NBER WORKING PAPER SERIES

PROPERTY RIGHTS TO LAND AND AGRICULTURAL ORGANIZATION: AN ARGENTINA-UNITED STATES COMPARISON

Eric C. Edwards
Martin Fiszbein
Gary D. Libecap

Working Paper 27750
http://www.nber.org/papers/w27750

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
August 2020, Revised December 2021

We thank Lee Alston, Douglas Allen, Eric Hilt, Ron Johnson, Naomi Lamoreaux, Trevon Logan, Jim Roumasset, and Tom Weiss for valuable comments and suggestions, as well as by participants at the NBER DAE Spring Program Meeting (2021), Society for Institutional and Organizational Economics Conference (2021), Mountain West Economic History Conference, Logan, UT (2020), Seminar on Property, Solstrand, Bergen, Norway (2019), workshop at the Property and Environment Research Center (PERC), Bozeman, Montana (2019), and conference at the Center for Economic Liberty, Arizona State University (2019). We thank Andrew Hutchens for research assistance. All errors are our own. The views expressed herein are those of the authors and do not necessarily reflect the views of the National Bureau of Economic Research.

Property Rights to Land and Agricultural Organization: An Argentina-United States Comparison
Eric C. Edwards, Martin Fiszbein, and Gary D. Libecap
NBER Working Paper No. 27750
August 2020, Revised December 2021
JEL No. K11,L1,L22,N2,N21,N22,N26,N5,N51,N52,N56,O13,Q12,Q15

ABSTRACT

The contributions of Harold Demsetz offer key insights on how property rights and transaction costs shape economic organization. This guides our comparison of agricultural organization in two comparable regions, the Argentine Pampas and the US Midwest. In the US, land was distributed in small parcels and actively traded. In the Pampas, land was distributed in large plots and trade was limited because land was a social and political asset as well as commercial. We analyze why this led to persistently larger farms, specialization in ranching, and peculiar tenancy contracts in Argentina, relative to the US. Our empirical analysis, based on county-level data for both regions, shows that geo-climatic factors cannot explain the observed differences in agricultural organization. We discuss implications for long-term economic development in Argentina.

Eric C. Edwards
North Carolina State University
Campus Box 8109
2801 Founders Drive
Raleigh, NC 27695
Eric.edwards@ncsu.edu

Martin Fiszbein
Department of Economics
Boston University
270 Bay State Road
Boston, MA 02215
and NBER
fiszbein@bu.edu

Gary D. Libecap
Distinguished Professor,
Bren School of Environmental Science and Management
Distinguished Professor of Economics
University of California, Santa Barbara (Emeritus)
400 Daly Avenue
Missoula, Montana 59801
and NBER
glibecap@bren.ucsb.edu

1. Introduction

In a classic study, Demsetz (1967) outlined a theory of property rights as economic institutions, illustrating key points with examples about agricultural organization. He argued that when land is traded smoothly, markets respond to information on expected profits, resulting in modifications in scale, output mix, and other aspects of economic organization. Initial property rights allocations and production structures do not matter. In addition, he argued that if the property rights regime limited the market responses of producers to profit opportunities, this could lead them to make other changes in institutional arrangements. In this paper, we build on Demsetz's ideas to examine the persistent differences of farm structures in the Argentine Pampas and a comparable region in the U.S. Midwest.

These two regions had similar geo-climatic characteristics and produced commodities for the same international grain and livestock markets. Yet their agricultural organization was historically very different: in the Pampas, farms were larger, more specialized in cattle relative to cereals, and relied more upon short-term cash tenancy. Prior research argues that Argentina's concentrated land ownership is one of the causes behind the country's poor economic performance despite its favorable prospects at the beginning of the 20th century (e.g., Scobie 1964; Stein and Stein, 1970; Solberg 1987; Adelman 1994; Amaral 1998). This paper considers the origins, persistence, and impact of land concentration in Argentina relative to the U.S., drawing connections with distinctive features of its agricultural organization.

We argue that large landowners in the Argentine Pampas, whose property rights granted social and political status, behaved differently from small landowners in similar parts of the US Midwest, whose property rights primarily provided commercial benefits. Because landownership in Argentina conveyed additional benefits beyond production and the capital gains of sale, breaking up and selling their land implied a loss in status, ultimately making market-generated changes less frequent or extensive (see Demsetz 1964, 13-15). Consistent with the emphasis of Demsetz (1967) on the role of "laws, customs, and mores of a society" in the functioning of property rights regimes, the bundling of property rights to economic and non-economic attributes of land in Argentina is key to understanding the different agricultural organization of the Pampas with respect to otherwise comparable areas of the US.

A property rights regime that limits how producers can respond to new profit opportunities creates incentives to change or resort to different institutional arrangements. We discuss this thesis of property rights adjustment, advanced by Demsetz (1967, 350), and how it applies to the cases we study. We suggest that adjustment takes place in the United States and also, with important constraints, in Argentina. In the US rights modifications from colonial times onward were made to make land more easily distributed to small claimants, smoothly transacted, and a basis for collateral (Gates 1968; Kanazawa 1996; Libecap and Lueck 2011; Priest 2021). These patterns are not observed in Argentina, where the landed elite opposed land policies like the U.S. Homestead Acts, and political institutions did not support land markets. In the Argentine context, adjustments in agricultural organization in response to new opportunities had to operate through channels other than land markets.

.

In both regions, new profit opportunities were generated as real international wheat prices rose by about 50% between 1895 and 1914, with cattle prices generally static (Jacks 2019). Pampas landowners, who traditionally raised and sold cattle globally, responded quickly. By 1913, Argentina was the largest corn supplier to the United Kingdom and fourth largest source of wheat, with the US the second largest source of corn and largest for wheat. Argentina also was the principal supplier of chilled and frozen beef to the UK, with the US fifth (Ross 1917, 128). While livestock production had economies of scale and required limited labor, intensive grain production required more labor and smaller land plots. Pampas owners might have partitioned their large holdings (*estancias*) and sold their lands as small farms, but they did not do so. They divided parts of their lands for short-term tenancy contracts, holding onto ownership and social status. Production units remained sharply different from the US Midwest, where small, owner-operated farms that relied upon family labor dominated. Such farms were commonly sold, and land sales were a primary source of wealth generation. Easily-traded land was a source of collateral, supporting the development of land and capital markets, in contrast to Argentina.

Our empirical analysis uses data from the Argentine Pampas and the U.S. Lower Midwest in the early 20th Century. The U.S. region we call the ``Lower Midwest," which is not an official designation, comprises Arkansas, Kansas, Missouri, Oklahoma, and Texas (plus, in an extended sample for robustness checks, Louisiana, Nebraska, Iowa, Illinois); in terms of official designations, it comprises a southern section of the Midwest Census Region and the West South Central Census Division. We choose this region of the U.S. based on similarities to the Argentine Pampas, which were noted by contemporaneous observers (Eastabrook, 1926). Both regions have similar temperate climates, fertile flatlands, and lie primarily between 30- and 40-degrees latitude.

Farm size, output mix, and tenancy patterns reveal sharp contrasts between Argentina and the U.S. For instance, the average county-level mean farm size in the Pampas was 1,076 acres while in the U.S. Lower Midwest it was 724 acres. Subnational variation allows us to examine how geo-climatic factors influence agricultural organization, and we find that such factors cannot account for the differences in farm sizes, ranching specialization, and tenancy contracts between the two regions. Considering each country separately, we show geographic and climatic features explain a much smaller fraction of variation in farm sizes for Argentina than for the United States. While the empirical design does not directly attribute unexplained differences to specific causes, property rights institutions and costs of market exchange offer very plausible explanations. Following Demsetz, our approach differs from others who have emphasized geography as a primary factor in explaining different economic, social, and political outcomes.

Our analysis also shows that the Pampas had higher specialization in cattle ranching and higher prevalence of cash contracts among tenants, showing that these patterns are also not a result of geo-climatic features. Rather, we argue they were shaped by the incentives to maintain large landholdings. Production of cereals was labor-intensive relative to cattle ranching. Large landholdings would have required substantive external labor to grow corn and wheat, leading to potentially large incentive and contracting problems. The persistence of large landholdings in Argentina therefore favored an output mix with more specialization in cattle production relative to the Lower Midwest. Moreover, when Argentine agriculture shifted to cereals in response to profit opportunities, it did so not by breaking up large estancias, but instead through a peculiar system of short-term cash tenancy contracts that allowed landowners to retain ownership and political status—creating another sharp difference with the U.S., where share tenancy contracts were more common.

If there were immediate costs for the Argentine economy, they were not large enough to preclude a rapid expansion of its participation in world markets in the late 19th century and early 20th century. Like Australia, Canada, and the United States, by the early 20th century it had a large and growing production of agricultural staples, high levels of income per capita, and glowing growth prospects. The longer-term impacts may have been more significant, inhibiting capital markets and rural human capital investment, and contributing to farm labor strikes and political instability.

Our paper contributes to a large literature on comparative development, presenting a contrast with contributions that emphasize the role resource endowments play in shaping agricultural organization (for instance, Engerman and Sokoloff (1997, 2000)). While the emphasis on the key role of property rights and market exchange does not deny the important role of resource endowments, it emphasizes that these differences do not account for the sharp contrast between Argentina and the US. Our emphasis on the role of colonial land policies and their legacies in shaping land allocations, transaction costs, and the flexibility of property rights regimes is in line with the "legal origins" thesis of La Porta et al. (1998, 1999) that highlights the differences in legal traditions former colonies inherited from their colonizers. Finally, our view of the role of landed elites in Argentina highlights, in line with Acemoglu et al (2005), that the evolution of property rights regimes can be constrained by the interests of groups with political power.

The paper proceeds as follows. Section 2 develops a conceptual framework for understanding how property right institutions and the costs of exchange in land markets influence agricultural organization. Section 3 goes over the historical record on the differing colonial property rights policies by England and Spain and subsequent national land policies. Section 4 describes the data and approach used in our empirical analysis, the results of which are presented in Section 5. Section 6 discusses some possible implications of our analysis of agricultural organization for development. Section 7 concludes.

2. Institutional Structures of Agricultural Production

This section outlines a conceptual framework to understand differences in scale, output mix, and tenancy structure. These are presented as adaptation to incentives for land exchange arising from the different property rights regimes in the Midwest and Pampas.

2.1. Scale of production units and output mix

The size of production units is a principal dimension of economic organization in any productive activity, including agriculture. A key notion discussed by Coase (1960) and Demsetz (1967) is that when the transaction costs are sufficiently low, the initial allocation of property rights does not matter for the organization of production. This follows from the so-called Coase Theorem. In agriculture the optimal-scale problem is closely tied to the land's productive attributes like soil quality, climate, terrain, and elevation as well as to the labor intensity of production that varies by output type. The response of agricultural organization to changes in these factors to achieve greater profitability occurs through market exchange. Further: ``[T]he output mix that results when the exchange of property rights is allowed is efficient and the mix is independent of who is assigned ownership" (Demsetz 1967, 349).

Demsetz (1967, 357-8) discusses adjustment of farm sizes and the role of the transaction costs through a thought experiment. He asks readers to consider a situation in which "land was distributed in randomly-sized parcels to randomly-selected owners" who then have to "negotiate among themselves to internalize any remaining externalities." Landowners can make contractual agreements to internalize externalities associated with suboptimal land sizes or else engage in land sales to change the size of the parcels. He suggests that "we have here a standard economic problem of optimal scale." Transaction costs will be compared to costs that "depend on the scale of ownership, and parcels of land will tend to be owned in sizes which minimize the sum of these costs."

Throughout the paper, we consider the implications of costs immediately related to market transactions as well as other relevant costs and barriers to trade. For convenience, we encompass all of them in a broad notion of *transaction costs* or *costs of exchange*. As noted by Allen (2000), a broad definition of transaction costs as "the costs of establishing and maintaining property rights" is common in the property rights literature; Demsetz usually adopted a narrow definition (e.g., in Demsetz 1968, 35, "the cost of exchanging ownership titles"), but at the same time, some of his key contributions are in line with broader notions (see Allen 2000, 903-904, for a detailed discussion).

Low transaction costs require that property rights parameters are conventional, measurable, with verifiable value indicators used by both sellers and buyers (Barzel 2004; Allen 2011, 31-39). If these conditions do not hold, the costs of exchange are higher and market-generated changes are more limited (Demsetz 1964, 13-15). While we describe in Section 3 that property rights to land in the US as commercial assets were easily traded, that was not the case in Argentina. The ownership of land conveyed benefits of social status and political power in addition to its economic returns from production and capital gains of sale. Status benefits could not be traded separately. And since status was not generally traded in markets, it lacked the equivalent external valuation and validation required to facilitate commercial transactions.

The bundling of economic and non-economic attributes of land increased transaction costs and lowered the incentives to trade because status benefits could dissipate with transfers. The status of elite landowning families was tied to the ownership of their large estates and inherited across generations. Customs assigned benefits to them as historical owners, not just to the estate. Historical descriptions of the tie between social hierarchy and land ownership in semi-feudal England (Beckett 1989; see also, Allen 2011, 44-80) and Spanish American colonies (Elliott 2006, 340) indicate a convex function of property size. As a result, parceling parts of estates for sale would erode total status values.

The allocation and nature of property rights to land are key to understanding the Pampas' high levels of specialization in cattle ranching, relative to cereal cultivation compared to the Midwest. These two activities had very different organizational features: ranching was extensive in nature, while cereal production was much more labor intensive and occurred on a smaller scale. Insofar as the property rights regime favored the persistence of large landholdings, this was likely to influence choices about output mix.

The US Midwest small owners relied upon internal family labor where agency costs were limited (Allen and Lueck 1998, 355). They could adjust output in response to price signals with less concern about monitoring and differential incentives of farm labor. By contrast, large landowners in the Pampas used external labor, increasing the degree of asymmetric information on inputs and performance. Misaligned incentives between owners and hired labor could result in shirking, different production and marketing practices, and holdup during critical periods (Klein et al. 1978; Williamson 1985; Demsetz 1988, 151). To limit these problems, large landowners had an incentive to specialize more in ranching, as just a few laborers could handle a large estate with several thousand cattle (Ortiz 1978). This incentive was magnified for landowners who did not reside in their estates year-round, since monitoring, while absent, was even harder.

2.2. Tenancy Contracts

Tenancy transfers some of the economic attributes of land (in particular, its use for production) from the owner to the tenant for a specified amount of time. It does not exchange ownership as in a land market transaction. There are two main types of tenancy contracts, with a core tradeoff for landowners: cash-rent contracts that provide stronger incentives for farmer effort, but also incentivize land overuse and soil depletion, and crop-share contracts that share risk and capital, but also encourage output underreporting (Alston et al. 1984; Datta et al. 1986; Allen and Lueck 1992a, 1993).

In the U.S., by the late 19th century, share tenancy was common, and it often provided an option for farmers to acquire land through purchase at the end of the contract, favoring a widespread "agricultural ladder" pattern of upward mobility (Spillman 1919; Atack 1989; Winters 1982, 137-143; Alston and Ferrie 2005; Alston and Kauffman 1997). By offering farmers the prospect of ownership, share tenancy increased the demand for land rentals and gave landowners a way to discourage soil depletion.

In the Pampas, however, landowners typically did not use share contracts. Their advantage was that they could encourage tenant investment in production knowledge and physical capital. This benefit generally required renewable contracts over a long term. These attributes potentially raised monitoring and measurement costs in output shares. Importantly, renewable, long-term share contracts also could imply a tenant stake in the land. Pampas' landowners, who were often absentee, sought to maintain their ownership status and to lower the costs associated with monitoring output.

As a result, they chose short, often non-renewable, cash-tenant contracts with explicit production instructions, ceding land use rights in only a limited and temporary way. Insofar as tenants provided their labor and little else, the leases designed by large landowners (*estancieros*) were labor contracts, in contrast with the land contracts held by Midwestern tenants.

Tenants were not encouraged to invest in physical capital, nor were they reimbursed for any investments made during the contract term. Landowners specified what crops were to be grown during the time of the contract, including the requirement to sow alfalfa at the end of the contract period. Doing so reduced soil depletion by tenants during the last year, and improved pasture when the land was moved back to ranching. The commitment to leave good quality alfalfa was verifiable. Upon completion of the contract, the relationship between the land and tenant ended. The use of short-term, cash contracts allowed *estancia* owners to shift small plots of land into grain production in response to rising relative grain prices and then to move them back into ranching with fewer laborers, lower monitoring costs, and more clearly measurable livestock output. Through this process, large estates were divided as *estancias mixtas* into small, short-term tenant plots for grains and larger pastures for livestock raising

2.3. Adjustment in property rights regimes

Demsetz (1967, 350) argued that changes in property rights may emerge "in response to the desires of the interacting persons for adjustment to new benefit-cost possibilities." If political/legal support were required to promote trade and institutional change toward more valuable arrangements, asset owners, who would internalize those gains, could mobilize for them. This process has been referred to as the "Political Coase Theorem" (Acemoglu 2003; Acemoglu and Johnson 2005).

As we reference below, in the US, the ability to acquire property rights to land, the uniformity in their definition, and their recognition as collateral were advanced by legislatures and Congress from colonial times through the turn of the 20th century. These actions promoted land markets, which was in the interest of the many small land claimants who sought to occupy and then buy and sell land as a commercial asset. By contrast, this pattern is not observed in Argentina. Large landowners sought to maintain, not trade or diminish their holdings and the bundled economic and non-economic benefits they provided. They resisted political efforts to allow for more entry and exchange of land via markets.

Demsetz's (1967, 350) analysis hints at the possibility of limitations to institutional adjustments created by local particularities of property rights regimes and opposition from relevant parties. We observe this opposition in the Pampas as noted in the historical literature. Our analysis goes further, however, by examining the incentive of large landowners to respond to profit opportunities via alternatives that did not compromise the size of their holdings or their status. Subdividing their lands into short-term tenancies, rather than sale, the *estancia mixta*, provided such an alternative.

3. Colonial Legacies in Property Rights Regimes

In this section we provide an analytic narrative of the differences in property rights to land in the US and Argentina.

3.1. England and the United States

In feudal England, property in land entailed both wealth and privilege. It was part of the social, economic, and political hierarchy that flowed from the sovereign to the nobility. The different classes of landed gentry were signaled by the size of their estates. Those who worked the land as serfs or diverse types of tenants were at the bottom of the hierarchy, with no property claims. The feudal system concentrated political power and social status in a small group, the landed elite, who had incentives to hold on to their estates and the status benefits they provided (Beckett 1989, 545-549).

As English feudalism declined from the 16th century on, land become more transferable as a commodity or asset, rather than primarily a source of political position (Campbell 1942, 67, 156). Land markets gradually became more active after the advent of the agricultural and industrial revolutions, which weakened the position of traditional landed gentry, relative to new industrial and merchant classes and provided new sources of wealth from the reorganization and sale of land. Estates gradually were broken up and sold in smaller parcels (Johnson 1909, 11). Participation in land markets increased among farmers, who had started as tenants, members of the rising merchant and industrial class, and other segments of society (Linklater 2013, 5, 12, 30-8, 58; Johnson 1909, 20, 117).

Landownership remained relatively concentrated through the 19th century (Lindert 1987). But maintenance of heredity status based on land became increasingly costly, while selling property to compensate for lost status benefits became more and more common. Historical legal constraints were relaxed to promote market transactions (Bean 1991; Holdsworth 1927). Over time, landowners became more and more willing to shift land to commercial uses.

Property rights to land in colonial North America were in line with this pattern. All immigrants aspired to own land (Ely 2008, 13). English colonial charter holders intensely competed to attract settlers to create small farms in temperate regions, profitable new communities, and to raise land values as an asset. To do so, British colonial policies quickly made land a marketable commodity and a liquid asset that could be transferred and used to obtain credit (Priest 2021, 21-38). Even large land grants from the Crown were broken up and sold. The availability of fertile land to small holders, who could secure and cultivate freeholds, generated a comparatively egalitarian society (Lindert and Williamson 2013).

After independence, as the U.S. expanded westward via dispossession of land from Native American populations, federal land policies continued to emphasize low-cost, small-scale landownership and exchange. This emphasis was present in the adoption of the Public Lands Survey System under the Land Ordinance of 1785 that placed frontier lands into uniform grids for definition, use, and sale (Libecap and Lueck 2011); military warrants, redeemable for small parcels (Ford 1910, 359-411); recognition of squatters via Preemption Acts (Kanazawa 1996); and after 1862, the Homestead Acts that opened land for widespread claiming and ownership (Gates 1968, 799-805).

Examination of manuscript census and probate records reveals the capital gains from land sales as a primary source of wealth generation, particularly in Midwest states (Kearl et al. 1980; Steckel 1989; Galenson and Pope 1989; Ferrie 1993; Gregson 1996; Stewart 2009). Hartnett's (1991) study of land transfers between 1839 and 1889 in southern Wisconsin reveals a turnover of 12% of land each year. Collateral and cash raised from past transactions or loans from neighbors and relatives were used in these purchases. Hartnett (1991, 47) argues that this record was representative. The close ties linking landownership, collateral, and property markets encouraged nascent capital market development.

As available frontier land declined and Midwestern land prices rose in the late 19th Century, share tenancy became an option for new farmers to acquire land through purchase at the end of the contract. The ultimate aim of tenancy was ownership as part of the agricultural ladder (Spillman 1919; Winters 1982, 137-143; Alston and Ferrie 2005). Share tenant contracts aligned the incentives of owners and tenants through sharing inputs, risk, and joint claims on output (Cheung 1969a, b).

There were influential constituencies for low-cost, rapid transfers of federal lands in small plots, among them members of Congress and Presidents, as illustrated by Thomas Jefferson's well-known support for widespread ownership of small landholdings (Katz 1976, 480). At the end of the 19^{th} century and the closing of the frontier, the Public Lands Commission looked back over the small-farm, homestead principle and concluded in a celebratory fashion: ``The maxim that He who tills the soil should own the soil is accepted as a fundamental principle of political economy… Small holdings distributed severally among the tillers of the soil is believed to be a fundamental condition for the prosperity and happiness of an agricultural population" (US Public Lands Commission, 1880, xxii).

3.2. Spain and Argentina

In contrast to the changes that took place in England, over the colonial period Spanish feudal structures remained in place (Van Bath 1963). Spain's pastoral, grazing economy did not experience major transformations, and the Crown, church, and landed nobility remained at the top of a rigid hierarchical system (Hennessy 1978, 28-30, 161). All land was the property of the Crown, and concessions to hereditary nobility or to non-hereditary office holders were made at the sovereign's discretion. Even by the 18th century, there was no appreciable small-landowner class in Spain like the one growing in England.

A salient case in the organization of primary production in medieval Spain illustrates how forces pushing toward adjustment in property rights lead to adjustments under constraints. The Mesta, a union of sheep raisers, was set up in the late 13th century to maintain rights-of-way for migration and grazing. The Spanish Crown granted the Mesta these privileges in exchange for tribute payments and loyalty, reinforcing a hierarchical system. But as suggested by Nugent and Sanchez (1989) and Drelichman (2009), taking as given the absence of extensive land markets and the logistical challenges of migratory shepherding, this seemingly rigid regime was a second-best institution that fostered the development of Spain's comparative advantage in wool, while enabling flexibility in output mix. In response to changes in terms of trade, the Crown adjusted the incentives for agricultural and shepherding activities through selective enforcement of existing privileges. The Mesta system was thus seemingly in line with Demsetz's thesis of property rights adjustments, under constraints, just like the adjustments we discuss later in this Section for Argentina centuries later.

In the Spanish colonies, the distribution of land rights bundled them with political and social power, mimicking positions held by the Spanish landed gentry (Elliott 2006). Land policies, tightly controlled by the Crown, limited independent colony proprietorships and competing colonial charters as the ones that existed in English North America. In the Pampas, a relatively small number of landowners held huge properties, *estancias*. These estancias comprised in some cases, tens of thousands of acres and only very rarely were broken up for subsequent resale to small holders (Scobie 1964, 45; Adelman 1994, 63-68; Engerman and Sokoloff 1994, 19; Amaral 1998, 24, 25; Hora 2001, 2; Elliott 2006, 40-55; Linklater 2013, 77).

After independence, settlement moved inland across the temperate Argentine Pampas, displacing native populations as occurred in the US. Smaller-scale land distributions and agricultural production might have been feasible, but contemporary observers and subsequent historians, instead emphasize the immense size of observed *estancias* (Duval 1915, 286; Ross 1917 2-7, 51, 153; Estabrook 1926, 60; Zimmerman 1945, 5-6, 14). Owners specialized in livestock raising for export of meat, hides, and other products to Spain. With two key production periods, roundup, marketing, and/or slaughter in the fall and breeding and pasture herding in the Spring, monitoring costs were low for the limited labor required. In contrast to the U.S., as Hennessy (1978, 18) put it, ``the latifundio, not the homestead, became the typical rural institution."

Landownership provided social and political power by facilitating access to critical networks (Losada 2012, 2015). Members of this "aristocratic sphere" participated in exclusive social clubs, sports, and cultural activities that facilitated links with political elites. They gained access to political parties, as documented by Figueroa and Leiras (2014, 2018). These studies show that from 1880 to 1912, landowners, who were more involved as members of exclusive clubs had higher chances of getting political positions, and that once elected they favored legislation in accordance with their economic interests.

In an effort that imitated US frontier land policies and to promote more small-scale landownership, Argentine Presidents Domingo Faustino Sarmiento (1868-1874) and Nicolás Avellaneda (1874-1880) attempted to replicate US Homestead laws and to implement systematic, rectangular plot surveys on remaining government lands in the Pampas (Solberg 1971, 36). These efforts were opposed by large owners, who sought additional access to remaining government frontier land and to avoid restrictions on their economic and political positions (Adelman 1994, 81, 68-77, 89).

To illustrate, the 1876 Law No. 847 or "Ley Avellaneda" provided a survey system of 40,000 hectare or approximately 100,000-acre sections with individual plots of 100 hectares, about 250 acres. 1% of each section was to be town-owned and 19% communal property (Scobie 1964, 118, 121-126; Yuln, 2012). The law also forbade the purchase of large land blocks by a single person. Land sales of small plots, however, were limited, and shortly after land policy reverted to favoring the interests of large landholders. A new law, No. 947 passed in 1878, allowed for larger distributions of 25 plots of 10,000 acres each, almost 25,000 acres, 100 times the size of plots allowed under the 1876 law (Adelman 1994, 81, 68-77, 89; Yuln, 2012). In contrast to the US, each individual 10,000-hectare plot was larger than a whole US township, which was subdivided into 36 sections of 640 acres each or quarter sections of 160 acres. By comparison, the smallest units in Argentina's 1878 law were 62.5 times the size of quarter sections. Large landholdings continued to be favored following the military campaigns directed by Julio Argentino Roca as Minister of War and then President, which seized large amounts of land from indigenous peoples.

Although *estancias* historically were devoted to livestock raising, as the real international price of wheat rose (Jacks 2019), there were incentives to shift some land to cereal production. In this regard, Argentine landowners were successful, and the country became a leading grain exporter by 1913 (Ross 1917, 128). Some new production came from small holdings via colonialization schemes in the province of Santa Fe (Scarzanella 1989, 3). The major source of new grain output came from institutional innovation by *estancieros*, a shift to labor markets and use of tenant farmers, rather than the division and sale of their properties. To achieve optimal scale in grain production the resort to labor markets was more attractive than the use of land markets. Large land owners generally did not want to sell their lands, and instead parceled them into small tenant plots for grains, while maintaining larger holdings for livestock. As noted above, these practices, *estancia mixta* or mixed estates, allowed for both cattle and cereals production under different organization structures, but the same ownership (Conde 1966; Slutzky 1968; Palacio 2002; Scobie 1964, 52, 72-88; Adelman 1994, 77, 133-135, 202-149; Scarzanella 1989, 3, 5).

Large landowners rented fractions of their properties to cereal farmers as cash tenant leases, *arrendamiento*s. These leases typically were short-term, 2- to 5-year contracts on a plot of 100-200 hectares, that generally were not renewed (Scobie 1964, 52, 72-88; Solberg 1971, 20, 40; Scarzanella 1989, 3; Adelman 1994, 77, 133-135, 202-149). Tenants then moved to another plot or *estancia*. As noted above, the contract required cultivation of alfalfa during the last year of the contract to improve subsequent pasture by fixing atmospheric nitrogen, and to reduce over-cultivation in wheat by tenants (Cortez Conde 1966; Slutzky 1968; Scarzanella 1989, 3, 5, 13; Palacio 2002). Immigrants to the Pampas from Italy and Spain, where small landownership was unusual, became tenants, or temporary laborers, returning to Italy or Spain after harvest. Unlike those who migrated to the Midwest, they did not expect to own land (Ross 1917, 8-9, 126; Solberg 1971, 40; 1982, 141).

The tenancy contracts that enabled the implementation of this joint production system were described in 1892 in the annals of the *Sociedad Rural Argentina* and became a major feature of Argentina agricultural organization over the next decades. This system enabled landowners to respond to profit opportunities from cereal production, retaining ownership and political status, while at the same time obtaining from tenant farmers improved soil for their ranching activity. The widespread expansion of the *estancia mixta* system during the cereals boom is in line with Demsetz's adjustment thesis where high costs of using land markets led to alternatives, in this case a shift by owners to labor markets via cash tenancy in agricultural production.

4. Comparative Analysis: Data and Empirical Approach

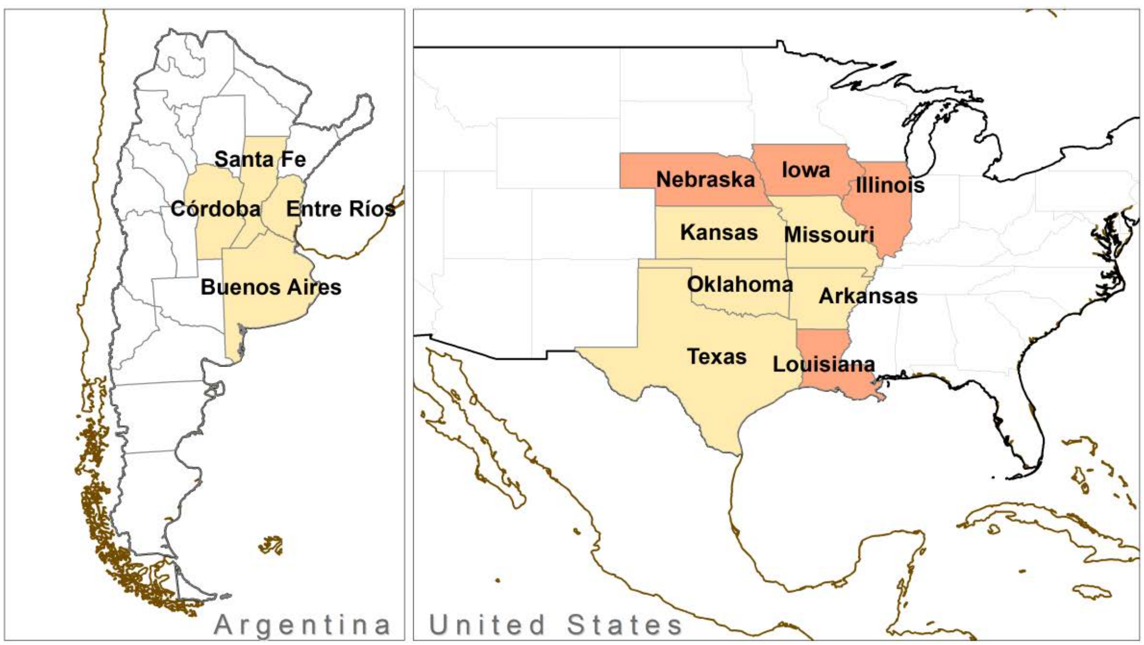
In this section, we describe our approach for a quantitative comparative analysis of the Argentine Pampas and the U.S. Lower Midwest. We begin with discussion of the selection of regions for a meaningful comparative analysis. Then, we turn to variable definitions and sources. Finally, we describe our empirical approach.

4.1. Sample regions and data

We consider four Argentina provinces: Buenos Aires, Córdoba, Santa Fe, and Entre Ríos. These comprised the core agricultural region and most of the country's agricultural output in 1914. We exclude from our analysis the small departments in the province of Buenos Aires located around the city of Buenos Aires, as they were already highly urbanized.

Based on geo-climatic similarities with the Pampas, we consider the states of Texas, Oklahoma, Arkansas, Kansas, and Missouri. The sample regions, shown in figure 1, lie primarily between 30- and 40-degrees latitude. Accounts of contemporaneous discussions suggest that “[t]he Pampa of Argentina is a region similar to portions of the Great Plains country west of the Mississippi, especially portions of Texas, Oklahoma, and Kansas" (Eastabrook 1926, 11).

Figure 1: Sample Areas



Notes: Sample areas with US baseline sample in tan and extended sample in orange; Maps are drawn by the authors.

We refer to the U.S. region as the “Lower Midwest," although this is not an official designation, and only Kansas and Missouri are included as the Midwest as defined by the U.S. Census. For robustness, we also consider an extended U.S. sample that includes Louisiana, Nebraska, Iowa, and Illinois, with the latter three also part of the Midwest as defined by the US Census. Figure 2 displays the regions with some of their key climatic and geographic characteristics. Table 1 shows comparison statistics for the Argentine sample as well as the baseline and extended US samples and the entire U.S. east of the 98th Meridian, the line typically considered the division between the humid and semi-arid regions of the country.

Table 1: Summary Statistics

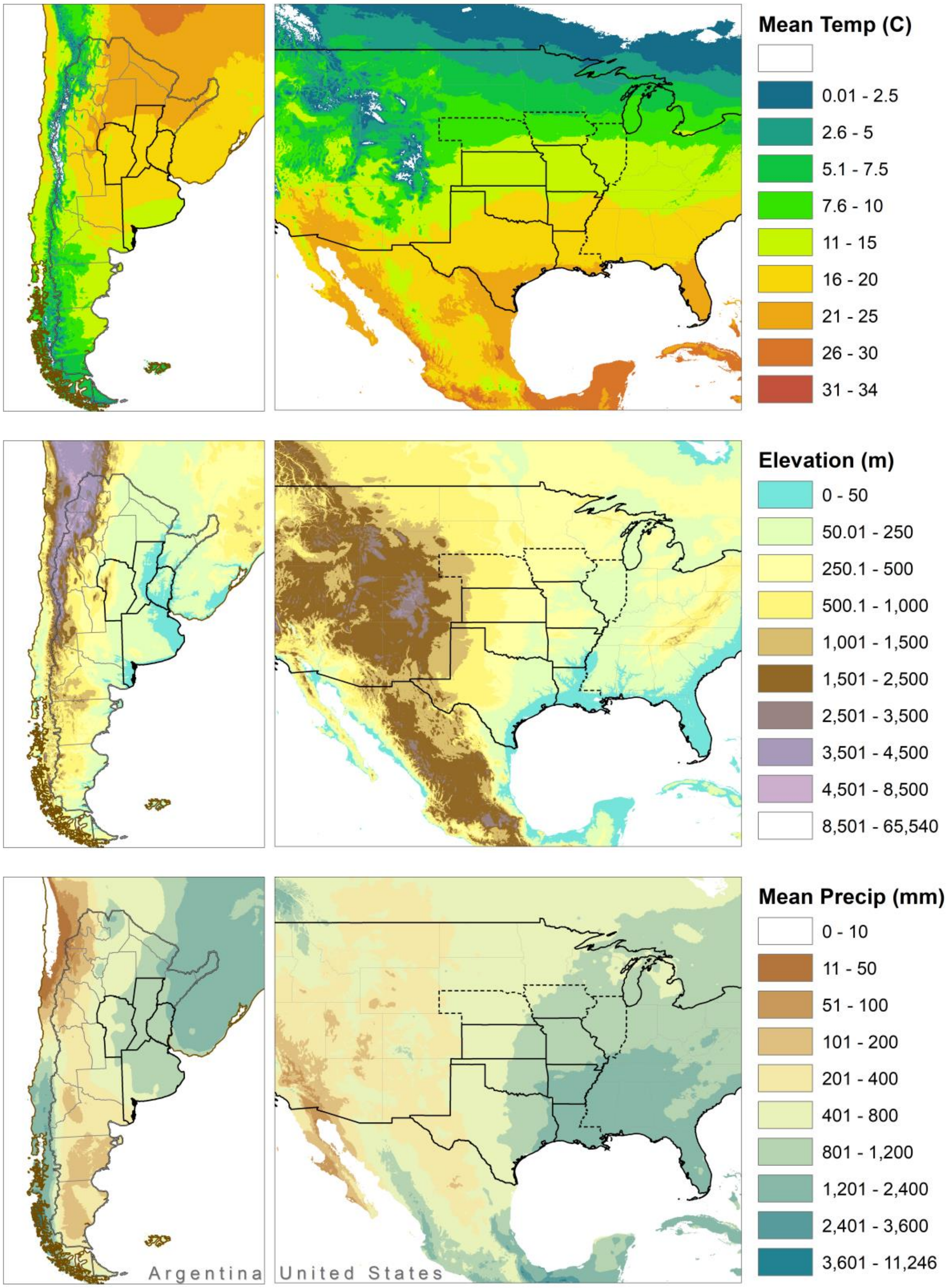
	U.S. East	U.S. Lower Midwest Extended	U.S. Lower Midwest Baseline	Argentine Pampas
Elevation	237.30	357.50	373.40	128.40
	(161.9)	(289.6)	(292.5)	(192.0)
Temperature	12.74	14.06	15.51	16.49
	(4.19)	(3.71)	(2.85)	(1.55)
Precipitation (log)	6.98	6.77	6.75	6.81
	(0.23)	(0.34)	(0.35)	(0.18)
Pasture Potential Yields (log)	7.15	6.53	6.34	7.19
	(0.39)	(1.03)	(1.15)	(0.49)
Wheat Potential Yields (log)	8.66	8.28	8.08	8.31
	(0.22)	(1.20)	(1.46)	(0.26)
Corn Potential Yields (log)	8.96	9.14	9.20	9.18
	(0.68)	(0.12)	(0.06)	(0.02)
Mean Farm Size (log)	4.66	5.29	5.41	6.64
	(0.42)	(1.00)	(1.16)	(0.82)
Cattle per capita (log)	0.26	0.55	0.63	1.58
	(0.74)	(0.99)	(1.03)	(0.95)
Cattle per Farm Acre (log)	0.13	0.22	0.28	0.89
	(0.14)	(0.39)	(0.48)	(1.09)
Percentage of tenants with cash rent	0.38	0.31	0.27	0.71
	(0.24)	(0.22)	(0.20)	(0.27)

Notes: Baseline sample includes all counties in Kansas, Arkansas, Oklahoma, Missouri, and Texas. Extended sample includes in addition all counties in Louisiana, Nebraska, Iowa, and Illinois. U.S. East includes all counties east of the 98th Meridian. Standard deviations are in parentheses. Suitability measures are in tons per hectare of potential yield.

We use number and size of farms, number of farms operated by owners, renters, and rental agreement types, and number of cattle from the 1914 Argentine national census digitized by Droller (2018) and Droller and Fiszbein (2021) and data from the 1910 United States Census of Agriculture digitized by Haines (2010). The data are at the county level for the U.S. and at the equivalent level (*departamentos* or, for the province of Buenos Aires, *partidos*) for Argentina.

In both censuses, data on farms/ranches reported on units run by a single operator, not ownership, and hence, includes rented farms by tenants as separate units. This factor would bias down the actual size of overall owner holdings in the Pampas relative to the Midwest as *estancias* were subdivided into individual tenant plots. Further, the censuses differ slightly in how they report cropland, with the US census reporting improved acres and the Argentine census reporting number and acres in *explotaciones agrarias* or agriculture. We label both of these variables as cropland, although there may be some differences in what is reported under each measure.

Figure 2: Geoclimatic Comparisons



Notes: top: mean temperature (degrees C); middle: elevation (meters above sea level); bottom: mean precipitation (mm/year). Maps are drawn by the authors.

We also collect data from both countries on the number of rented farms. In Argentina, rented farms are further divided into cash-rent and share-rent for establishments in cropland, but only number of renters is provided for ranches—we assume this is because share-rent is not a common form of contract for ranch operations. We construct a cumulative number of tenancy rentals for the Pampas by adding the number of rented farms and ranches. In addition, we construct the proportion of establishments in cash-rent and share-rents.

In the U.S., four categories of rent are provided in the census that cover ranches and farms cumulatively. The additional two categories are cash-share rent and unknown rent. To present a consistent comparison, we categorize cash-share rentals as share rentals and unknown rentals as cash rentals. Our key variable of interest is the number of cash-rent farms divided by the total number of tenant farms.

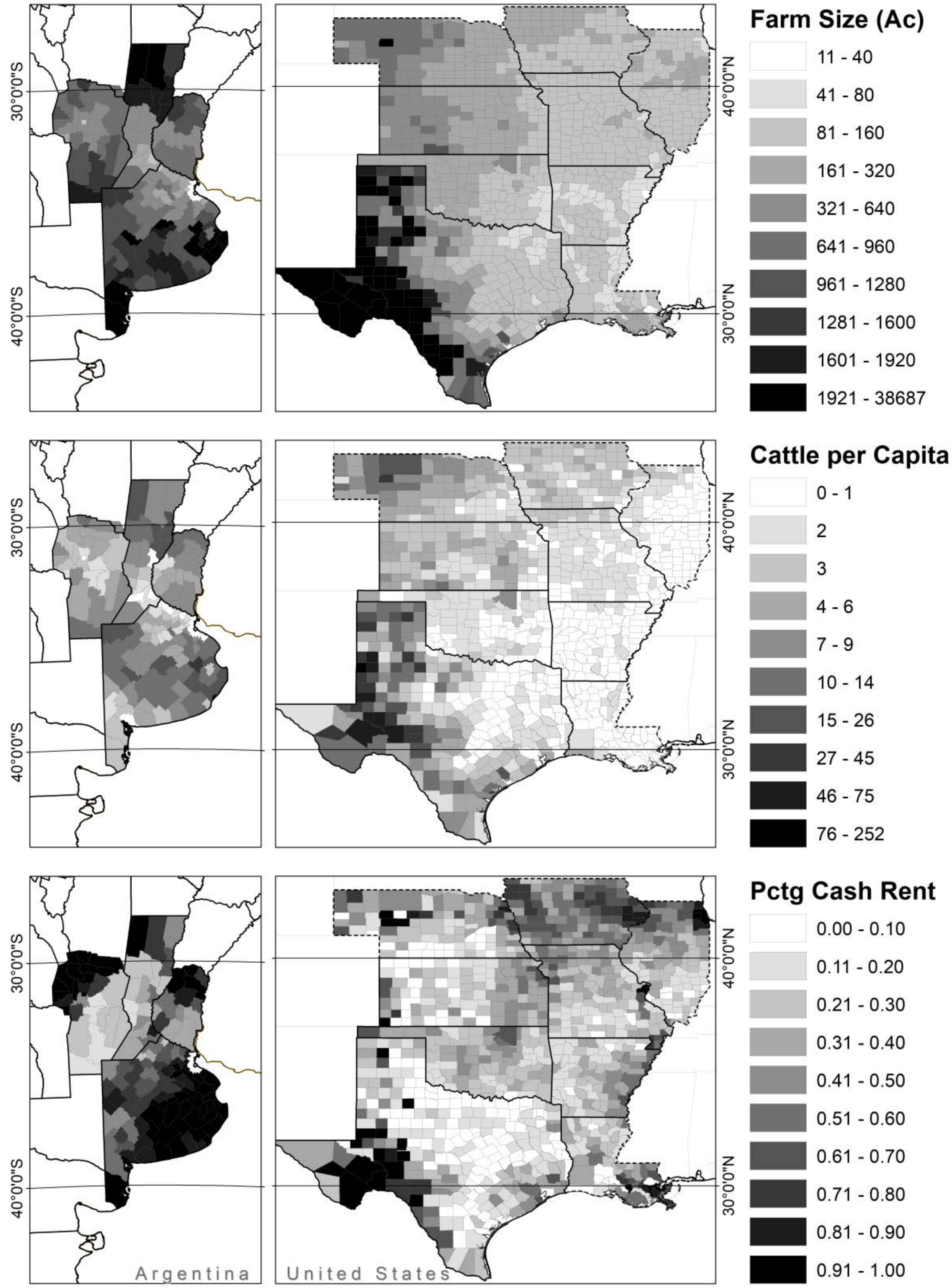
We calculate the average farm size for each county/department as the total area in farms divided by the total number of farms. Both censuses also provide the number of cattle that we use to construct a measure of ranching intensity, cattle per capita, and an alternative measure, cattle divided by total farm area.

To construct geo-climatic descriptions of the historic counties and departments, we extract the area-weighted mean of yearly temperature, precipitation, and elevation using geographical information system software. US 1910 county shapefiles come from the National Historic Geographic Information System produced by the Minnesota Population Center. Argentine department shapefiles are constructed by the authors by modifying a shapefile of the current boundaries using Argentina department maps corresponding to 1914 boundaries as provided in Cacopardo (1967). We extract average normalized attainable yields for pasture, wheat, and corn from FAO's Global Agro-Ecological Zones project v3.0 (IIASA/FAO, 2012).

These estimates employ climatic data, including precipitation, temperature, wind speed, sunshine hours, together with crop-specific factors, thermal suitability, water requirements, growth and development parameters. Combining these data, the GAEZ model determines the maximum attainable yield (measured in tons per hectare per year) for each crop in each grid cell of 0.083x0.083 degrees. We use FAO's measure of agro-climatic yields based solely on climate, not on soil conditions, to eliminate potential endogeneity in soil productivity investments. We do not have historic measures of soil quality for both regions, and current soil quality is related to land-use decisions made subsequent to our period of study. We consider attainable yields under rain-fed conditions using yields for intermediate levels of inputs/technology.

From the US census, the number of farms and area in farms are comprehensive counts that include all ownership types and farming activities as well as ranching. These measures correspond most closely to the Argentine Pampas data on number of *explotaciones agropecuarias* which includes both farms and ranches, and the area measure corresponding to all these establishments. Due to differing definitions and translation issues, we label as “farms” the US farm/ranch total and total Argentine *explotaciones agropecuarias*. Maps of farm size, cattle per capita, and percentage cash rent are shown in Figure 3 (with cattle per farm acre shown in appendix Figure A1).

Figure 3: Comparison of Farm Organization

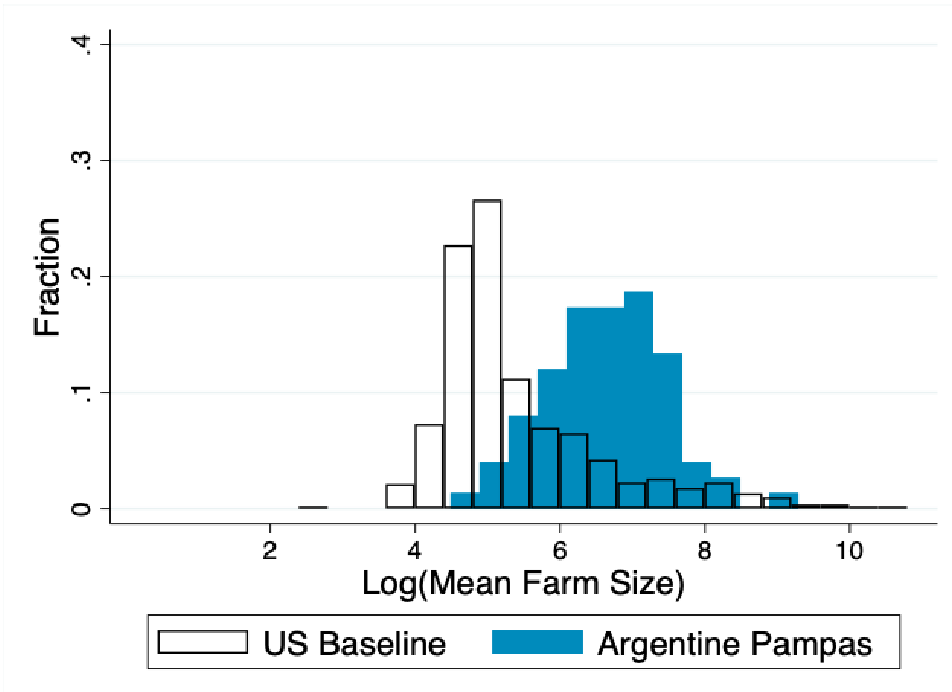


Notes: The top figure is mean county/department farm size in acres; the middle is mean number of cattle per farm acre; the bottom share of cash tenancy as a percent of total tenant farms. Figures use U.S. 1910 Agricultural Census data and 1914 Argentina Census data. Maps are drawn by the authors with identical scales.

4.2 Empirical Approach

Argentine farms are a worldwide outlier in size historically and today (Eastwood et al. 2010; Federico 2008). In the period we study, the average of county-level mean farm size in the Pampas was 1,076 acres while in the U.S. Lower Midwest it was 724 acres. Figure 4 provides a histogram comparing the distribution of county/department mean farm sizes in the Pampas and the U.S. Lower Midwest (the extended sample is shown in Figure A2).

Figure 4: Farm Size Comparison



Notes: Table shows histograms of the overall distribution of average farm sizes (logged) in Argentina and the US. The Argentine sample includes departments in, Córdoba Buenos Aires, Santa Fé and Entre Rios. The US includes counties from Texas, Oklahoma, Kansas, Arkansas, and Missouri.

The larger size of Argentine farms, relative to U.S. farms, as well as other input and output choices, could plausibly be explained by underlying differences in potential agricultural productivity. This would be in line with the contribution of Engerman and Sokoloff (2002), that highlights soil and climate-influenced agricultural specialization patterns and associated levels of land concentration across the Americas. Our choice of the Argentine and US samples to be similar in geo-climatic characteristics, however, is a broad attempt to consider comparable areas.

We rely on subnational data on agricultural organization for both the Argentine Pampas and the US Lower Midwest baseline sample. Exploiting cross-sectional variation, we can examine how geo-climatic factors influence agricultural organization and whether they can explain observed overall differences in agricultural organization between Argentina and the United States. Moreover, we can examine responsiveness to these factors in both countries.

Our main estimating equation takes the following form:

$$y_c = \alpha + \beta \text{ Argentina}_c + \gamma' \mathbf{X}_c + \varepsilon_c, \qquad (1)$$

where y_c is an agricultural organization attribute (e.g., farm size) in county c, Argentina_c is a dummy that takes a value of one for counties in Argentina and zero for countries in the U.S, $\mathbf{X}_c$ is a vector of geo-climatic variables, and ε_c is an error term.

The key outcome of interest is farm size. Estimating regression (1) without including the vector of geo-climatic variables (area-weighted mean of yearly temperature, precipitation, and elevation) simply captures the overall difference between counties in our Argentine and U.S. samples. Including this vector allows us to assess whether differences in agricultural organization between the two regions can be explained by geo-climatic factors. Our analysis in the next section thus establishes differences in the organization of farm production that are not related to these geo-climatic factors. While the empirical design does not directly attribute unexplained differences to specific causes, differing property right institutions offer a plausible explanation as discussed in the prior sections.

One additional exercise provides further suggestive support for the idea that different property rights regimes underlie the differences in agricultural organization. We assess the levels of responsiveness to the geo-climatic factors in each country by splitting the sample and running regression (1) in each sample. Our assumption here is that absent institutional constraints, farm characteristics in each country would respond similarly in sign and magnitude to factors including precipitation, temperature, elevation, and yield. Finally, we examine differences in agricultural organization, including not only farm sizes, but also the output mix favoring ranching specialization and the cash contracts as the preferred type of tenancy.

5. Comparative Analysis: Results

5.1 Farm Size

To understand the difference in farm size between the two countries, we pool all observations and regress farm size (in logs) on a country dummy, with results shown in Table 2. The coefficient in column 1 is the overall mean difference in the size of farms in Argentina relative to the United States. In column 2, we control for geo-climatic variables, and find that the dummy for Argentina is larger. Without accounting for the way in which these factors influence farm size across counties, Argentine farms are over two times larger than in the U.S. However, accounting for geo-climatic factors, the difference becomes even larger, and the estimates imply that under the same conditions, Argentine farms are six times larger than U.S. farms.

We also consider regression specifications including weights for robustness. In columns 3 and 4, we repeat the same exercise with weights by county size. In Appendix Table A1, we do the same using weights by number of farm acres and by the inverse of the number of observations for the corresponding county. The latter is an *ad hoc* specification of weights to check that the results are not driven by the fact that our sample has more US counties (616) than Argentine counties (150). Appendix Table A2 applies the same specifications as Table 2 to the extended sample. In all cases we find that the coefficient on the Argentina dummy is positive and significant, and larger in magnitude when we include geo-climatic controls. Appendix Tables A3 and A4 show that the results do not change when including controls for soil quality and when accounting for spatial dependence using Conley standard errors with various distance cutoffs (in both tables, these additional exercises include the regressions for farm size as well as those for the outcomes considered in Sections 5.2 and 5.3).

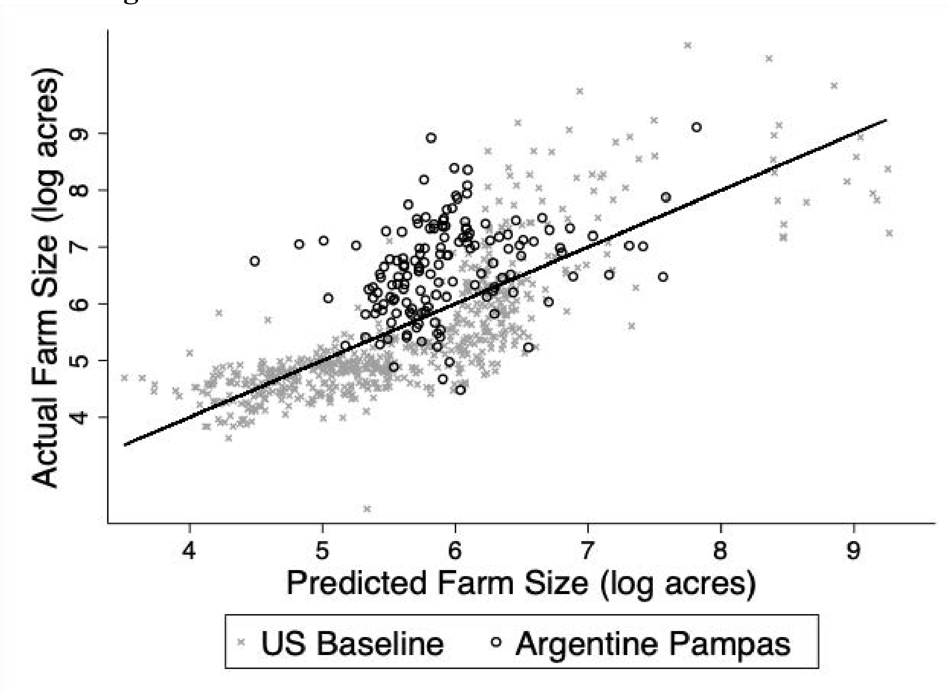
Table 2. Farm Size

	Farm Size (log)			
	No Weights		Weighted by County Size	
Dependent Variable	(1)	(2)	(3)	(4)
Argentina	1.22***	2.06***	1.19***	2.35***
	(0.08)	(0.10)	(0.13)	(0.10)
Elevation (000s)		-0.51*		-0.19
		(0.28)		(0.29)
Temperature		-0.02		0.02
		(0.01)		(0.02)
Precipitation (log)		1.01***		1.46***
		(0.36)		(0.40)
Pasture Potential Yields (log)		-1.20***		-1.30***
		(0.13)		(0.15)
Wheat Potential Yields (log)		-0.12***		-0.10***
		(0.04)		(0.03)
Corn Potential Yields (log)		-3.65***		-4.11***
		(0.60)		(0.68)
Constant	5.42***	41.18***	5.79***	42.15***
	(0.05)	(4.40)	(0.09)	(5.35)
Counties	766	766	766	766
R^2	0.16	0.76	0.16	0.76

Notes: Table shows coefficient estimates for regression of county average farm size (logged) on factors affecting agricultural production. Argentine sample includes departments in Córdoba Buenos Aires, Santa Fé, and Entre Rios. US sample is the baseline sample and includes counties from Texas, Oklahoma, Kansas, Arkansas, and Missouri. Farm size is defined as total acres in farming and ranching in a county/department divided by the number of establishments. Columns 1 and 2 are not weighted, columns 3 and 4 apply importance weights proportional to the acres in a county. Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1.

To visualize the overall size of farms in Argentina, relative to the U.S. we run the regression of (log) farm sizes on the set of geo-climatic factors, with no country dummy. Then, we plot in Figure 5 the predicted and actual farm sizes of farms in both countries and the 45-degree line, where predicted is equal to actual. The Pampas farms generally lie above the 45-degree line, indicating that Argentine farms are systematically larger than the model predicts.

Figure 5: Actual and Geo-Climatic Predicted Farm Sizes



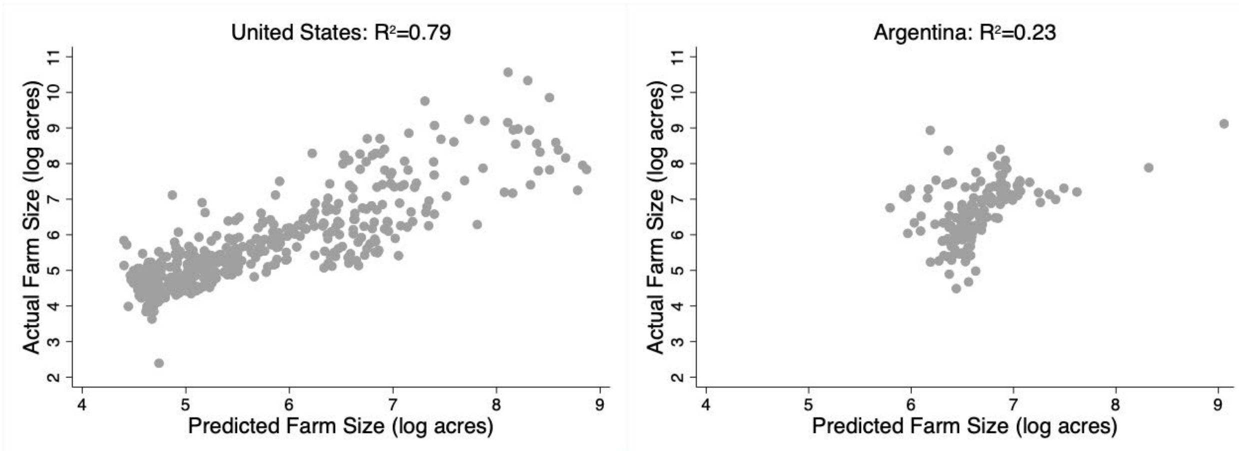
Notes: The predicted mean farm size of a regression on elevation, roughness, temperature, precipitation and corn, wheat, and pasture suitability (logged) plotted against actual farm sizes. Sample includes Argentine Pampas and provinces US baseline Midwest states: Texas, Oklahoma, Kansas, Arkansas, and Missouri.

The difference in farm sizes between the two countries that is unexplained by geo-climatic factors is suggestive of the difficulties in breaking up large land allocations, potentially due to bundled property rights in Argentina, compared to the US. We now test how responsive farm size was to geo-climatic conditions in each country that would ordinarily provide an incentive for altering farm size to address the economies of production under different climate regimes. We run the same regression as equation (1) but with the sample split by country. Figure 6 displays the scatter plots of actual and predicted farm sizes for each country.

Geo-climatic controls explain much less variation in farm size in Argentina than in the U.S., as demonstrated by the Argentine R^2 value of 0.23 relative to a U.S. value of 0.79. While most of the variation in U.S. farms is explained by geography and climate, this is not the case for Argentina, where farms were generally fixed in size and not readily adjusted to climatic conditions via sales. Regression results are shown in appendix Table A5.

One concern with this type of analysis is that Argentina and the U.S. might have different distributions of underlying climate conditions that could be driving the strength of fit. To ensure a common support for the regression analysis, we can limit the U.S. sample only to counties with elevation, temperature, and precipitation levels that fall within the range of these variables for Argentine counties. These results are nearly identical to those shown in Figure 6 (shown in Appendix Figure A3) and using this subsample of the U.S. Lower Midwest, which eliminates 30% of counties from the baseline sample, for all the specifications in our analysis, does not alter the results.

Figure 6: Split regressions and differential responsiveness



5.2. Differences in Output Mix and Tenancy

In his discussion of how the initial allocation of property rights and the level of costs of exchange affect the organization of production, Demsetz (1967) explicitly mentioned the output mix as a key outcome that may be affected.

A salient feature of the Pampas was its specialization in ranching activities. This was also a feature of the Lower Midwest, but not to the same extent. The difference may have plausibly originated in geo-climatic differences, in line with Engerman and Sokoloff (2002). Moreover, Droller and Fiszbein (2021) show that variation in ranching specialization across localities in the Argentine Pampas is partly explained by geo-climatic conditions. But it could also be the case, beyond the influence of geo-climatic factors, that large Argentine landowners in 1914 specialized in ranching to maintain their extensive properties with lower monitoring costs as they shifted back and forth into grain production.

To examine this question, we estimate regression (1) with two measures of ranching specialization: the number of cattle per person and the ratio between the number of cattle and the number of farm acres---as the outcome. The results, shown in Table 3, suggest that as predicted, Argentina's specialization in ranching is not accounted for by geo-climatic conditions.

Turning to tenancy, Table 4 shows the results of a regression of percentage of tenant farms with cash contracts. After controlling for geo-climatic characteristics, the Pampas have a higher proportion of cash tenants among all tenants than the baseline Midwest sample. Appendix tables A6-A7 and A8-A9 provide robustness checks for ranching specialization and cash tenancy, respectively, for the extended sample and alternative weights.

Table 3. Ranching

	Panel A: Cattle per Capita (log)				Panel B: Cattle per Farm Acre (log)			
	No Weights		Weighted by County Size		No Weights		Weighted by County Size	
Dependent Variable	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Argentina	0.99***	1.63***	0.97***	1.99***	0.60***	0.72***	0.34***	0.65***
	(0.09)	(0.15)	(0.10)	(0.19)	(0.09)	(0.12)	(0.10)	(0.16)
Elevation (000s)		0.18		0.76		0.14		0.71**
		(0.40)		(0.57)		(0.34)		(0.34)
Temperature		0.00		0.02		0.05**		0.08***
		(0.02)		(0.03)		(0.02)		(0.03)
Precipitation (log)		0.88*		2.28***		0.33		0.49
		(0.49)		(0.79)		(0.64)		(0.82)
Pasture Potential Yields (log)		-0.77***		-1.03***		-0.16		-0.17
		(0.18)		(0.31)		(0.24)		(0.28)
Wheat Potential Yields (log)		-0.16***		-0.07		-0.15***		-0.14***
		(0.04)		(0.09)		(0.03)		(0.03)
Corn Potential Yields (log)		-3.69***		-4.56***		-2.18***		-3.13***
		(0.70)		(1.01)		(0.51)		(0.65)
Constant	0.55***	34.70***	0.78***	33.58***	0.29***	19.59***	0.45***	26.43***
	(0.04)	(4.93)	(0.06)	(6.45)	(0.02)	(2.70)	(0.06)	(3.83)
Counties	766	766	766	766	766	766	766	766
R^2	0.12	0.51	0.15	0.48	0.12	0.32	0.04	0.33

Notes: Table shows coefficient estimates for regression of cattle per capita (log) in panel A and ranching specialization (cattle per farm acre) in panel B on factors affecting production. Argentine sample includes departments in Córdoba Buenos Aires, Santa Fé, and Entre Rios. US sample is the baseline sample and includes counties from Texas, Oklahoma, Kansas, Arkansas, and Missouri. Columns 1 and 2 are not weighted, columns 3 and 4 apply importance weights proportional to the acres in a county. Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1.

Table 4. Cash Tenancy

	Pctg. Tenants in Cash Tenancy			
	No Weights		Weighted by County Size	
Dependent Variable	(1)	(2)	(3)	(4)
Argentina	0.45***	0.56***	0.36***	0.51***
	(0.02)	(0.03)	(0.04)	(0.05)
Elevation (000s)		-0.05		0.03
		(0.08)		(0.11)
Temperature		-0.02***		-0.01
		(0.00)		(0.01)
Precipitation (log)		0.46***		0.45**
		(0.14)		(0.21)
Pasture Potential Yields (log)		-0.17***		-0.18***
		(0.05)		(0.07)
Wheat Potential Yields (log)		-0.02		-0.01
		(0.01)		(0.01)
Corn Potential Yields (log)		-0.97***		-1.18***
		(0.18)		(0.25)
Constant	0.26***	7.62***	0.29***	9.48***
	(0.01)	(1.33)	(0.01)	(1.78)
Counties	766	766	766	766
R^2	0.41	0.46	0.30	0.38

Notes: Table shows coefficient estimates for regression of percentage of tenant farms in cash tenancy on factors affecting production. Argentine sample includes departments in Córdoba Buenos Aires, Santa Fé, and Entre Rios. US sample is the baseline sample and includes counties from Texas, Oklahoma, Kansas, Arkansas, and Missouri. Columns 1 and 2 are not weighted, columns 3 and 4 apply importance weights proportional to the acres in a county. Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1.

6. Discussion: Implications for Development

Our empirical analysis focuses on the origins and impact of the distinctive features of Argentina's agricultural organization, not on their long-term consequences. However, our examination of how property rights and the costs of land market exchange influence farm sizes, ranching specialization, and tenancy contracts contain insights into their likely longer-term effects that are consistent with historical studies.

As we discussed, despite the persistence of large estates, the Argentine Pampas substantially expanded the production of cereals in response to profit opportunities through the *mixed estancia* system. By design, this system was implemented through short-term cash tenancy contracts. The short-time horizon and lack of renewal of tenancy contracts helped ensure the continued status of large landowners. However, these features likely had broad negative effects on longer-term economic development.

6.1 Investment in Physical Capital

The choice of cash contracts may have led to soil-mining by tenants as suggested by historical narratives. While landowners tried to limit this through stipulations in the cash-tenant contracts, observers claim that soil exhaustion was occurring on tenant plots to some degree (Ross 1917, 229; Scobie 1964, 72-88; Scarzanella 1989, 21). Adelman references a 1900 report by the Ministry of Agriculture on the potential problem of overcultivation by tenants (Duval 1916, 287-8; Ross 1917, 234). We do not have data to assess this impact.

Under tenant contracts, existing equipment and buildings belonging to the owner were to be returned in original condition at the end of the tenancy (Scarzanella 1989, 6-7). Owners did not reimburse tenant investments in housing, and with short-term tenant occupancy and limited family migration, there was less demand for housing stock (Solberg 1971, 22, fn 15; 1982, 138; Scarzanella 1989, 12-14). With no incentives for tenant improvements, contemporary observers and the historical literature describe the low-quality of housing and roads in the Pampas. According to Solberg (1971, 16), in 1925 there were only 1,273 km of all-weather roads in rural Argentina.

6.2. Development of Credit Markets

In the US, land and credit markets developed in tandem. Harnett (1991) describes how small farmers pooled assets to invest in land purchases by relatives. Capital gains from land market participation could then be used in other economic investments. In Argentina, formal rural land and capital markets were much less active (Cortes Conde 1979; Adelman, 1990; Banzato 2013).

It is plausible that limited development in land and credit markets in Argentina were reinforcing. From colonial times through the 19^{th} century, most frontier land was acquired by large owners. Even where they might secure open lands, tenants could not do so if they required credit. Access to credit required collateral, but without credit they did not have property as collateral. Because tenants moved frequently, their individual credit histories would have been sparce. They generally could not get mortgages, nor could they rely upon a network of neighbors or family members as in the Midwest. Instead, tenant farmers relied upon informal credit from local merchants to cover any short-term costs of production and consumption until harvest when the loan was to be repaid (Adelman 1990, 81-2). Further, creditor protection was much weaker in the Spanish legal tradition than in the British one (La Porta el al, 1999). Finally, landowning elites may have had reasons to oppose credit market expansion via the entry of banks, fearing easier access to land would provide tenants with an outside option. This pattern is similar to that noted by Rajan and Ramcharan (2011) for the US South in the early 20th century.

6.3. Immigration Patterns and Investment in Rural Human Capital

As we have noted, difficulties in access to land, which were the flipside of the persistence of large estates, may have discouraged permanent immigration. In contrast to the US, migrants could not expect to own land; they could be tenants or short-term laborers during harvest; and they often returned to home countries after harvest (Ross 1917, 8-9, 126; Solberg 1971, 40;

1982, 141, 149). Nearly 50% of Italian immigrants, the most common origin country, returned between 1857-1924 (Wilcox 1929, I.543). Lack of permanent migration was also associated to a higher ratio of male-to-female migrants, lower family formation, and lower population densities (Ross 1917, 8-9, 13, 216-28; Estabrook 1926, 60; Wilcox 1929, 395-396; 539-540; Solberg 1971, 48; Adelman 1994, 8, 63-88, 104-131, 147-67).

These patterns were also bound to affect investment in education. Temporary migration and low family formation limited opportunities to collectively organize local school districts as occurred in the Midwest, and reduced overall demand for the education of children (Scarzanella 1989, 16-18). With temporary, short-term tenants and farm laborers landowners had little incentive to invest in education for their employees. Scarzanella (1989, 13) reports that the tenants in her samples were illiterate. Solberg (1971, 22) claims that 1931 local censuses on education revealed that the bulk of rural children in the Pampas had not attended any school and could not read or write. Even as late as the 1940s, Taylor (1948, 316) claims that 10-20% of rural children between the ages of 6 and 13 in the Pampas had had no education. The lack of education contributed to a rural labor force with limited human capital (Scobie 1964, 63; Scarzanella 1989, 7; Campante and Glaeser 2018, 2, 12-14).

The connections between access to land and immigration, population density, and education were not lost on contemporaries. The land policies of Avellaneda and Sarmiento were meant to foster immigration and denser settlement, and they sought to complement these policies with public investments in education, in the end with limited success.

By contrast, in the US Midwest in the late 19th and early 20th centuries, small farm owners invested in schooling for their children with an emphasis on practical subjects, aimed at understanding and using new technologies, cropping patterns, and shifts in market opportunities. The Northwest Ordinance of 1785 set aside section 16 of each survey township for public schools (Libecap and Lueck 2011). School governance was decentralized as a local effort (Goldin 1998, 347, 351; 2001, 279; Goldin and Katz 2010; Go and Lindert 2010, 3-16). Farm families captured many of the returns, including higher wages due to the quality of the labor force that migrated to Chicago and other urban areas (Campante and Glaeser 2018).

6.4 Agricultural Labor Unrest and Political Instability

Another likely implication of tenancy contracts in Argentina was the higher prevalence of agricultural labor strikes, induced in part by the misalignment of incentives between owners and tenants. Solberg (1971, 24-30, 36) and Scarzanella (1989, 2, 12) describe strikes by tenants in the Argentine grain belt during critical sowing and harvest periods in 1912 and 1913, 1917, 1919, and 1930. About 70,000 farm workers, two-thirds of whom held 2- or 3-year tenant contracts on plots of 150-200 hectares (371-494 acres) were involved, halting farm work and in some cases, destroying crops across the grain regions of Santa Fe, Entre Rios, Córdoba, and Buenos Aires provinces (Solberg 1971, 24-26). Their efforts were coordinated by the formation of a tenant cooperative, *Federación Agraria Argentina* (FAA). During the strikes, workers withheld labor, demanding lower rents, longer contract tenures with a minimum of 4 years, and later, overall landownership reform (Solberg 1971, 40-52; Scarzanella 1989, 11-12). There was nothing comparable in the US Midwest among small farmers and their family labor nor among US farm tenants, where incentives were more aligned as owners.

In his study of labor strike and militancy in the Pampas Solberg (1971, 37, fn 65, 51) argues that political instability continued thereon suggesting a contribution to the well-known political volatility of Argentina across the 20th century. With limited access to land following from the property rights allocation and the general absence of collateral to secure it via land markets, agricultural laborers remained landless. Land ownership and wealth were concentrated. The sense that the economy was not open to new entry encouraged resort to the political arena for redistribution. This ignited opposition from wealthy, land-owning elites. These political conflicts were ongoing and characterized Argentina, even after the economy became more urban and industrial.

7. Concluding Remarks

Guided by insights of Harold Demsetz, we have examined how different property rights to land in the U.S. and Argentina—influenced by the legacies of colonial practices—affected the costs and expected returns of land market exchange. In the US Midwest, land was distributed in small parcels as a commercial asset. Following investment in rights demarcation and measurement under US Land Laws, property was easily exchanged. When compared to Argentina, the US setting approximates Demsetz's thought-experiment: when trading costs are low, market exchanges enable adjustments in scale, organization, and output mix.

In the Argentine Pampas, land was distributed in large estates, *estancias*, and property rights granted both commercial and social and political status. These bundled attributes were difficult to measure and verify, limiting trade. *Estancia* owners sought to retain their properties across generations to preserve their positions, further limiting exchange. Overall, the costs trade were higher and market-generated changes less frequent or extensive (see Demsetz 1964, 13-15).

Our conceptual framework based on Demsetz and the empirical patterns that we document present an alternative narrative to studies that emphasize geography as a primary driver of differences in economic, social, and political outcomes. Our empirical analysis is based on subnational data from the Argentine Pampas and the U.S. Lower Midwest, two regions with very similar geo-climatic features. We find that Argentina's distinctive agricultural organization—large farm sizes, specialization in ranching, and prevalence of cash tenancy— cannot be explained by differences in geography and climate. Moreover, we show that farm size across locations in the Pampas was less responsive to local variation in geo-climatic factors.

One of the key takeaways from our analysis is that property rights regimes and the costs of exchange not only influence the organization of production, but also condition the subsequent evolution of property rights. Demsetz (1967, 350) suggested that a property rights regime that limited how producers could respond to profit opportunities created incentives to change or resort to different institutional arrangements. While there were fluid property rights adjustments in the US from colonial times onward to promote entry, exchange, and the commercial value of land, this was not the case in Argentina, where landowners had incentives to oppose policies favoring widespread land ownership. In this context, in response to new product market opportunities in grain cultivation, Pampas' landowners turned to labor markets, which were not affected by the same constraints. Rather than selling parts of the large landholdings, they rented plots to tenants through short-term, constrained cash contracts. The *estancia mixta* system enabled a shift in the production mix while *estancieros* retained ownership, status, and control over investment decisions.

If there were direct costs created by Argentina's peculiar agricultural organization, they were not serious enough to preclude a massive expansion of its agricultural exports in the late 19th century and early 20th century. However, longer-term impacts may have been more relevant. The large literature that examines the causes of Argentina's poor economic performance emphasizes concentration in landownership as a potential cause. Our analysis offers an explanation as to why land concentration emerged and persisted in the property rights regime and how this affected agricultural organization. This organization, in turn, may have hindered the development of capital and land markets, limited investments in rural human and physical capital, and encouraged agricultural labor unrest, contributing to political instability.

References

Abramitzky, R. and Braggion, F. (2006) Migration and human capital: Self-selection of indentured servants to the Americas. Journal of Economic History. 66 (4): 882-905.

Acemoglu, D., Johnson, S. and Robinson, J. (2001). The colonial origins of comparative development: An empirical investigation. American Economic Review 91 (5): 1369-1401.

Acemoglu, D., Johnson, S. and Robinson, J. (2002). Reversal of fortune: Geography and institutions in the making of the modern world income distribution. The Quarterly Journal of Economics 117(4): 1231-1294.

Acemoglu, D. 2003. "Why Not a Political Coase Theorem? Social Conflict, Commitment, and Politics." Journal of Comparative Economics 31 (December): 620–52.

Acemoglu, D., Johnson, S. and Robinson, J. (2005). Institutions as a fundamental cause of long-run growth, Aghion, P. and Durlauf, S.N. eds, Handbook of Economic Growth, Amsterdam: Elsevier, Chapter 6, 386-414

Acemoglu, D. and Johnson, S., (2005). Unbundling institutions. Journal of political Economy, 113(5), pp.949-995.

Acemoglu, D. and Robinson, J. (2012). Why nations fail, New York: Crown.

Adelman, Jeremy (1990). Agricultural credit in the province of Buenos Aires, Argentina, 1890-1914, Journal of Latin American Studies, Vol. 22, No. 1, pp. 69-87.

Adelman, Jeremy. (1994). Frontier development: Land, labor, and capital on wheat lands of Argentina and Canada, 1890–1914. Oxford: Clarendon Press.

Alchian, A.A. and Demsetz, H., (1972). Production, information costs, and economic organization. The American economic review, 62(5), pp.777-795.

Allen, D. W. (2000). "Transaction costs." In Encyclopedia of Law and Economics, Vol. 1, edited by Boudewijn Bouckaert and Gerrit De Geest. Edward Elgar.

Allen, D.W. (2011), The institutional revolution: measurement and the economic emergence of the modern world (markets and governments in economic history). Chicago: The University of Chicago Press.

Allen, D.W. and Lueck, D., (1998). The nature of the farm. The Journal of Law and Economics, 41(2), pp.343-386.

Allen, D.W. and Lueck, D., (1993). Transaction costs and the design of cropshare contracts. The RAND Journal of Economics, pp.78-100.

Alston, L.J., and Kyle Kauffman. (1997). Agricultural Chutes and Ladders: New Estimates of Sharecroppers and 'True Tenants' in the South, 1900–1920. Journal of Economic History 57(2) (June): 464–75.

Alston, L.J. and Ferrie, J.P. (2005). Time on the ladder: Career mobility in agriculture, 1890-1938. Journal of Economic History 65(4): 1058-1081.

Alston, L.J. and Gallo, A. (2010). Electoral Fraud, the Rise of Peron, and the Demise of Checks and Balances in Argentina. Explorations in Economic History 47 (April): 179-97.

Alvaredo, F., Cruces, G. and Gasparini, L. (2018). A short episodic history of income distribution in Argentina Lat Am Econ Rev (2018) 27:7.

Álvarez-Nogal, C. and De La Escosura, L.P., (2013). The rise and fall of Spain (1270–1850) 1. The Economic History Review, 66(1), pp.1-37.

Amaral, S. (1998). The Rise of capitalism on the pampas: The estancias of Buenos Aires, 1785-1870. New York: Cambridge University Press.

Atack, J., 1989. The agricultural ladder revisited: A new look at an old question with some data for 1860. Agricultural History, 63(1), pp.1-25.

Banzato, G. (2013). Tierras rurales. políticas, transacciones y mercados en Argentina, 1780-1914. Prohistoria.

Barzel, Y. (2004). Standards and the Form of Agreement. Economic Inquiry. 42 (1): 1-13.

Bean, J.M.W. (1991). Landlords. In Thirsk, J. General Editor, The Agrarian History of England and Wales, Miller, E. ed., Volume III, 1348-1500, Chapter 6: 526-586. Cambridge: Cambridge University Press.

Becker, G.S. and Murphy, K.M. 1992. The division of labor, coordination costs, and knowledge. Quarterly Journal of Economics. 1007 (4):1137-1160.

Beckett, J.V (1989). Landownership and Estate Management. In Thirsk, J. General Editor, The Agrarian History of England and Wales, Volume VI, 1750-1850, G.E. Mingay, G. E. ed. Chapter 6, 546-640. Cambridge: Cambridge University Press.

Cacopardo, M.C. (1967). República Argentina: cambios en los límites nacionales, provinciales y departamentales, a través de los censos nacionales de población (Vol. 47). Instituto Torcuato Di Tella, Centro de Investigaciones Sociales.

Campante, F. and Glaeser, E.L. (2018). Yet another tale of two cities: Buenos Aires and Chicago, Latin American Economic Review, 27 (2): 1-33. DOI 10.1007/s40503-017-0052-7.

Campbell, M. (1942). The English yeoman under Elizabeth and the Early Stuarts, London: The Merlin Press.

Cheung, S.N.S. (1968). Private property rights and sharecropping. Journal of Political Economy. 76 (6): 1107-1122.

Cheung, S. N.S. (1969a). Transaction costs, risk aversion, and the choice of contractual arrangements. Journal of Law and Economics. 12 (1): 23-42.

Cheung, S.N.S. (1969b). A theory of share tenancy. Chicago: University of Chicago Press.

Cheung, S. N.S. (1983). The contractual nature of the firm. Journal of Law and Economics 26(1) :1- 21.

Coase, R.H. (1937). The nature of the firm. Economica 4 (16): 386–405.

Coase, R.H. (1960). The problem of social cost. Journal of Law and Economics 3: 1–44.

Cortés Conde, R. (1979). El progreso argentino (1880-1914). Buenos Aires: Sudamericana.

Demsetz, H. (1964). The exchange and enforcement of property rights. The Journal of Law and Economics, 7: 11-16.

Demsetz, H. (1966). Some aspects of property rights. Journal of Law and Economics. 9 (October): 61-70.

Demsetz, H. (1967). Toward a theory of property rights. The American Economic Review, Papers and Proceedings, 57 (2): 347-359.

Demsetz, H. (1968). The cost of transacting. The Quarterly Journal of Economics, 82 (1): 33-53.

Demsetz, H., (1969). Information and efficiency: another viewpoint. The Journal of Law and Economics, 12(1), pp.1-22.

Demsetz, H., (1988). The theory of the firm revisited. Journal of Law, Economics, & Organization, 4(1), pp.141-161.

Droller, F. (2018). "Migration, population composition and long run economic development: Evidence from settlements in the pampas." The Economic Journal 128: 2321-2352

Droller F. and Fiszbein, M. (2021). Staple products, linkages, and development: Evidence from Argentina. Journal of Economic History, September: 723-761.

Duval, L. (1915). The Production and Handling of Grain in Argentina. Office of Grain Standardization, Bureau of Plant Industry, Yearbook of the Department of Agriculture (Washington: U.S. Department of Agriculture),

Eastabrook, L. (1926). Agricultural Survey of South America: Argentina and Paraguay. United States Department of Agriculture Department Bulletin No. 1409. Washington D.C.: Government Printing Office.

Eastwood, R., Lipton, M. and Newell, A. (2010). Farm size. In Pingali, L, Evenson, R.E. eds. Handbook of Agricultural Economics (4): 3323-3397, Amsterdam: North Holland, Elsevier.

Edwards, E.C., (2016). What lies beneath? Aquifer heterogeneity and the economics of groundwater management. Journal of the Association of Environmental and Resource Economists, 3(2): 453-491.

Ellickson, R.C. (1993). Property in land. Yale Law Journal 102: 1315-1400.

Elliott, J.H. (2006). Empires of the Atlantic world: Britain and Spain in America 1492-1830, New Haven: Yale University Press.

Ely, J.W., Jr. (2008). The guardian of every other right: A constitutional history of property rights. New York: Oxford University Press, 3rd Edition.

Engerman, S.L. and Sokoloff, K.L. (1994). Factor Endowments, Institutions, and Differential Paths of Growth Among New World Economies: A View from Economic Historians of the United States. NBER Historical Paper No. 66.

Estabrook, L. M. (1926). Agricultural Survey of South America, Argentina, and Paraguay. Washington D.C. USDA, Bureau of Agricultural Economics, Department Bulletin 1409. Government Printing Office.

Eswaran, M. and Kotwal, A., (1986). Access to capital and agrarian production organisation. The Economic Journal, 96(382), pp.482-498.

Feder, G., (1985). The relation between farm size and farm productivity: The role of family labor, supervision and credit constraints. Journal of development economics, 18(2-3), pp.297-313.

Federico, G., (2008). Feeding the world: an economic history of agriculture, 1800-2000. Princeton University Press.

Ferrie, J.P. (1993). 'We are Yankees now': The Economic Mobility of Two Thousand Antebellum Immigrants to the United States. Journal of Economic History. 53 (2): 388-391.

Ford, A.C. (1910). Colonial precedents of our National Land System as it existed in 1800. Madison: Bulletin of the University of Wisconsin, No. 352, History Series, 2 (2): 321-477.

Foster, A.D. and Rosenzweig, M.R. (2017). Are there too many farms in the world? Labor-market transaction costs, machine capacities and optimal farm size (No. w23909). National Bureau of Economic Research.

Franklin, B. (1751/1845). Observations concerning the increase of mankind, peopling of countries, etc.," in The Literature of Political Economy: A Classified Catalogue of Selected Publications…with Historical, Critical, and Biographical Notices. McCulloch, J. Boston: Longman, Brown, Green, and Longmans.

Galenson, D.W. and Pope, C.L. (1989). Economic and geographic mobility on the farming frontier: Evidence from Appanoose County, Iowa, 1850-1870. Journal of Economic History 49 (3): 635-655.

Galor, O., Moav, O. and Vollrath, D., (2009). Inequality in landownership, the emergence of human-capital promoting institutions, and the great divergence. The Review of Economic Studies, 76(1), pp.143-179.

Gates, P (1968). History of Public Land Law Development. Washington D.C.: Public Land Law Review Commission. Reprint, New York: Arno Press, 1979.

Glaeser, E.L., Di Tella, R., Llach, L. (2018). Introduction to Argentine Exceptionalism. Latin American Economic Review. 27

Go, S. and Lindert, P.N. (2010). The uneven rise of American Public Schools to 1850. Journal of Economic History 70 (1): 1-26.

Goldin, C. (1998). America's graduation from high school: The evolution and spread of secondary Schooling in the twentieth century. Journal of Economic History 58 (2): 345-374.

Goldin, C. and Katz, L.F. (2010). The race between education and technology. Cambridge: Harvard University Press.

Gregson, M.E. (1996). Wealth accumulation and distribution in the Midwest in the late Nineteenth Century. Explorations in Economic History 33 (4): 524-538.

Grubb, F. (1986). Redemptioner immigration to Pennsylvania: Evidence on contract choice and profitability. Journal of Economic History. 46(2): 407-418.

Haines, M.R., (2010). Historical, demographic, economic, and social data: The United States, 1790–2002. Ann Arbor, MI: Inter-university Consortium for Political and Social Research.

Harnett, S. (1991). The land market on the Wisconsin frontier: An examination of landownership processes in Turtle and La Prairie Townships, 1839-1890. Agricultural History 65 (4): 38-77.

Hart, O. and Moore, J. (1990). "Property rights and the nature of the firm. Journal of Political Economy. 98 (6): 1119–1158.

Hennessy, A. (1978). The frontier in Latin American history. Albuquerque: University of New Mexico Press.

Holdsworth, W. (1927, reprint 2013). An Historical Introduction to the Land Law, London: Oxford University Press; Clark NJ: The Law Book Exchange.

Hora, R, (2001). The landowners of the Argentine Pampas: A social and political history 1860-1945. New York: Oxford University Press. news

Hora, R. (2003). The Making and Evolution of the Buenos Aires Economic Elite in the Nineteenth Century: The Example of the Senillosas. Hispanic American Historical Review, 83 (3): 451-86.

Jacks, D.S. (2019). From boom to bust: A typology of real commodity prices in the long run. Cliometrica, 13(2): 201-220.

Johnson, A.H. (1909). The disappearance of the small landowner, Ford Lectures, 1909, Oxford: At the Clarendon Press.

Kanazawa, M. T. (1996) Possession is nine points of the law: The political economy of early public land disposal, Explorations in Economic History, 33 (2): 227-249.

Katz, S.N. (1976): Thomas Jefferson and the right to property in revolutionary America. Journal of Law and Economics. 19 (3): 467-488.

Kearl, J. R., Pope, C.L., and Wimmer, L.T. (1980). Household wealth in a settlement economy: Utah, 1850-1870. Journal of Economic History 40, (3): 477-4 96.

Keefer, P. and Vlaicu, R .(2007). Democracy, credibility, and clientelism. Journal of Law, Economics and Organization. 24 (2): 371-406.

Klein, B., Crawford, R.G. and Alchian, A.A. (1978). Vertical integration, appropriable rents, and the competitive contracting process. The Journal of Law and Economics, 21 (2): 297-326.

La Porta, R. Lopez-de-Silanes, F. and Shleifer, A. (2008). The economic consequences of legal origins, The Journal of Economic Literature, 46 (2): 285–332.

Libecap, G. D. (1993). Contracting for property rights. New York: Cambridge University Press.

Libecap, G.D. and Lueck, D., (2011). The demarcation of land and the role of coordinating property institutions. Journal of Political Economy, 119(3), pp.426-467.

Lindert, P.H. (1987). Who owned Victorian England? The debate over landed wealth and inequality. Agricultural History 61 (4): 25-51.

Lindert, P.H. and Williamson, J.G. (2013). American incomes before and After the revolution, Journal of Economic History, 73 (3): 725-65.

Linklater, A. (2013). Owning the earth: The transforming history of landownership. New York: Bloomsbury.

Maddison Project. Historical National Accounts. 2010. Groningen Growth and Development Centre. Gross domestic product at factor cost by type of economic activity in millions of Argentinian pesos at constant prices of 1970. https://www.rug.nl/ggdc/historicaldevelopment/na/.

North, D. C., Wallis, J.J. and Weingast, B.R. (2009). Violence and social orders: A conceptual framework for interpreting recorded human history. New York: Cambridge University Press.

Oto-Peralias,D. and Romero-Avila, D. (2016). The economic consequences of the spanish reconquest: The long-term effects of medieval conquest and colonization. Journal of Economic Growth 21: 409-464.

Palacio, J.M. (2002). La estancia mixta y el arrendamiento agrícola: Algunas hipótesis sobre su evolución histórica en la región pampeana, 1880-1945. Boletín del Instituto de Historia Argentina y Americana Dr. Emilio Ravignani 25: 37-87.

Pinilla, V. and Rayes, A. (2018). How Argentina became a super-exporter of agricultural and food products during the first globalization (1880-1929). Cliometrica 13: 443-469.

Priest, C., 2021. Credit Nation: Property Laws and Institutions in Early America. Princeton University Press.

Rada, N.E. and Fuglie, K.O., (2019). New perspectives on farm size and productivity. Food Policy, 84, pp.147-152.

Rajan, R. G. and Ramcharan, R. (2011). Land and credit: A study of the political economy of banking in the United States in the early 20th century. *The Journal of Finance* 66(6: 1895-1931.

Ross, G. (1917). Argentina and Uruguay. London: Methuen and Co.

Roumasset, J. (1995). The nature of the agricultural firm. Journal of Economic Behavior and Organization. 26 (2): 161-77.

Roumasset, J. and Uy, M. (1987) Agency costs and the agricultural firm. Land Economics, 63 (3): 290-302.

Scarzanella, E. (1984), 'Corn Fever': Italian tenant farming families in Argentina (1895-1912), Bulletin of Latin American Research, 3 (1) 1-23.

Scobie, J.R. (1964) Revolution on the pampas: A social history of Argentine Wheat, 1860-1910. Austin: University of Texas Press.

Slutsky, D. (1968). Aspectos sociales del desarrollo rural. Desarrollo Economico y Social 8 (29): 95-136.

Sokoloff, K.L. and S.L. Engerman (2000). History lessons: Institutions, factor endowments, and paths of development in the new world. Journal of Economic Perspectives 14(3): 217-32.

Solberg, C.E. (1971). Rural unrest and agrarian policy in Argentina, 1912-1930. Journal of Interamerican Studies and World Affairs 13 (1): 18-52.

Solberg, C.E., (1987). The prairies and the pampas: agrarian policy in Canada and Argentina, 1880-1930. Stanford University Press.

Spillman, W.J. (1919). The agricultural ladder. The American Economic Review, Supplement 9: 170-179.

Steckel, R. (1989). Household migration and rural settlement in the United States, 1850-1860. Explorations in Economic History 26 (2): 190-218.

Stewart, J.I. (2009). Economic opportunity or hardship The causes of geographic mobility on the agricultural frontier, 1860-1880. Journal of Economic History 69 (1): 238-68.

Taylor, C.C. (1948). Rural life in Argentina. Baton Rouge: Louisiana University Press.

Taylor, A.M. (1995). Peopling the Pampa: On the Impact of Mass Migration to the River Platt, 1870-1914. Cambridge, MA: NBER Historical Paper No. 68.

Taylor, A.M. (1997). *Latifundia* as Malefactor in Economic Development? Scale, Tenancy, and Agriculture on the Pampas, 1880-1914. Cambridge, MA: NBER Historical Paper No. 96. *Research in Economic History*, 17.

Taylor, A.M. (2018) The Argentina Paradox: Microexplanations and Macropuzzles. Latin American Economic Review 27 (3). https://doi.org/10.1007/s40503-017-0051-8

U.S. Census Bureau, Historical Statistics Colonial Period to 1970. CColhttps://www2.census.gov/library/publications/1975/compendia/hist_stats_colonial-1970/hist_stats_colonial-1970p1-chF.pdf.

U.S. Department of Agriculture (1922). Work and Expenditures of the Agricultural Experiment Stations. Washington D.C.: Government Printing Office.

Van Bath, B.H. (1966). The agrarian History of Western Europe A.D. 500-1850, London: Edward Arnold 1963, reprinted 1966.

Wilcox, W.F. International migrations, Volume I: Statistics. Published in 1929 by NBER URL: https://www.nber.org/books/fere29-1

Williamson, O.E. (1975). Markets and hierarchies: Analysis and antitrust implications. New York: Macmillan.

Williamson, O.E. (1985). The economic institutions of capitalism. New York: Macmillan.

Winters, D.L. (1982). Agricultural tenancy in the nineteenth-century middle west: The historiographical debate. Indiana Magazine of History. 78 (2): 128-153.

Yuln, M. (2012). The squared territory. The adaptation of a US territorial model in Argentina, 1850-1890. Discussions. New World, New Worlds. https://doi.org/10.4000/newworld.64653; (https://journals.openedition.org/nuevomundo/64653#tocto1n4).

Zimmerman, A.F. (1945). The land policy of Argentina, with particular reference to the conquest of the southern Pampas. Hispanic American Historical Review. 25 (1): 3-26

APPENDIX

Table A1. Farm Size with Alternative Weights

	Farm Size (log)			
	Weighted by Ag Acres		Country Weights	
Dependent Variable	(1)	(2)	(3)	(4)
Argentina	1.49***	1.86***	1.22***	1.86***
	(0.08)	(0.08)	(0.08)	(0.12)
Elevation (000s)		-0.22		-1.13***
		(0.21)		(0.31)
Temperature		-0.03**		-0.04*
		(0.01)		(0.02)
Precipitation (log)		0.07		0.25
		(0.29)		(0.50)
Pasture Potential Yields (log)		-0.70***		-1.05***
		(0.12)		(0.16)
Wheat Potential Yields (log)		-0.13***		-0.14***
		(0.04)		(0.04)
Corn Potential Yields (log)		-2.12***		-2.66***
		(0.47)		(0.79)
Constant	5.14***	30.31***	5.42***	36.92***
	(0.03)	(3.54)	(0.05)	(5.61)
Counties	766	766	766	766
R^2	0.48	0.79	0.27	0.68

Notes: Table shows coefficient estimates for regression of county average farm size (logged) on factors affecting agricultural production. Argentine sample includes departments in Córdoba Buenos Aires, Santa Fé, and Entre Rios. US sample is the baseline sample and includes counties from Texas, Oklahoma, Kansas, Arkansas, and Missouri. Farm size is defined as total acres in farming and ranching in a county/department divided by the number of establishments. Columns 1 and 2 are weighted by total county ag acres, columns 3 and 4 apply country importance weights proportional to the number of observations within each country. Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1.

Table A2. Farm Size for Extended Sample

	Farm Size (log)			
	No Weights		Weighted by County Size	
Dependent Variable	(1)	(2)	(3)	(4)
Argentina	1.34***	1.91***	1.36***	2.23***
	(0.07)	(0.09)	(0.11)	(0.09)
Elevation (000s)		-0.33*		-0.27
		(0.18)		(0.21)
Temperature		0.01		0.03*
		(0.01)		(0.02)
Precipitation (log)		0.22		0.77**
		(0.25)		(0.34)
Pasture Potential Yields (log)		-0.90***		-1.12***
		(0.10)		(0.14)
Wheat Potential Yields (log)		-0.12***		-0.09***
		(0.04)		(0.03)
Corn Potential Yields (log)		-1.51***		-2.40***
		(0.22)		(0.29)
Constant	5.30***	24.49***	5.62***	29.72***
	(0.03)	(1.97)	(0.07)	(2.65)
Counties	1119	1119	1119	1119
R^2	0.18	0.76	0.2	0.78

Notes: Table shows coefficient estimates for regression of county average farm size (logged) on factors affecting agricultural production. Argentine sample includes departments in Cordoba Buenos Aires, Santa Fe, and Entre Rios. US sample is the extended sample and includes counties from Texas, Oklahoma, Kansas, Arkansas, Missouri, Louisiana, Nebraska, Illinois, and Iowa. Farm size is defined as total acres in farming and ranching in a county/department divided by the number of establishments. Columns 1 and 2 are not weighted, columns 3 and 4 apply importance weights proportional to the acres in a county. Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1.

Table A3. Soil Controls

	Farm Size (log)			Cattle per Capita (log)			Cash Tenancy (%)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Argentina	1.22***	2.06***	2.03***	0.99***	1.63***	1.60***	0.45***	0.56***	0.54***
	(0.08)	(0.10)	(0.10)	(0.09)	(0.15)	(0.15)	(0.02)	(0.03)	(0.03)
Elevation (000s)		-0.51*	-0.45		0.18	0.20		-0.05	-0.03
		(0.28)	(0.29)		(0.40)	(0.42)		(0.08)	(0.08)
Temperature		-0.02	-0.01		0.00	0.00		-0.02***	-0.02***
		(0.01)	(0.01)		(0.02)	(0.02)		(0.00)	(0.00)
Precipitation (log)		1.01***	1.06***		0.88*	0.94*		0.46***	0.45***
		(0.36)	(0.36)		(0.49)	(0.49)		(0.14)	(0.14)
Pasture Potential Yields (log)		-1.20***	-1.21***		-0.77***	-0.80***		-0.17***	-0.16***
		(0.13)	(0.13)		(0.18)	(0.18)		(0.05)	(0.05)
Wheat Potential Yields (log)		-0.12***	-0.11***		-0.16***	-0.15***		-0.02	-0.02
		(0.04)	(0.04)		(0.04)	(0.04)		(0.01)	(0.01)
Corn Potential Yields (log)		-3.65***	-3.79***		-3.69***	-3.84***		-0.97***	-0.96***
		(0.60)	(0.62)		(0.70)	(0.71)		(0.18)	(0.19)
Controls	None	Geoclimatic	Geoclimatic Soil	None	Geoclimatic	Geoclimatic Soil	None	Geoclimatic	Geoclimatic Soil
Number of Counties	766	766	762	766	766	762	764	764	760
R^2	0.16	0.76	0.76	0.12	0.51	0.52	0.41	0.46	0.46

Notes: Table shows coefficient estimates for regression of three key variables, farm size, cattle per capita (log), and cash tenancy (%) on factors affecting production. Columns 1, 4, and 7 includes only the Argentina dummy, columns 2, 5, and 8 include only geoclimatic controls, columns 3, 6 and 9 also include controls for soil nutrient level and oxygen level from FAO Harmonized World Soil Database extracted via majority county area via a 30 arc-second raster database. Argentine sample includes departments in Córdoba Buenos Aires, Santa Fé, and Entre Rios. US sample is the extended sample and includes counties from Texas, Oklahoma, Kansas, Arkansas, Missouri, Louisiana, Nebraska, Illinois, and Iowa. Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1.

Table A4. Conley Standard Errors

Dependent Variable:	Farm size (log)		Cattle per Capita (log)		Cash Tenancy (%)	
	(1)	(2)	(3)	(4)	(1)	(2)
Argentina	1.21	2.06	0.94	1.56	0.45	0.56
Huber-White robust standard errors	(0.08)***	(0.10)***	(0.09)***	(0.14)***	(0.02)***	(0.03)***
Conley standard errors with cutoff 100km	(0.22)***	(0.20)***	(0.20)***	(0.25)***	(0.05)***	(0.07)***
Conley standard errors with cutoff 200km	(0.35)***	(0.24)***	(0.31)***	(0.30)***	(0.08)***	(0.09)***
Conley standard errors with cutoff 300km	(0.42)***	(0.25)***	(0.35)***	(0.30)***	(0.10)***	(0.10)***
Conley standard errors with cutoff 400km	(0.45)***	(0.22)***	(0.34)***	(0.26)***	(0.09)***	(0.10)***
Conley standard errors with cutoff 500km	(0.46)***	(0.16)***	(0.33)***	(0.17)***	(0.07)***	(0.09)***
Geo-climatic controls	No	Yes	No	Yes	No	Yes
Counties	766	766	766	766	766	766
R^2	0.16	0.76	0.12	0.53	0.41	0.46

Notes: Table shows coefficient estimates for the Argentina dummy and various standard errors (indicating significance levels for each case) for regressions of farm size (log), cattle per capita (log), and percentage of all tenant with cash tenancy arrangements. Argentine sample includes departments in Córdoba Buenos Aires, Santa Fé, and Entre Rios. US sample is the baseline sample and includes counties from Texas, Oklahoma, Kansas, Arkansas, and Missouri. Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1.

Table A5. Farm Size Split by Country

	Farm Size (log)			
	United States		Argentina	
Dependent Variable	(1)	(2)	(3)	(4)
Elevation (000s)	0.4	0.2	-1.60***	-1.80***
	(0.3)	(0.4)	(0.3)	(0.4)
Temperature	0.02	0.02	-0.07	0.11
	(0.02)	(0.02)	(0.08)	(0.09)
Precipitation (log)	1.45***	1.84***	-1.66*	-0.38
	(0.37)	(0.42)	(0.87)	(0.72)
Pasture Potential Yields (log)	-1.16***	-1.39***	0.00	-0.23
	(0.15)	(0.16)	(0.65)	(0.64)
Wheat Potential Yields (log)	-0.10***	-0.08***	-0.44	-0.77
	(0.03)	(0.03)	(1.02)	(1.06)
Corn Potential Yields (log)	-4.55***	-4.85***	-3.50	-10.47**
	(0.57)	(0.68)	(3.94)	(5.11)
Constant	45.11***	46.73***	55.11	112.09**
	(4.26)	(5.17)	(38.30)	(49.67)
Weights	None	County Size	None	County Size
Counties	616	616	150	150
R^2	0.79	0.81	0.23	0.27

Notes: Table shows coefficient estimates for regression of county average farm size (logged) on factors affecting agricultural production separated by country. Argentine sample includes departments in Córdoba Buenos Aires, Santa Fé, and Entre Rios. US sample is the baseline sample and includes counties from Texas, Oklahoma, Kansas, Arkansas, and Missouri. Farm size is defined as total acres in farming and ranching in a county/department divided by the number of establishments. Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1.

Table A6. Ranching with Alternative Weights

	Panel A: Cattle per Capita (log)				Panel B: Cattle per Farm Acre (log)			
	Weighted by Ag Acres		Country Weights		Weighted by Ag Acres		Country Weights	
Dependent Variable	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Argentina	1.06***	1.33***	0.99***	1.55***	0.19***	0.25***	0.60***	0.43*
	(0.10)	(0.14)	(0.09)	(0.19)	(0.02)	(0.03)	(0.09)	(0.22)
Elevation (000s)		0.73*		-0.23		0.15		0.34
		(0.43)		(0.54)		(0.10)		(0.45)
Temperature		-0.02		-0.03		0.01**		0.06*
		(0.02)		(0.03)		(0.01)		(0.04)
Precipitation (log)		-0.23		0.97		0.55***		-0.94
		(0.54)		(0.71)		(0.12)		(1.30)
Pasture Potential Yields (log)		-0.15		-0.75***		-0.12**		0.32
		(0.20)		(0.25)		(0.05)		(0.46)
Wheat Potential Yields (log)		-0.13*		-0.20***		-0.08***		-0.18***
		(0.07)		(0.05)		(0.02)		(0.03)
Corn Potential Yields (log)		-2.30***		-2.91***		-0.76***		-2.22**
		(0.76)		(1.08)		(0.15)		(0.93)
Constant	0.30***	25.11***	0.55***	27.61***	0.12***	4.60***	0.29***	25.36***
	(0.03)	(5.44)	(0.04)	(7.29)	0.00	(0.96)	(0.02)	(4.88)
Counties	766	766	766	766	766	766	766	766
R^2	0.26	0.42	0.18	0.38	0.17	0.25	0.11	0.19

Notes: Table shows coefficient estimates for regression of cattle per capita (log) in panel A and ranching specialization (cattle per farm acre) in panel B on factors affecting production. Columns 1 and 2 are weighted by total county ag acres, columns 3 and 4 apply country importance weights proportional to the number of observations within each country. Argentine sample includes departments in Córdoba Buenos Aires, Santa Fé, and Entre Rios. US sample is the baseline sample and includes counties from Texas, Oklahoma, Kansas, Arkansas, and Missouri. Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1.

Table A7. Ranching for Extended Sample

	Panel A: Cattle per Capita (log)				Panel B: Cattle per Farm Acre (log)			
	No Weights		Weighted by County Size		No Weights		Weighted by County Size	
Dependent Variable	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Argentina	1.09***	1.41***	1.07***	1.79***	0.66***	0.63***	0.44***	0.56***
	(0.09)	(0.14)	(0.09)	(0.19)	(0.09)	(0.09)	(0.09)	(0.14)
Elevation (000s)		0.23		0.69		-0.16		0.18
		(0.28)		(0.48)		(0.20)		(0.26)
Temperature		0.01		0.03		0.03**		0.06***
		(0.02)		(0.02)		(0.01)		(0.02)
Precipitation (log)		-0.99**		0.52		-0.17		0.11
		(0.40)		(0.65)		(0.36)		(0.61)
Pasture Potential Yields (log)		-0.24		-0.60**		-0.06		-0.14
		(0.16)		(0.29)		(0.15)		(0.23)
Wheat Potential Yields (log)		-0.15***		-0.03		-0.16***		-0.15***
		(0.05)		(0.10)		(0.03)		(0.03)
Corn Potential Yields (log)		-1.51***		-2.61***		-0.76***		-1.19***
		(0.35)		(0.51)		(0.13)		(0.28)
Constant	0.45***	23.63***	0.68***	24.44***	0.23***	9.63***	0.36***	11.62***
	(0.04)	(2.54)	(0.05)	(3.16)	(0.01)	(1.23)	(0.04)	(1.66)
Counties	1119	1119	1119	1119	1119	1119	1119	1119
R^2	0.11	0.52	0.15	0.51	0.15	0.34	0.07	0.34

Notes: Table shows coefficient estimates for regression of cattle per capita (log) in panel A and ranching specialization (cattle per farm acre) in panel B on factors affecting production. Columns 1 and 2 are not weighted, columns 3 and 4 apply importance weights proportional to the acres in a county. Argentine sample includes departments in Córdoba Buenos Aires, Santa Fé, and Entre Rios. US sample is the extended sample and includes counties from Texas, Oklahoma, Kansas, Arkansas, Missouri, Louisiana, Nebraska, Illinois, and Iowa. Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1.

Table A8. Cash Tenancy with Alternative Weights

	Pctg. Tenants in Cash Tenancy			
	Weighted by Ag Acres		Country Weights	
Dependent Variable	(1)	(2)	(3)	(4)
Argentina	0.24***	0.31***	0.45***	0.54***
	(0.03)	(0.04)	(0.02)	(0.04)
Elevation (000s)		-0.29***		0.04
		(0.09)		(0.08)
Temperature		-0.04***		-0.02***
		(0.00)		(0.01)
Precipitation (log)		0.32**		0.38*
		(0.15)		(0.20)
Pasture Potential Yields (log)		-0.11*		-0.13*
		(0.06)		(0.07)
Wheat Potential Yields (log)		-0.02		-0.02
		(0.01)		(0.01)
Corn Potential Yields (log)		-0.03		-1.25***
		(0.21)		(0.22)
Constant	0.25***	-0.13	0.26***	10.42***
	(0.01)	(1.43)	(0.01)	(1.51)
Counties	764	764	764	764
R^2	0.25	0.37	0.48	0.52

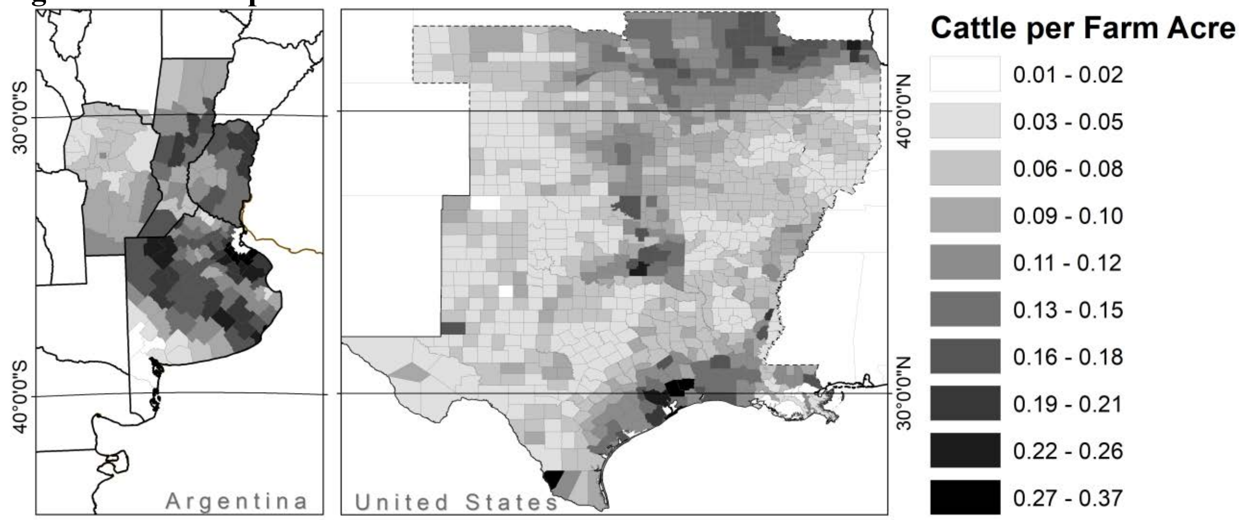
Notes: Table shows coefficient estimates for regression of percentage of tenant farms in cash tenancy on factors affecting production. Argentine sample includes departments in Córdoba Buenos Aires, Santa Fé, and Entre Rios. US sample is the baseline sample and includes counties from Texas, Oklahoma, Kansas, Arkansas, and Missouri. Columns 1 and 2 are weighted by total county ag acres, columns 3 and 4 apply country importance weights proportional to the number of observations within each country. Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1.

Table A9. Cash Tenancy for Extended Sample

	Pctg. Tenants in Cash Tenancy			
	No Weights		Weighted by County Size	
Dependent Variable	(1)	(2)	(3)	(4)
Argentina	0.40***	0.56***	0.33***	0.51***
	(0.02)	(0.03)	(0.03)	(0.05)
Elevation (000s)		-0.11		-0.09
		(0.06)		(0.08)
Temperature		-0.02***		-0.02***
		0.00		(0.01)
Precipitation (log)		0.53***		0.53***
		(0.10)		(0.17)
Pasture Potential Yields (log)		-0.18***		-0.22***
		(0.04)		(0.06)
Wheat Potential Yields (log)		-0.03*		-0.02*
		(0.01)		(0.01)
Corn Potential Yields (log)		-0.90***		-0.91***
		(0.09)		(0.11)
Constant	0.31***	6.63***	0.32***	6.83***
	(0.01)	(0.70)	(0.01)	(0.88)
Counties	1117	1117	1117	1117
R^2	0.26	0.4	0.24	0.35

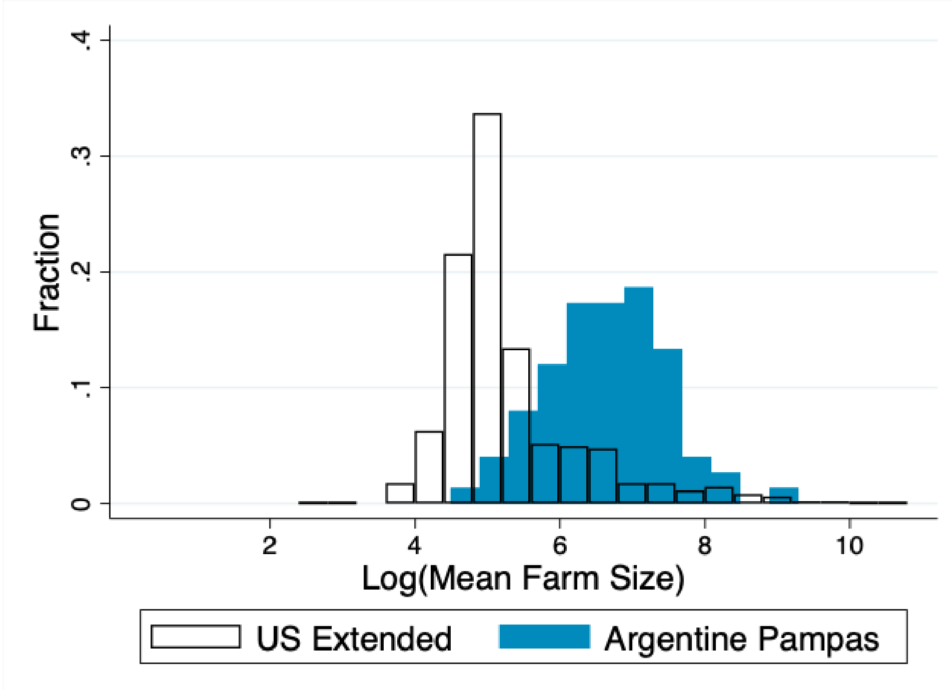
Notes: Table shows coefficient estimates for regression of percentage of tenant farms in cash tenancy on factors affecting production. Argentine sample includes departments in Córdoba Buenos Aires, Santa Fé, and Entre Rios. US sample is the extended sample and includes counties from Texas, Oklahoma, Kansas, Arkansas, Missouri, Louisiana, Nebraska, Illinois, and Iowa. Columns 1 and 2 are not weighted, columns 3 and 4 apply importance weights proportional to the acres in a county. Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1.

Figure A1: Cattle per farm acre



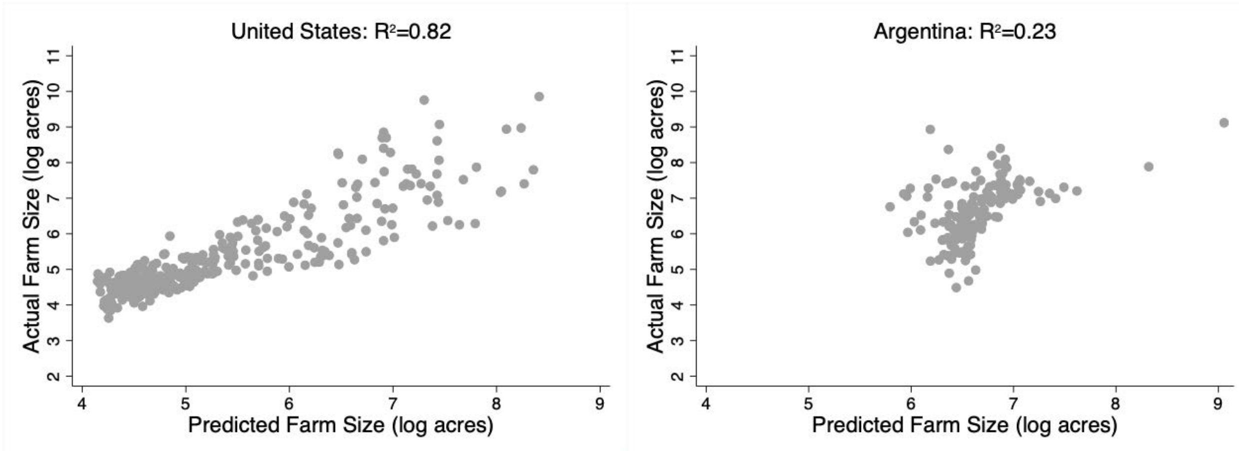
Notes: U.S. 1910 Agricultural Census data and 1914 Argentina Census data. Maps are drawn by the authors with identical scales.

Figure A2: Farm Size Comparison with Extended Sample



Notes: Table shows histograms of the overall distribution of average farm sizes (logged) in Argentina and the US. The Argentine sample includes departments in, Córdoba Buenos Aires, Santa Fe and Entre Rios. The US includes counties from Louisiana, Iowa, Nebraska, Illinois, Texas, Oklahoma, Kansas, Arkansas, and Missouri.

Figure A3. Split regressions and differential responsiveness with common support



Notes: The residuals and fitted values of a regression on elevation, temperature, precipitation and corn, wheat, and pasture suitability (logged) plotted against actual farm sizes. Sample includes Argentine Pampas provinces and US baseline: Texas, Oklahoma, Kansas, Arkansas, and Missouri. The U.S. counties exclude any counties whose measures of elevation, temperature, or precipitation are below the minimum or above the maximum of the values for Argentina.