

Colonial Origins, Property Rights, and the Organization of Agricultural Production: The US Midwest and Argentine Pampas Compared

Eric C. Edwards, North Carolina State University
Martin Fiszbein, Boston University and NBER
Gary Libecap, UC Santa Barbara and NBER

DAE Spring Meeting
March 20, 2021

Motivation

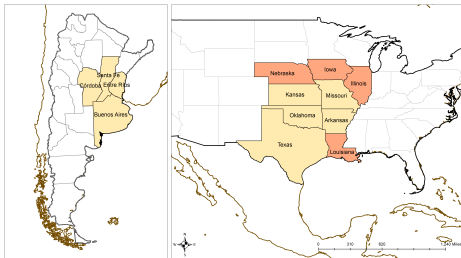
- ▶ Today, Argentina has the largest farms in the world
 - ▶ Argentina average 1,159 acres; U.S. is 462 acres
 - ▶ Potentially problematic historically: soil exhaustion, less investment in human capital and agricultural innovation (e.g. Adelman 1994; Hennessy 1978; Campante and Glaeser 2009)
- ▶ Colonial origins: Property right institutions persist
 - ▶ Spain → Argentina: Large land holdings across generations provide political and social status (e.g. Adelman 1994; Engerman and Sokoloff 1994)
 - ▶ England → U.S.: Modification of property law to turn land into a liquid asset (e.g. Priest 2021)
- ▶ Agricultural endowments of southern US Midwest and Argentine Pampas are strikingly similar, yet patterns of development differ

Colonial Origins → Organization of Agriculture

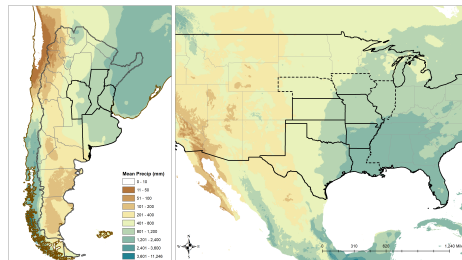
- ▶ Pampas and southern Midwest United States around 1910
 - ▶ Similar in terrain, soil quality, and climate
 - ▶ Producing similar suite of agricultural products
- ▶ The colonial policies of England and Spain heavily influence initial land allocations
- ▶ A low transaction-cost setting allows for flexibility in land property rights
- ▶ However, Argentina sees significant transaction costs in land markets
 - ▶ Pampas: non-standard, status attributes associated with land ownership (Losada 2012; 2015; Figueroa and Leiras 2014; 2018)
- ▶ Land market transaction costs determine flexibility in agricultural production
 - ▶ Southern Midwest: small-scale farms relying more on family labor and share tenants
 - ▶ Pampas: large estates, ranching, and short-term, cash tenancy

Geo-Climatic Comparisons

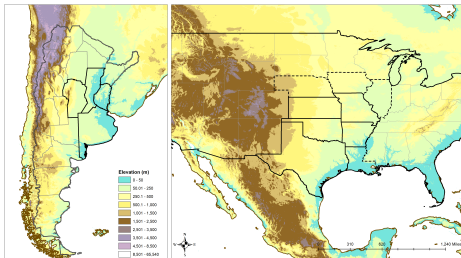
Study Regions



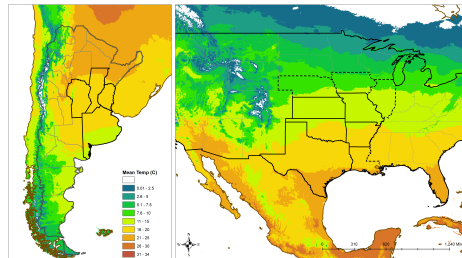
Precipitation



Elevation



Temperature



Background

- ▶ Economic Historians have been key in examining the role of institutions and outcomes (North and Thomas 1973; North 1981)
- ▶ Institutions persist with long-term impacts (North et al. 2009; Acemoglu and Robinson 2012; Acemoglu et al. 2020)
- ▶ The New World offers a laboratory of imposed institutions
 - ▶ Follows La Porta et al. (2008)
 - ▶ Spanish colonies: rights assigned to elites in large parcels with ownership a basis for political and social position with little land trading and thin markets (e.g. Solberg 1971; Hennessy 1978)
 - ▶ English colonies: land distributed and traded in relatively small parcels as a commercial asset (e.g. Grubb 1986; Priest 2021).

Property Rights to Land and Institutional Persistence

Comparison of Land Allocation Schemes

Subdivisión USA (township)



- ▶ United States: Homesteading and active government land sales facilitated by PLSS
 - ▶ Share tenancy and the 'agricultural ladder'
- ▶ Argentina: Large grants and sales
 - ▶ High transaction costs in land markets
 - ▶ Limited share tenancy

Subdivisión Ley nº 947 (1878) y ley de Territ. Nacionales (1882)

50 km

1	2	3	4	5
10	9	8	7	6
11	12	13	14	15
20	19	18	17	16
21	22	23	24	25

Sección
250000 ha.

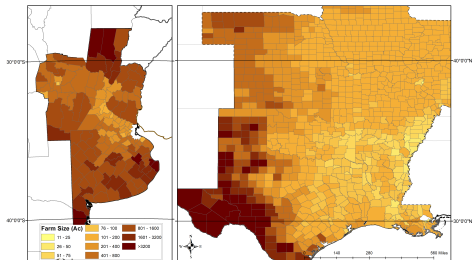
Source: Yulin (2012)

Empirical Approach and Data

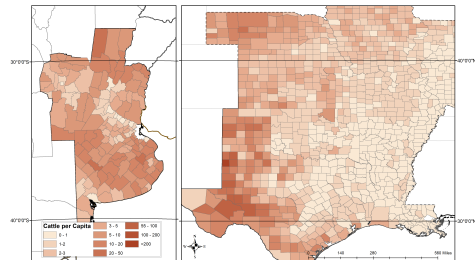
- ▶ Regress measures of farm organization on geo-climatic and potential productivity variables
 - ▶ Argentina: *Departamento* data (subdivision of province) from 1914 National Census (new digitization and Droller and Fiszbein, 2020)
 - ▶ United States: County-level data from 1910 Agricultural Census (Haines et al., 2018)
- ▶ Outcomes: farm size, production choice, tenancy arrangements
 - ▶ Use enumerator instructions to ensure similar measures from different countries
- ▶ Geoclimatic variables
 - ▶ Temperature and precipitation (1970-2000 averages)
 - ▶ Elevation and terrain (from DEM)
- ▶ Crop suitability: Agro-climatic productivity based solely on climate for wheat and pasture

Farm Organization Measures

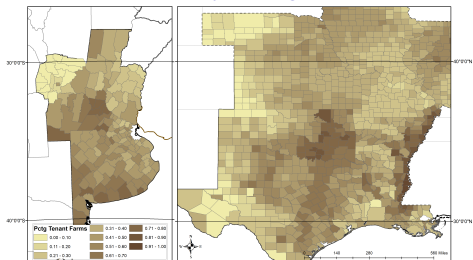
Farm Size



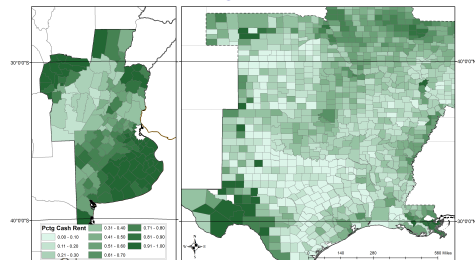
Cattle per Capita



Tenancy Percentage

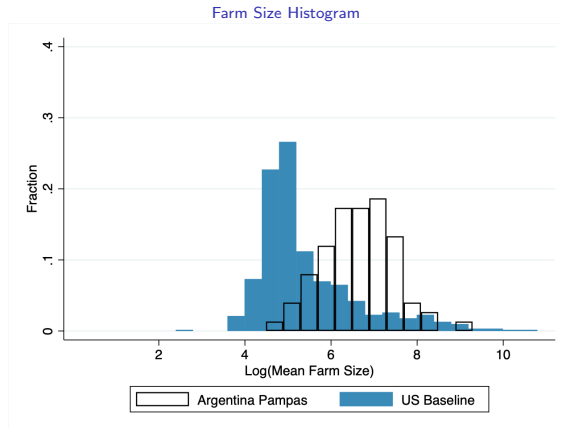


Percentage Cash Rent

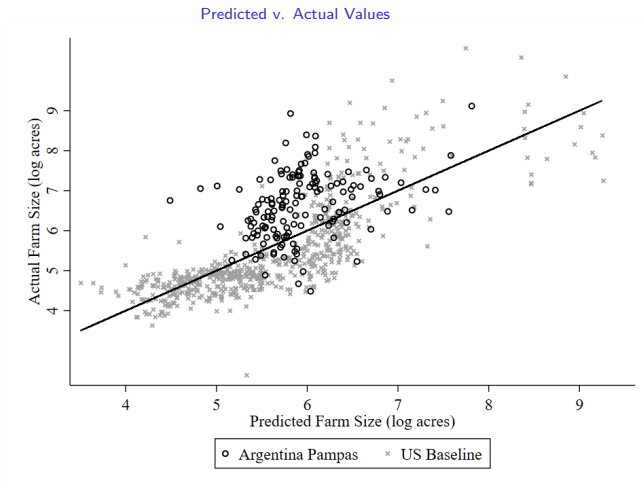


Farm Size Distribution

- Mean county farm size
Argentina: 1,076ac
Baseline: 724ac
Extended: 533ac
Eastern US: 143ac



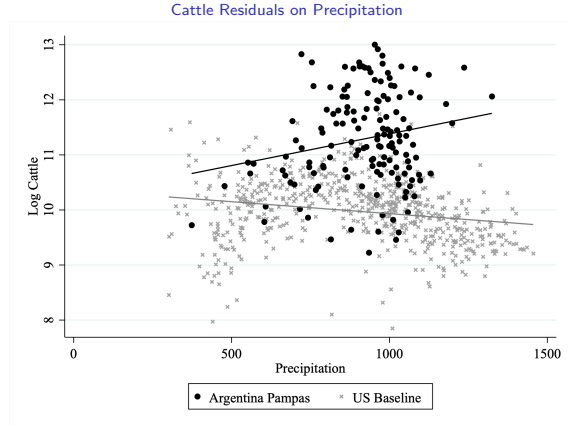
Farm Size Residuals



- ▶ Regress farm size on geo-climatic and potential productivity variables
 - ▶ Argentine counties have large positive residuals
 - ▶ Regressions indicate Argentine farms are 61% larger than US farms

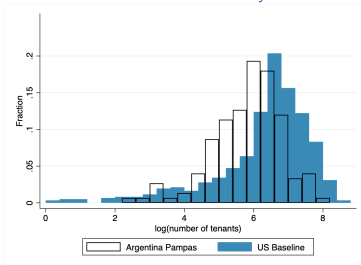
Cattle Ranching Intensity

- ▶ Residuals of geo-climatic cattle regression plotted against precipitation
 - ▶ US: Cattle increasing in aridity
 - ▶ Argentina: Cattle decreasing in aridity

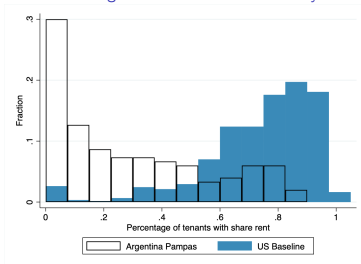


Tenancy Distribution

Total Farms in Tenancy



Percentage of Farms in Share Tenancy



- ▶ U.S. counties: more tenant farms over smaller county areas
 - ▶ Tenancy creates smaller ag production units
 - ▶ Tenancy forms vary in capital requirements and risk-sharing
- ▶ The tenancy gap occurs because Argentina lacks significant share tenancy
 - ▶ Cash tenancy: short and specific contracts
 - ▶ Non land-owning Argentinians lack access to agricultural ladder

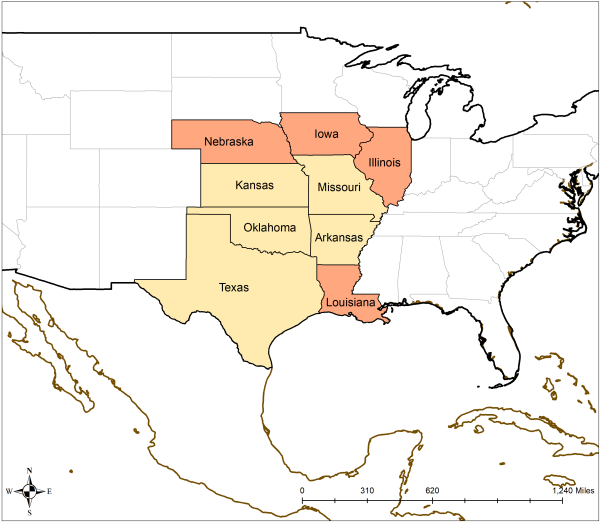
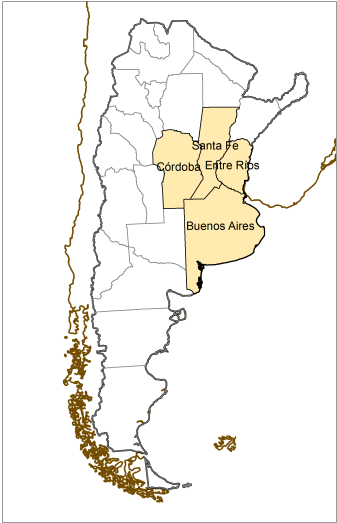
Conclusions

- ▶ Sub-national attributes of ag production in Argentina (1914) and the U.S. (1910)
- ▶ Economic organization reflects rational response to underlying institutions
- ▶ Privilege attributes tied to land in Argentina raised transaction costs
- ▶ Argentine farms were larger and more likely to specialize in ranching
- ▶ Tenancy outcomes also reflect land transaction costs

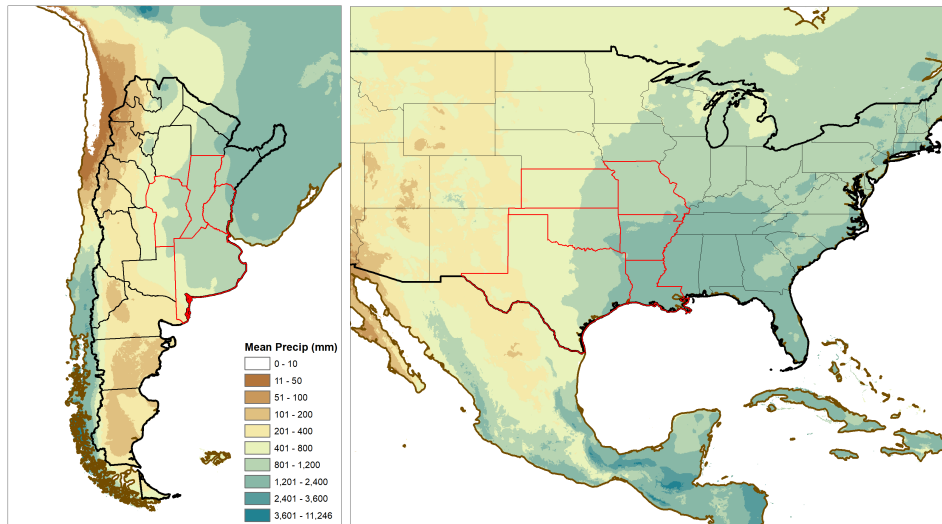
Thank You!

► Questions?

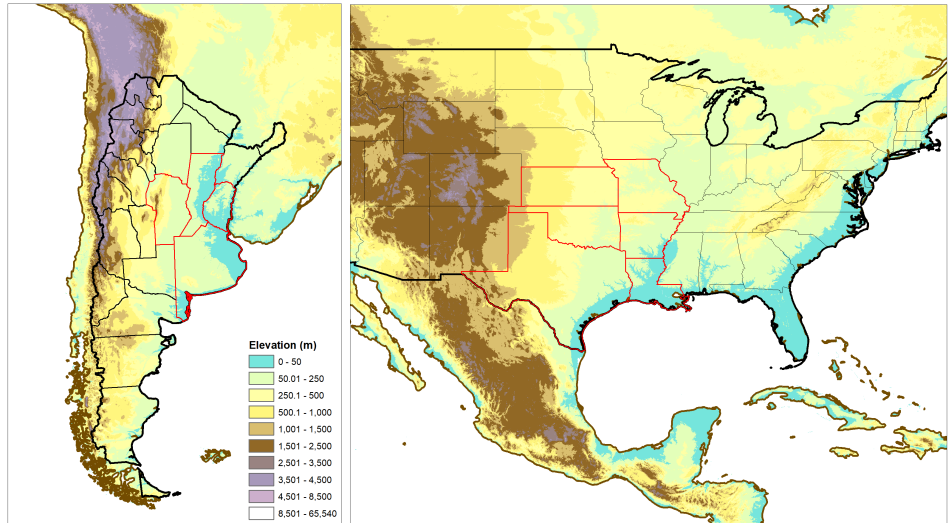
Sample Areas



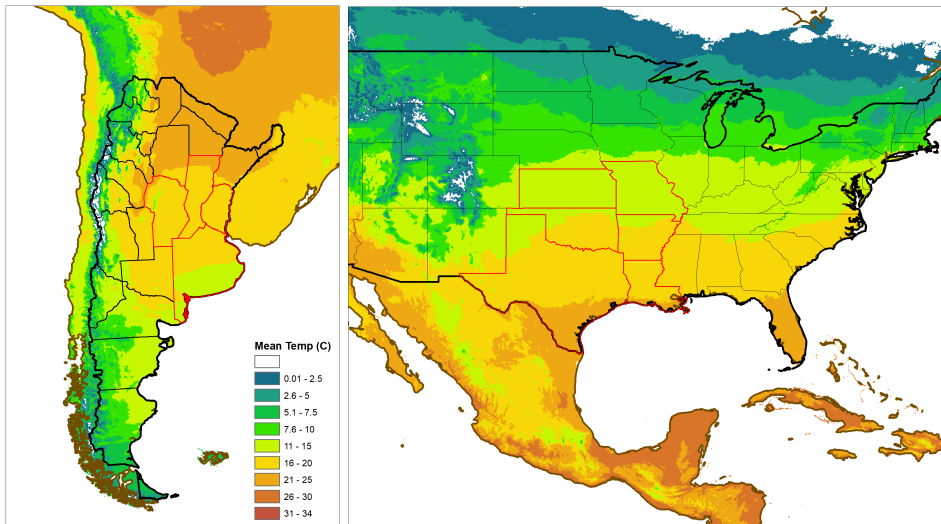
Precipitation



Elevation



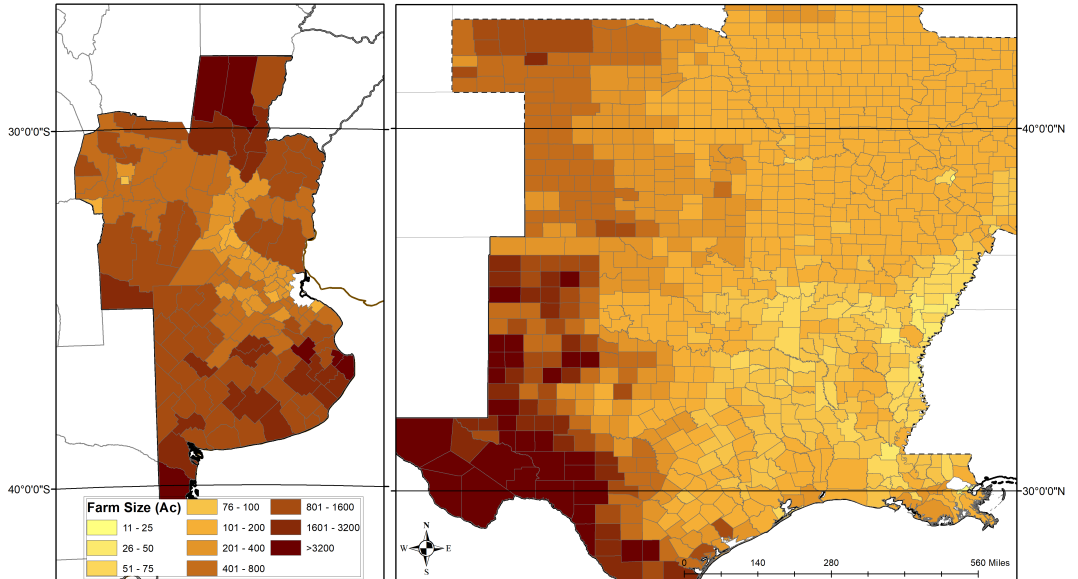
Temperature



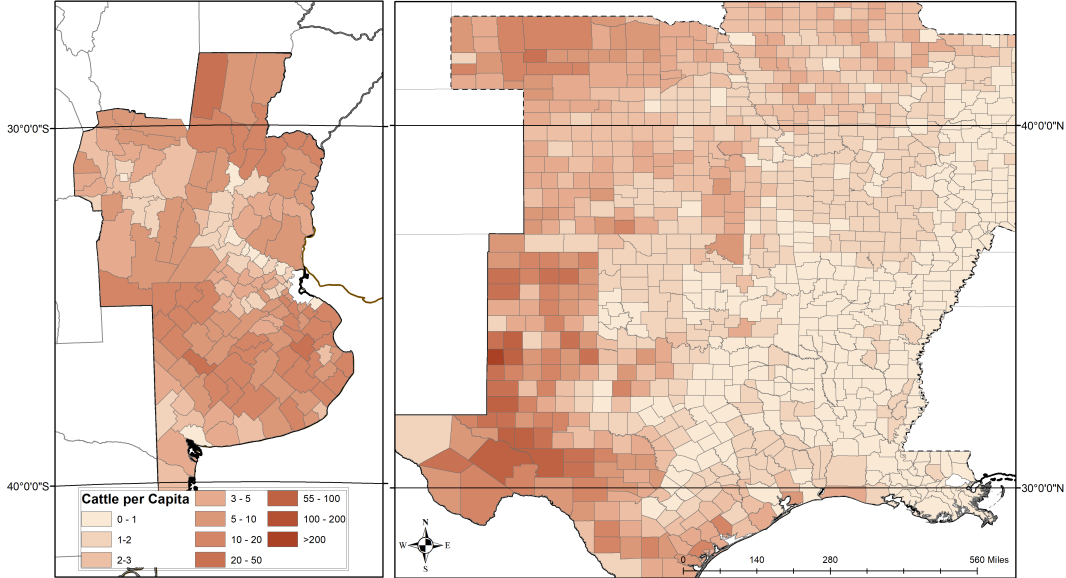
Summary Statistics

	Argentine Pampas	US Baseline Midwest
Mean Temperature (C)	16.49 (1.55)	15.52 (2.85)
Mean Precipitation (mm)	920 (148)	896 (278)
Mean Elevation (m)	128 (192)	375 (293)
Roughness	52 (106)	36 (27)
Pasture Suitability	1,451 (487)	868 (571)
Wheat Suitability	4,182 (901)	4,461 (2,009)

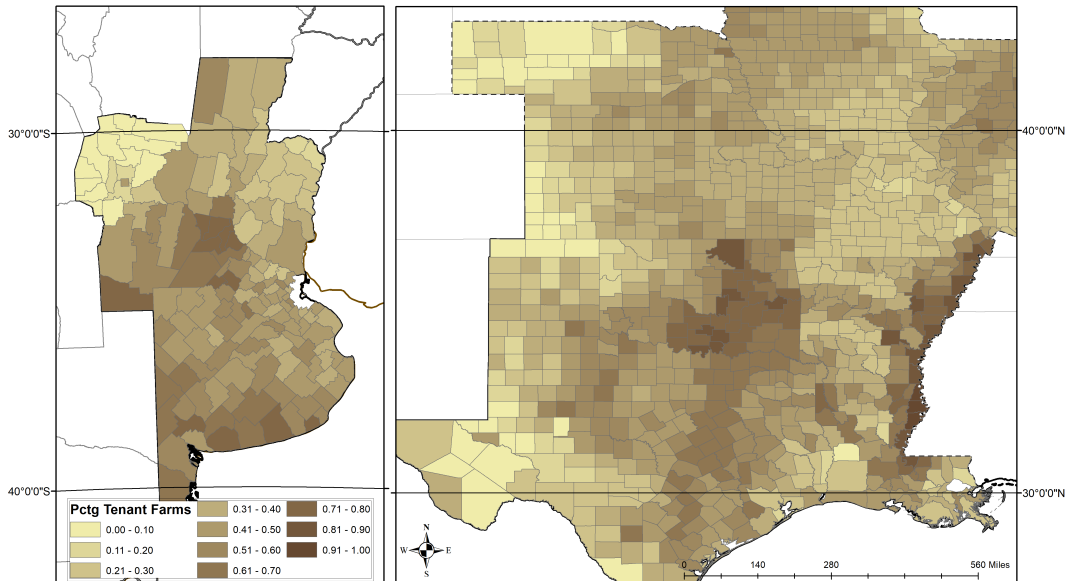
Farm Size



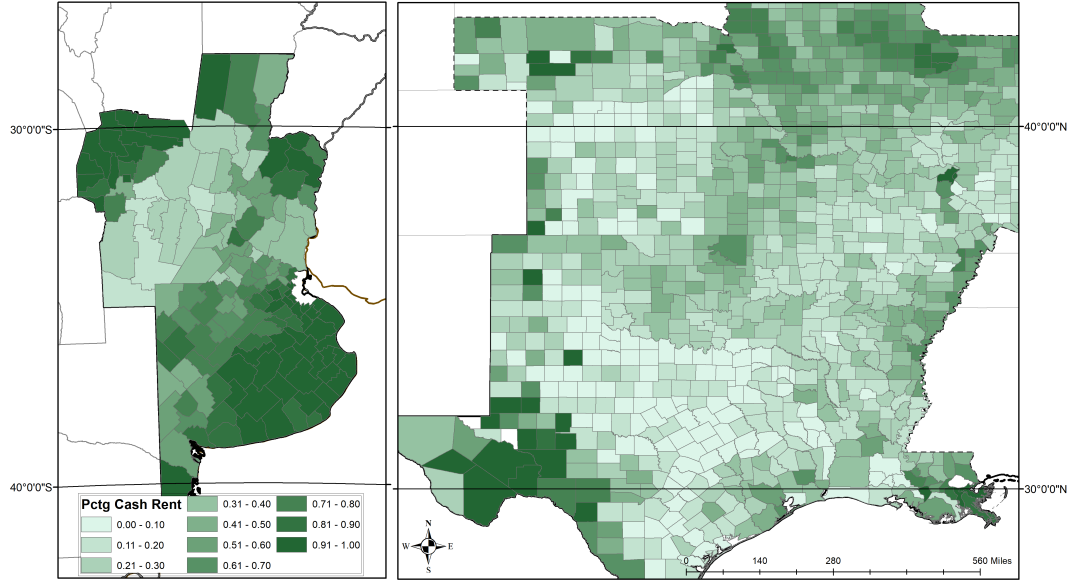
Cattle per Capita



Percentage Tenant Farms



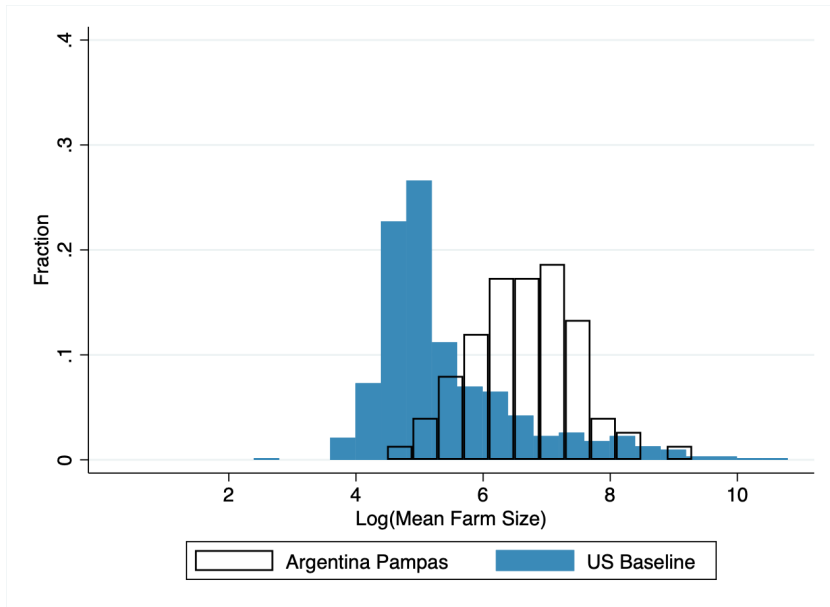
Percentage Cash Tenancy



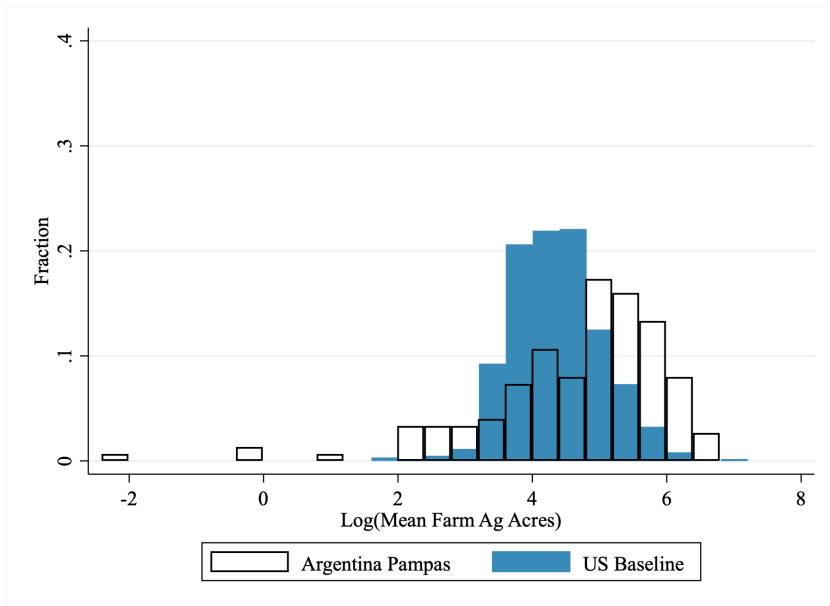
Summary Statistics

	Argentine Pampas	US Baseline Midwest
County Area	1,119,606 (930,451)	555,676 (367,169)
Farms	1,184 (836)	2,074 (1,336)
Mean Farm Size (acres)	1,076 (1,147)	724 (2,539)
Percent of Farms Rented	0.43 (0.18)	0.40 (0.18)
Percentage Cash Rent	0.71 (0.26)	0.26 (0.20)
Number of Cattle	113,147 (95,489)	25,255 (15,402)
Cattle per Acre	127 (111)	43 (167)
Cattle per Capita	6.83 (5.45)	4.24 (13.15)

Farm Size Distribution



Farm Size Distribution (Area of Agricultural Production)

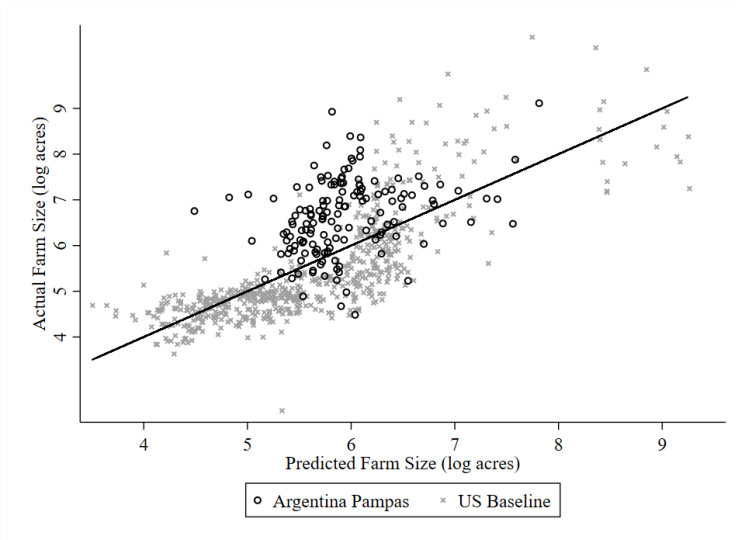


Basic Geo-climatic Regression Results

	(1) Farm Size	(2) Farm Size	(3) Farm Size	(4) Farm Size	(5) Farm Size	(6) Farm Size
Argentina				0.4757*** [0.1106]	0.8218*** [0.1421]	0.7838*** [0.1451]
Terrain	0.0012 [0.0008]	0.0006 [0.0013]	0.0008 [0.0011]	-0.0062*** [0.0010]	-0.0074*** [0.0013]	-0.0068*** [0.0014]
Elevation	-0.0009** [0.0004]	-0.0009 [0.0006]	-0.0013** [0.0005]	0.0006 [0.0004]	0.0009* [0.0005]	0.0008 [0.0006]
Temperature	0.034 [0.0223]	0.0826** [0.0416]	0.0677* [0.0362]	-0.0720*** [0.0219]	-0.0549* [0.0321]	-0.0628* [0.0366]
Precipitation	-0.0041*** [0.0003]	-0.0049*** [0.0005]	-0.0049*** [0.0005]	-0.0019*** [0.0005]	-0.0019*** [0.0007]	-0.0019** [0.0008]
Wheat Suit. (log)	-0.3018*** [0.0391]	-0.2937*** [0.0517]	-0.3459*** [0.0527]	0.1355*** [0.0318]	0.1411*** [0.0304]	0.1466*** [0.0346]
Corn Suit. (log)	0.0935 [0.6211]	-0.4531 [0.7837]	-0.3294 [0.8406]	0.8812* [0.5102]	1.1008 [0.6784]	1.1903 [0.7748]
Pasture Suit. (log)	0.2715** [0.1306]	0.4290* [0.2227]	0.3798* [0.1947]	0.1507 [0.1652]	0.222 [0.2301]	0.1661 [0.2780]
Constant	8.9286 [5.7488]	13.0391* [7.2867]	12.9587* [7.7055]	-2.9339 [4.9226]	-5.7787 [6.3708]	-6.1638 [7.3044]
Observations	766	766	766	766	766	766
R-squared	0.566	0.5396	0.4946	0.3874	0.3882	0.3131
Weights	none	county acres	farm acres	none	county acres	farm acres

Robust standard errors in brackets: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Geo-Climatic Predicted Farm Sizes

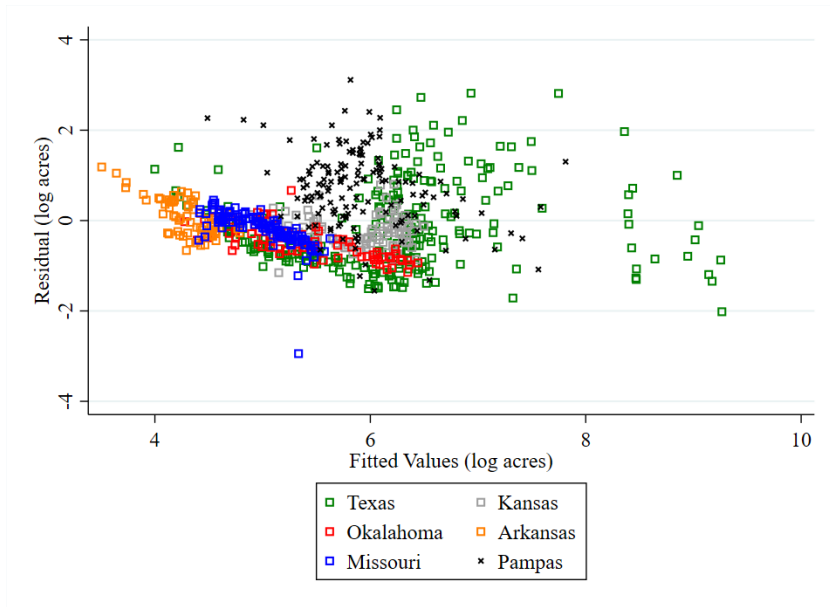


Midwest and Pampas Farm Size Regression Results

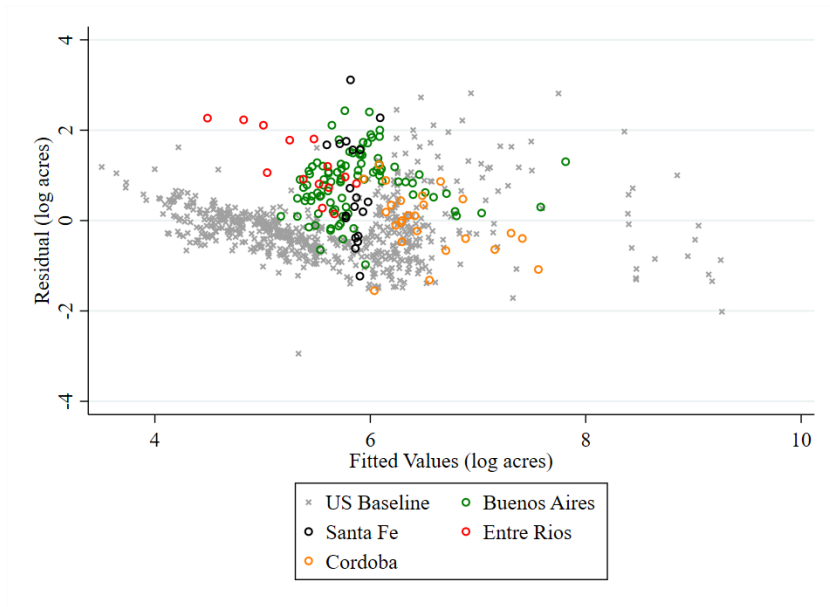
	(1) Farm Size	(2) Farm Size	(3) Farm Size	(4) Ag Size	(5) Ag Size	(6) Ag Size
ARG	5.6785*** [0.9358]	3.3417*** [1.1318]	3.8627*** [1.0710]	-1.3424 [1.3961]	-2.3149 [1.4127]	-2.4405 [1.4869]
ARG Terrain	-0.0007 [0.0020]	-0.0038** [0.0017]	-0.0028* [0.0014]	-0.0094*** [0.0036]	-0.0136*** [0.0039]	-0.0131*** [0.0038]
US Terrain	0.0027* [0.0015]	0.0040** [0.0018]	0.0045* [0.0025]	-0.0056*** [0.0010]	-0.0075*** [0.0014]	-0.0065*** [0.0016]
ARG Temperature	-0.0654 [0.0594]	0.0852 [0.0751]	0.0456 [0.0660]	0.0219 [0.1123]	0.0618 [0.0857]	0.0625 [0.0962]
US Temperature	0.1133*** [0.0111]	0.1379*** [0.0139]	0.1296*** [0.0156]	-0.1188*** [0.0090]	-0.1303*** [0.0111]	-0.1303*** [0.0122]
ARG Precipitation	-0.0028*** [0.0005]	-0.0029*** [0.0006]	-0.0027*** [0.0006]	-0.0021* [0.0013]	-0.0019 [0.0012]	-0.0019 [0.0013]
US Precipitation	-0.0020*** [0.0002]	-0.0025*** [0.0003]	-0.0025*** [0.0003]	-0.0015*** [0.0001]	-0.0014*** [0.0002]	-0.0016*** [0.0002]
ARG Elevation	-0.0012 [0.0011]	0.0002 [0.0008]	-0.0003 [0.0008]	0.002 [0.0021]	0.0047* [0.0025]	0.0044* [0.0025]
US Elevation	0.0015*** [0.0003]	0.0012*** [0.0003]	0.0014*** [0.0004]	-0.0002 [0.0002]	-0.0002 [0.0002]	-0.0003 [0.0002]
Constant	4.7957*** [0.3666]	4.9427*** [0.4450]	4.9619*** [0.5018]	7.8136*** [0.2575]	8.0229*** [0.3364]	8.1951*** [0.3322]
Observations	766	766	766	766	766	766
R-squared	0.7171	0.7376	0.7151	0.367	0.3965	0.3254
Weights	none	county acres	farm acres	none	county acres	farm acres

Robust standard errors in brackets: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Farm Size Residuals



Farm Size Residuals

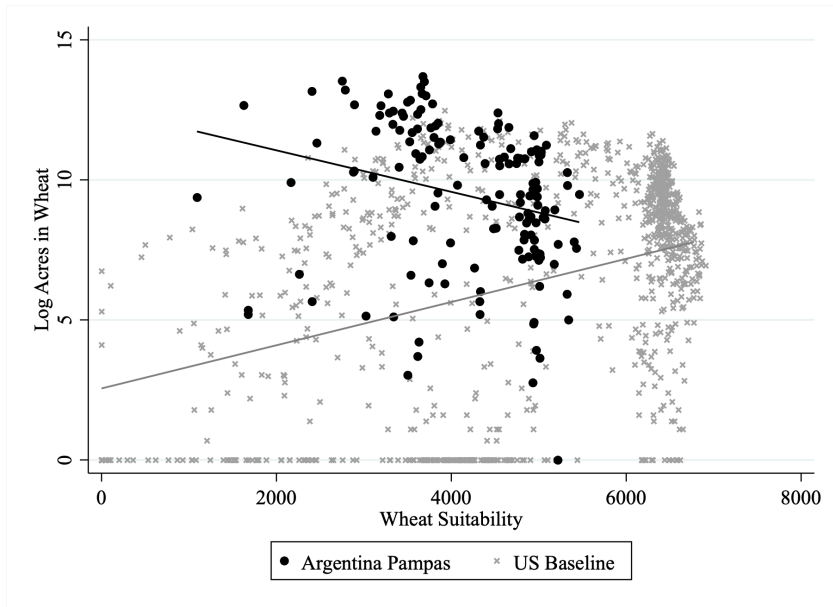


Production Choice Regression Results

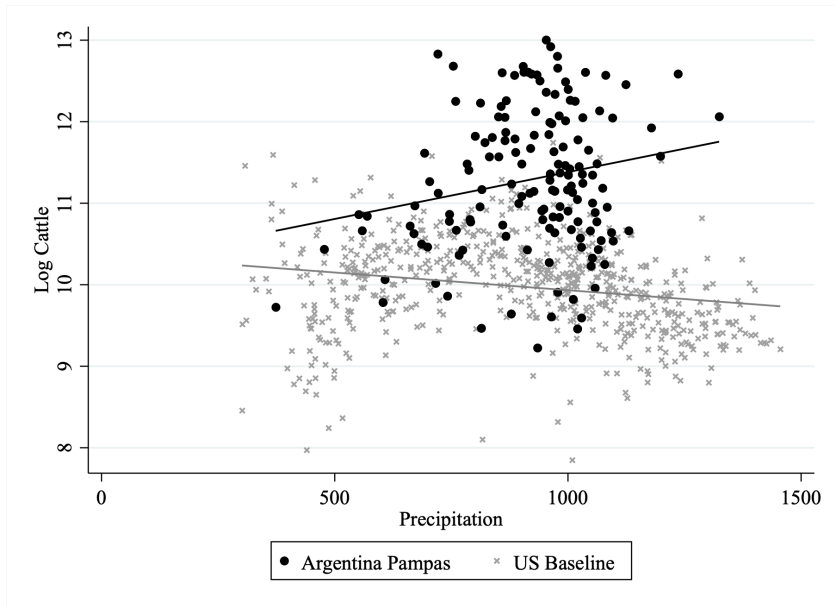
	(1) Acres Wheat	(2) Acres Wheat	(3) Acres Wheat	(4) Cattle	(5) Cattle	(6) Cattle
ARG	101.82*** [15.6633]	95.09*** [19.6539]	94.28*** [19.3391]	23.75*** [5.3708]	19.95*** [5.3765]	19.15*** [5.4891]
ARG Terrain	-0.0156** [0.0074]	-0.0196** [0.0081]	-0.0205** [0.0082]	-0.0019 [0.0019]	-0.0034* [0.0018]	-0.0038* [0.0020]
US Terrain	0.0064 [0.0044]	0.0082 [0.0061]	0.0059 [0.0060]	0.0044*** [0.0012]	0.0067*** [0.0009]	0.0061*** [0.0011]
ARG Temperature	-0.9864*** [0.1925]	-1.0482*** [0.2452]	-0.9685*** [0.2493]	-0.2289*** [0.0731]	-0.1540*** [0.0573]	-0.1520** [0.0639]
US Temperature	-0.8400*** [0.0651]	-0.8079*** [0.0784]	-0.7731*** [0.0746]	0.0283* [0.0146]	0.0402** [0.0172]	0.0256 [0.0169]
ARG Elevation	0.0038 [0.0049]	0.0072 [0.0054]	0.0077 [0.0053]	0.0008 [0.0010]	0.0018* [0.0011]	0.0021* [0.0012]
US Elevation	0.0005 [0.0011]	0.0011 [0.0013]	0.0017 [0.0013]	-0.0007** [0.0003]	-0.0007** [0.0003]	-0.0007** [0.0003]
ARG Precipitation	-0.001 [0.0033]	-0.0021 [0.0033]	-0.0026 [0.0033]	0.0003 [0.0009]	0.0006 [0.0008]	0.0005 [0.0009]
US Precipitation	-0.0131*** [0.0011]	-0.0158*** [0.0014]	-0.0151*** [0.0014]	-0.0028*** [0.0002]	-0.0029*** [0.0003]	-0.0026*** [0.0002]
ARG Wheat Suit.	-16.7997*** [2.8972]	-15.6953*** [3.5396]	-15.5425*** [3.4593]	-4.4941*** [0.9524]	-4.1179*** [0.9734]	-4.1212*** [0.9892]
US Wheat Suit.	0.4887*** [0.0818]	0.1639 [0.1810]	0.2700* [0.1627]	-0.0615** [0.0245]	-0.0936*** [0.0290]	-0.0725*** [0.0257]
ARG Pasture Suit.	7.7619*** [1.9680]	8.0571*** [2.1107]	8.0886*** [2.0489]	2.6520*** [0.5608]	2.6203*** [0.5309]	2.6325*** [0.5411]
US Pasture Suit.	2.7584*** [0.4400]	3.8012*** [0.5912]	3.7235*** [0.5696]	0.5371*** [0.0893]	0.5950*** [0.1103]	0.4525*** [0.1035]
Constant	8.9216*** [3.1150]	6.6967* [3.7132]	5.115 [3.6519]	9.2627*** [0.7227]	9.0652*** [0.8367]	9.8089*** [0.8162]
Observations	766	766	766	766	766	766
R-squared	0.7104	0.7406	0.723	0.5223	0.6817	0.6683
Weights	None	county acres	farm acres	none	county acres	farm acres

Robust standard errors in brackets: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Wheat Suitability and Residuals



Cattle Residuals and Precipitation

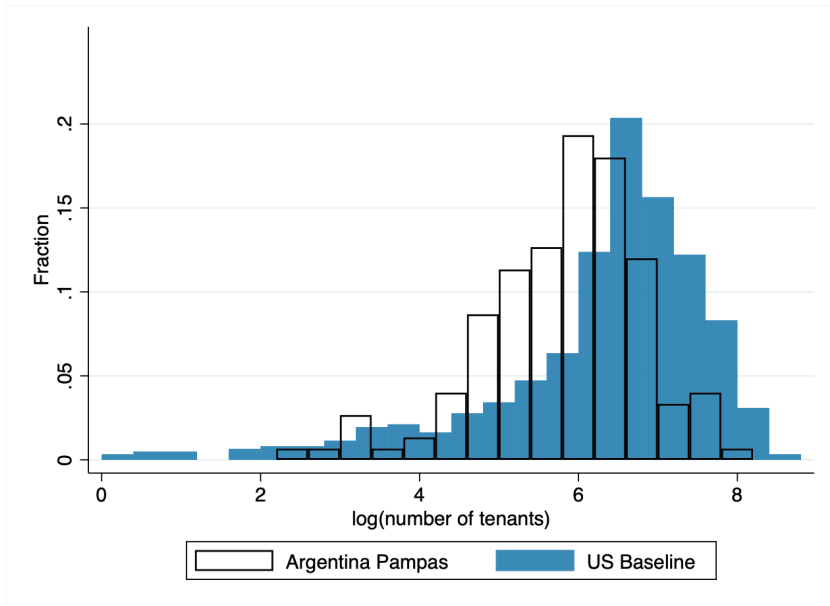


Tenancy Regression Results

	(1) % Rented	(2) % Rented	(3) % Rented	(4) % Share	(5) % Share	(6) % Share
ARG	2.5479*** [0.1825]	2.4016*** [0.2357]	2.2665*** [0.2024]	-0.8776** [0.3424]	-1.0158** [0.5013]	-1.2493*** [0.4671]
ARG Terrain	-0.0009*** [0.0002]	-0.0012*** [0.0004]	-0.0010*** [0.0003]	-0.0018*** [0.0007]	-0.0023** [0.0009]	-0.0025*** [0.0008]
US Terrain	-0.0015*** [0.0003]	-0.0014*** [0.0003]	-0.0015*** [0.0003]	-0.0005 [0.0006]	-0.0016** [0.0007]	-0.0019*** [0.0007]
ARG Temperature	-0.0581*** [0.0088]	-0.0505*** [0.0138]	-0.0552*** [0.0108]	0.0492** [0.0201]	0.0304 [0.0304]	0.0524** [0.0260]
US Temperature	0.0650*** [0.0055]	0.0569*** [0.0066]	0.0520*** [0.0058]	0.0025 [0.0067]	-0.0104 [0.0092]	-0.0075 [0.0087]
ARG Precipitation	0.0001 [0.0001]	0.0001 [0.0002]	0.0001 [0.0002]	0.0002 [0.0003]	0.0006 [0.0005]	0.0003 [0.0004]
US Precipitation	-0.0002*** [0.0001]	-0.0001 [0.0001]	0.0000 [0.0001]	0.0000 [0.0001]	0.0001* [0.0001]	0.0002** [0.0001]
ARG Elevation	-0.0002* [0.0001]	0.0000 [0.0002]	0.0000 [0.0002]	0.0005 [0.0004]	0.0010** [0.0005]	0.0012** [0.0005]
US Elevation	0.0002*** [0.0001]	0.0003*** [0.0001]	0.0002*** [0.0001]	-0.0001 [0.0001]	-0.0001 [0.0001]	-0.0001 [0.0001]
ARG Wheat Suit.	-0.0001*** [0.0000]	-0.0001** [0.0000]	-0.0001** [0.0000]	-0.0001*** [0.0000]	-0.0002** [0.0001]	-0.0001** [0.0001]
US Wheat Suit.	0.0001*** [0.0000]	0.0001*** [0.0000]	0.0001*** [0.0000]	0.0000 [0.0000]	0.0000 [0.0000]	-0.0000** [0.0000]
Constant	-0.9154*** [0.1259]	-0.8964*** [0.1473]	-0.7069*** [0.1314]	0.7657*** [0.1722]	0.9532*** [0.2380]	0.9331*** [0.2192]
Observations	766	766	766	764	764	764
R-squared	0.4229	0.456	0.464	0.4639	0.4341	0.4695
Weights	None	county acres	farm acres	None	county acres	farm acres

Robust standard errors in brackets: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Farm Size Distribution



Share Tenancy Distribution

