruguay also see Álvarez (2008).

[18] Wars of independence took place in the second and third decades of the 19th century.

of public land from the state to settlers through a variety of different legal regimes that moved incoherently between direct sales and leasing. Direct sales were inspired in liberal principles and it was aimed at transferring land to the private sector, and the leasing, as a system, was an effort to retain public land as a source of fiscal income and thus support the public debt. However, it turned out that neither Argentina nor Uruguay benefited for the transfer of land. Both countries lacked the political power to make an ordered distribution of land. Until the last quarter of the 19th century both states were weak in political, institutional and military terms, and land distribution process favoured social and economic groups and local elites. During the First Globalization land became much more valuable because of its connection with rising international commodity prices, and large estates consolidated their position in the land ownership structure. These social groups also supported the oligarchy regimen that dominated the political scene up to WWI. A basic concept in the Argentine Constitution of 1853 was *"to govern is to settle"*, but it turned out that the force of the facts were stronger than ideas and most of the land fell into the hands of capitalists and absentee landowners rather than settlers and the work on land (Cárcano, 1971 (1917)).

Until the last third of the 19th century, land distribution pattern in the River Plate lacked secure ownership rights and was further undermined by political weakness on the part of the authorities. Public policies were incoherent and inefficient, and when land ownership rights finally became more secure (in the 1880s) the result was that a highly concentrated ownership pattern was consolidated. For decades the authorities focused their efforts on organizing the country and the provinces instead of on how land was distributed within those boundaries. A combination of deficient functioning of productive factor markets, a strong identification between economical and political power (related to colonial heritage), and a persistent social differentiation based on idiosyncratic factors, explains land concentration and the increasing worsening income distribution associated with it during the last decades of the 19th century.

4.2 Similarities and differences

As it was proposed in a previous work (Álvarez & Willebald, 2012; Willebald, 2013b), conceptually, land frontier expansion and the creation of a new landownership regime during the 19th century was dominated by four principles:

(i)   Creation of a private land tenure system whereby, depending on the period and with differing intensity, land ownership was transferred to the colonizers. Initially the land was freehold and this was seldom questioned, but it was not long before doubts began to arise, especially towards the end of the 19th century, and there were tentative experiments with leasehold systems that were not always well thought out.

(ii)   There was a permanent idea that a new population should be brought onto the land so as to create a society based on immigrants.

(iii)   Authorities were increasingly convinced that land was the national wealth and land settlement was the source of prosperity.

(iv)   There was a notion that equality in land distribution was valuable in the construction of an independent and democratic nation.

Under these principles, authorities faced similar problems:

(i)   Strictly speaking, land was not "empty". The expansion of frontier meant displacing native population and taking over the land they had subsisted on for centuries. According to the dominant vision, land had to be brought into civilization and put to use, and the best results would be obtained by bringing in settlers to establish a stable, sedentary society of farmers (Williams, 1975, p. 63).

(ii)   There was a certain amount of theory involved,[19] but basically the way land was administered and how ownership rights for public land came into being was a matter of trial and error. It was very difficult to define land boundaries because of ignorance and information asymmetries, and there were problems too with determining the size of estates and their productive aptitude.

(iii)   Land policies were dominated by conflicts among interest groups. Occupiers used their wealth and influence to evade attempts to reallocate land, and many evasion methods were used such as "dummying", "peacocking" and forcing auctions.[20] Additionally, land oligarchies usually participated actively in the various levels of government and fostered legislation that furthered their own interests.

There are two main models, and there are four main differences between them:

1.   Colonial heritage —as it is used in Acemoglu et al. (2001, 2002) and Engerman & Sokoloff (1997, 2001)— in the River Plate contrasts with the delayed institutional development of Australasia.[21] The absence of "path-dependence" allowed a really "new" system to be created in Australia and New Zealand, close to the British tradition and with the North American system as reference.

2.   Oligarchic elites in the River Plate exerted broad control over land ownership, and with the development of constitutional government they consolidated their hold on political power. This contrasts with the pastoral economy of Australasia that was shaped by rules imposed by a bureaucracy that was relatively disinterested —it was dependent on the Crown— and involved the active political participation of small farmers (Denoon, 1983) motivated by democratic values.

3.   In Australasia the various states participated in the "agrarian question", and a well-organized public administration made it possible to implement and enforce autonomous actions. In contrast, chronic fiscal deficits in the River Plate and continuous political struggle —after the independence and among descendants of colonizers— prevented the implementation of long-run policies. Governments of Australasia set up administrative and institutional arrangements that were closer to the notion of a developmental state (Lloyd, 2013).

4.   Australia and New Zealand shared the same fragment culture and reforms reflected the same fundamental egalitarian, communally focused, working-class radical values that immigrants brought with them. Both societies shaped a socio-political context that put the land question as one of the main issues of the public policy, and politicians, theorists, and common citizens identified early these concerns. Colonial social hierarchy lacked the appearance of permanence and the change of status was a relatively familiar experience. This social homogeneity made a powerful unity in political questions (Lloyd, 2013; Paulson, 1988; Rosecrance, 1964).

Questions of land tenure were enormously important in the political economy of newly settled regions, and the ways in which such issues preserved a greater concern *"with property as a function rather than a right"* (Hawke, 1979, p. 382), provide guidelines to understand such differences. Institutional arrangements than governed the distribution of land ownership and the behaviour of the landowners involved were similar between regions. Regulations were

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[19] The most influential theorists were Robert Wilmot-Horton and Edward Wakefield in the early part of the century, and Alfred Russell Wallace and Henry George toward the end of it.

[20] "Dummying" is acting on the behalf of another individual in legal matters. "Peacocking" refers to the acquisition of the best pieces of land in such a way that the surrounding land is useless to others.

[21] Bértola et al. (2010) present an analysis of the evolution of income distribution in the Southern Cone of South America considering the colonial heritage as a main factor. The concept is not new. It is part of the classical Latin-American economic thought of the 1960s and 1970s (Cardoso & Faletto, 1969; Cardoso & Pérez Brignoli, 1979).

written with the same kind of concerns and interests in mind, and the American system was identified as an attractive model. Agents acted in accordance with their own interests, created mechanisms to obtain land for themselves and took advantage of other proprietors when circumstances permitted. The profound differences between the two systems were that the governments in the River Plate had little capacity to enforce regulations, and there were elites whose power was based on land ownership that influenced state policy (in the sense of Robinson, et al., 2006), a feature that derived from a strong colonial heritage. Authorities in Australasia created a more favourable environment for colonization and land settlement because they had the power to enforce regulations, they were guided by notions of development from the colonial government, and they enjoyed a context that was more stable economically and politically. The evolution and circumstances that the public land faced is a good illustration of these differences.

Occupation of public land was such a chaotic process that at the beginning of the 20th century, when the government sought to implement policies for encouraging agricultural production in Uruguay, the amount of public lands was still unknown (Álvarez et al., 2011). It is likely that these lands represented at the eve of the WWI around 15 per cent of the national territory (Álvarez, 2007), and that the state did not receive income from them. The public lands in Argentina presented similar conditions. Up our knowledge, information about public land is not available for all the country and it is difficult to reconstruct it even in the provincial level.[22] Based on information for several of the "national territories" in 1916, I estimate that these lands did not represent at that time more than 25 per cent of the country. The situation was significantly different in Australasia. Leases under government departments in Australia represented 45 per cent of total territory in 1912-1913 while the land held from Crown, under different tenures, achieved 44 per cent in New Zealand in 1911 (see Appendix).

In this situation, the conditions of appropriability were clearly different and more intense in the River Plate, they had incidence in income distribution (Willebald, 2013a) rather than income generation (growth) —as the econometric model confirms— and were accompanied by idiosyncratic elements that reinforced the consequences of natural resources endowments.

Coming back to the appropriability hypothesis results that environmental factors —represented by landholding system— that control the innovator's ability —the holder's capability— to get returns generated by an innovation —the incorporation of "new" land— characterized two different "models". Within similar economic growth conditions, one of them rendered an income inequality pattern of high concentration and rentier societies (Hispanic model) and, the other, a more egalitarian pattern with higher participation of wages and broader markets (associated with wider middle-social classes) that functioning more efficiently and encourage more equality (British model). The differences in terms of income distribution in the agriculture, land property, capacity of influence of states, colonial heritage and social homogeneity, explain two different ways to interact with the abundance of natural resources.

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[22] Thanks to Prof. Julio Djenderedjian and Prof. Cecilia Fandos for clearing my doubts up in this point.

5. Conclusions and final remarks

This paper analyses the effect of natural resources on economic growth and the functional income distribution in the agriculture, applying the curse of natural resource hypothesis for guiding the discussion. My motivation is that settler economies are characterized by abundance of natural resources, but natural capital is not homogeneous in composition (soils, humidity, temperature) neither in intensity (of extraction and use) and it determines differences in terms of economic development. I focus on the action of the abundance of natural resources that a country posses and the quality of its institutions in terms of the appropriability of a resource. Methodologically, I propose two approaches. One of them is based on the estimation of the statistical relationship between economic performance, natural resources and institutions. The other consists in an historical description of the distribution of land ownership rights and the institutional arrangements related to land property in four countries: Argentina and Uruguay (as Spanish ex-colonies) and Australia and New Zealand (as English ex-colonies).

In accordance with the first approach, I elaborate a gradient of appropriability natural resources abundance taking in account the relative land frontier expansion (land-labour ratio) by type of land and associating high land aptitude indicators with higher degree of appropriability. I reject the curse of the abundance of land on the agricultural production of settler economies during the First Globalization but I do not reject it as regards income distribution. Technical dimension of the appropriability hypothesis does not work for agriculture but it operates in terms of inequality. This means that better lands (those capable to generate greater rents to appropriate) would have influenced positively the agricultural production (level of income per worker) but they would have did worst income distribution.

As Australia, Canada and New Zealand expanded their land frontiers by the (relative) worst lands (Juambeltz & Willebald, 2013) they faced a worsening income distribution less intense than the South America Southern Cone (Williamson, 2002; Willebald, 2013a). However, as natural resources do not act alone, some intra-club discrepancies in terms of agricultural expansion could correspond to factors different than the type of lands.

Institutional quality would imply higher agricultural production per worker (not growth rates), and it would reduce inequality. The indirect influence of institutions (according to the interaction between enforcement of contracts and land resources) by type of land would entail similar consequences encouraging production; i.e. institutional dimension of the appropriability hypothesis does not work in terms of the level of production. However, institutional dimension works for income distribution; i.e. the interaction between institutional quality and high aptitude land renders differentiated results that improve equality.

The second approach is based on an historical description of the distribution of land rights and the institutional arrangements related to land property. Enforcement capacity of authorities in Australasia, determined by the colonial government and a more stable economic and political context, created an environment more positive to the colonization and land settlement. Under these circumstances, the conditions of appropriability were clearly different than in the River Plate reinforcing the previous consequences in terms of inequality.

Considering the institutional arrangements related to land property, they seemed suitable for obtaining high product levels in the agriculture of the club, but inadequate to promote more egalitarian societies. This evolution was more evident in the Spanish ex-colonies than in the case of economies conformed in the Anglo-Saxon tradition, where "good" institutions foster the

blessing (agricultural production) and moderate the curse (income distribution worsening) of natural resources. Disparities in terms of land aptitude would induce different incentives and possibilities to the agents to appropriate rental differentials between types of land. In other words, the appropriability problem will be more intense when the lands occupied are better (higher aptitude) because they would open the chance to appropriate rents. However this expectation would be mediated by the action of institutions and the path dependence of the settlement. The combination of better institutions and the expansion of the frontier by worse lands implied to receive the blessing of the abundance of natural resources in Australasia (a feature extensible to Canada) in productive terms and moderate the curse of an increasing inequality, contrasting with the River Plate (and Chile).

In brief, good institutions were important for the expansion in the agriculture but higher institutional quality implied better equality conditions. The definition, specification and enforcement of property rights were determinant in the agriculture and they allowed increasing the income level per worker, but they were not enough to improve equality. According to the trajectories of members of the club, better egalitarian conditions required specific policies of land re-distribution and the constitution of a state with capacity to act autonomously. Those conditions required an "environment" where the group powers were diffuse and where they operated in a society with idiosyncratic elements that placed the equality as a social value broadly extended. These aspects were predominant in the English ex-colonies where they conformed a specific pattern and clearly different than the Spanish ex-colonies.

Appendix: description of variables and sources

1. Agricultural product per worker and functional income distribution

I use data of agricultural product per worker (1913 constant dollars) and the relation between total land rents and total agrarian wages estimated for benchmarks and lineally annualized (Willebald, 2013a).

2. Institutional quality indicator: contract-intensive money (CIM).

$CIM=(M_2-Curr)/M_2$, where M_2 is a broad definition of the money supply and *Curr* is currency maintain by people (outside banks).

o   Argentina, Australia and Canada came from Prados de la Escosura & Sanz Villarroya (2009). Data kindly provided by the authors.

o   Chile: own elaboration. Data derive from Jeftanovi et al. (2003).

o   New Zealand: own elaboration. Data derived from Statistics New Zealand-Long Term Data Series (SNZ-LTDS) based on Bloomfield (1984) and own estimates. Source reports notes and coins held by the public since 1935 and, for the previous years (1875-1934), the category considers notes in circulation. SNZ-LTDS presents M_2 data for 1877-1913 and, for the previous years, I retropolate by the movement of M_1 series.

o   Uruguay: Román & Willebald (2014).

3. Land frontier indicators

I base my calculations on previous estimates of occupied land according to land aptitude for grassland (Willebald, 2011) and corrections proposed in Juambeltz & Willeblad (2013).

4. Public lands

o   Argentina

Public lands ("*tierra fiscal*") in the national territories from Cárcano [1971(1911)], p. 405. Total area of the national territories in this source does not coincide with the census records and I adjust Cárcano's data to compare with total surface.

o   Australia

Leasing lands under all government departments and total territory from Yearbook (1914), pp. 263-268 (1912-1913). Average hides important differences by state: New South Wales (63%), Victoria (26%), Queensland (74%), South Australia (48%), Western Australia (30%), Tasmania (10%), and North Territory (29%).

o   New Zealand

Land held from Crown (1911) under different tenures is presented, together with freehold and other leases, in Yearbook (1915).

o   Uruguay

Public land is estimated in Álvarez (2007), p. 294.

5. Data

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Table A.1

Data for econometric exercises

		rw	gdpapw	h	l	hw	lw	nh	nl	cim
Argentina	1870-1879	1.96	1,124.9	0.08	0.24	0.05	0.05	0.12	0.16	0.55
Argentina	1880-1889	1.67	1,419.9	0.09	0.28	0.06	0.06	0.10	0.15	0.55
Argentina	1890-1899	1.69	1,810.0	0.11	0.32	0.07	0.07	0.08	0.14	0.55
Argentina	1900-1913	2.51	2,162.0	0.14	0.39	0.09	0.09	0.07	0.12	0.67
Australia	1870-1879	1.64	1,199.8	0.01	0.37	0.00	0.04	0.10	0.17	0.83
Australia	1880-1889	1.88	1,484.5	0.01	0.38	0.00	0.04	0.08	0.14	0.88
Australia	1890-1899	2.04	1,865.8	0.01	0.39	0.00	0.04	0.06	0.11	0.92
Australia	1900-1913	1.56	2,090.2	0.01	0.38	0.00	0.04	0.05	0.09	0.92
Canada	1870-1879	2.09	801.5	0.02	0.09	0.00	0.04	0.03	0.12	0.63
Canada	1880-1889	1.94	971.6	0.03	0.11	0.00	0.04	0.03	0.10	0.72
Canada	1890-1899	1.98	1,171.2	0.04	0.14	0.00	0.04	0.04	0.09	0.79
Canada	1900-1913	2.16	1,715.7	0.09	0.23	0.00	0.04	0.06	0.08	0.86
Chile	1870-1879	3.54	609.0	0.18	1.21	0.05	0.31	0.13	0.09	0.28
Chile	1880-1889	4.06	746.2	0.17	1.25	0.04	0.32	0.11	0.09	0.39
Chile	1890-1899	3.50	766.6	0.17	1.26	0.04	0.32	0.10	0.08	0.51
Chile	1900-1913	2.82	652.8	0.15	1.27	0.04	0.33	0.07	0.07	0.66
N. Zealand	1870-1879	1.21	1,307.9	0.19	0.34	0.11	0.07	0.20	0.10	0.87
N. Zealand	1880-1889	1.26	1,330.8	0.27	0.46	0.15	0.09	0.18	0.09	0.92
N. Zealand	1890-1899	1.53	1,660.0	0.30	0.50	0.17	0.10	0.16	0.07	0.93
N. Zealand	1900-1913	1.77	1,915.7	0.34	0.58	0.20	0.12	0.14	0.06	0.94
Uruguay	1870-1879	1.30	775.6	0.21	0.14	0.21	0.00	0.10	0.05	0.61
Uruguay	1880-1889	1.78	902.8	0.28	0.22	0.28	0.00	0.10	0.05	0.64
Uruguay	1890-1899	1.96	1,287.6	0.38	0.42	0.37	0.01	0.09	0.07	0.69
Uruguay	1900-1913	2.45	1,551.4	0.47	0.61	0.46	0.01	0.08	0.08	0.65

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