

Geographical Origins and Economic Consequences of Language Structures

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Research Agenda

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- Are the geographical origins of this evolutionary process critical for the understanding of the development process?

Main Hypotheses

- Variations in language structures reflect pre-historical variations in geographical characteristics across regions

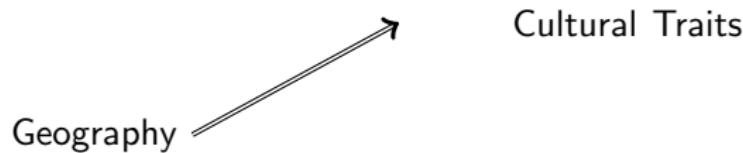
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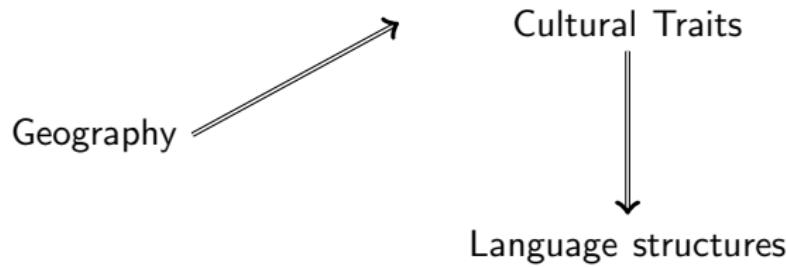
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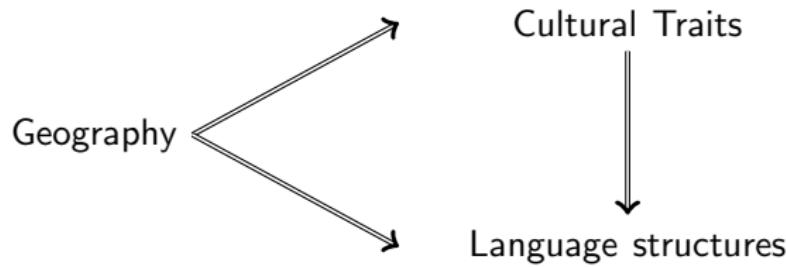
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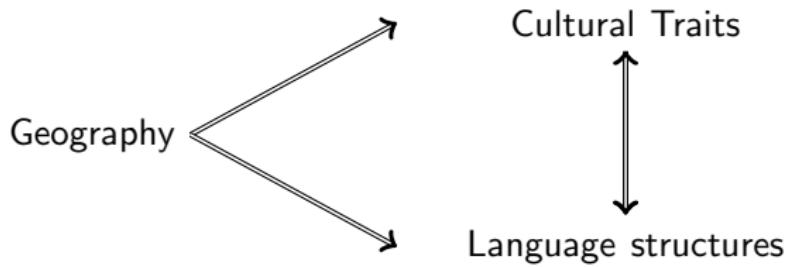
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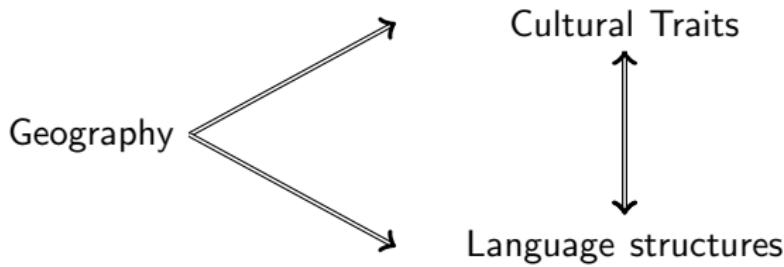
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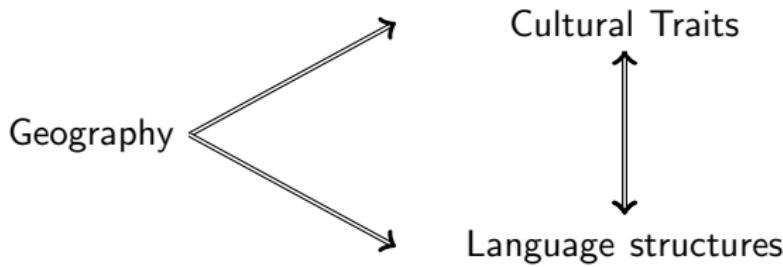
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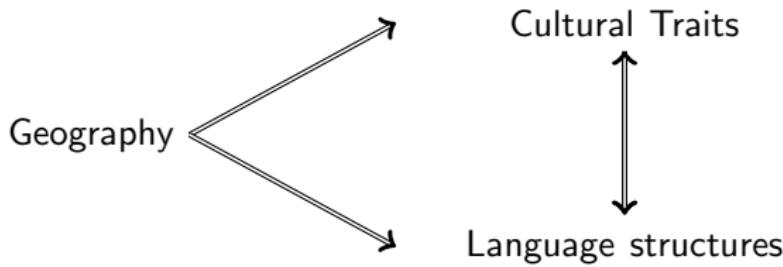
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Structure of the presentation

1 Introduction

2 Data

3 Empirical Analysis

4 Conclusions

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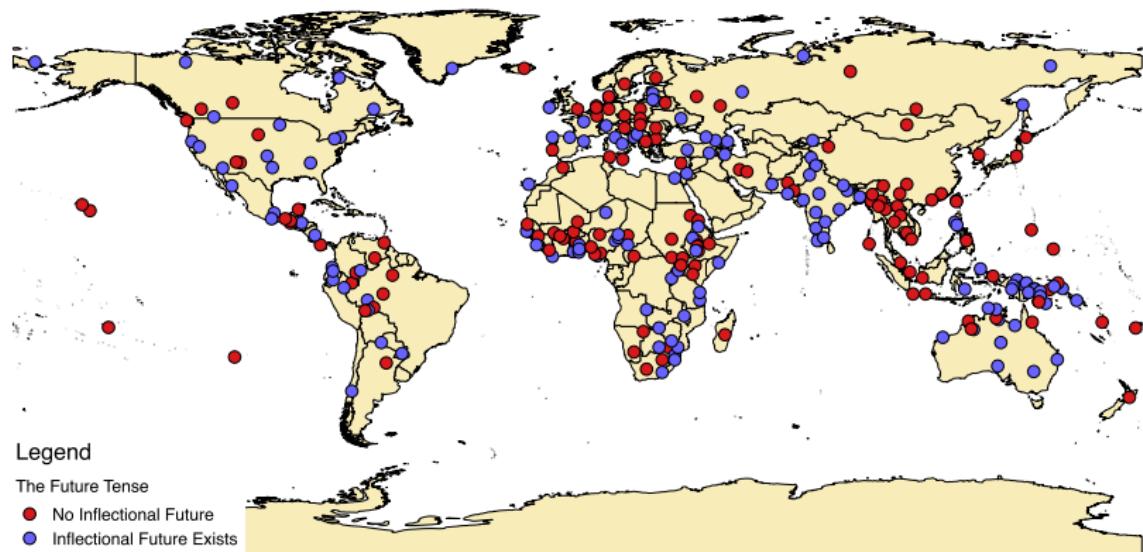
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 - Spanning 90% of languages in Ethnologue

Distribution of the Existence of Future Tense



Sex-Based Grammatical Gender

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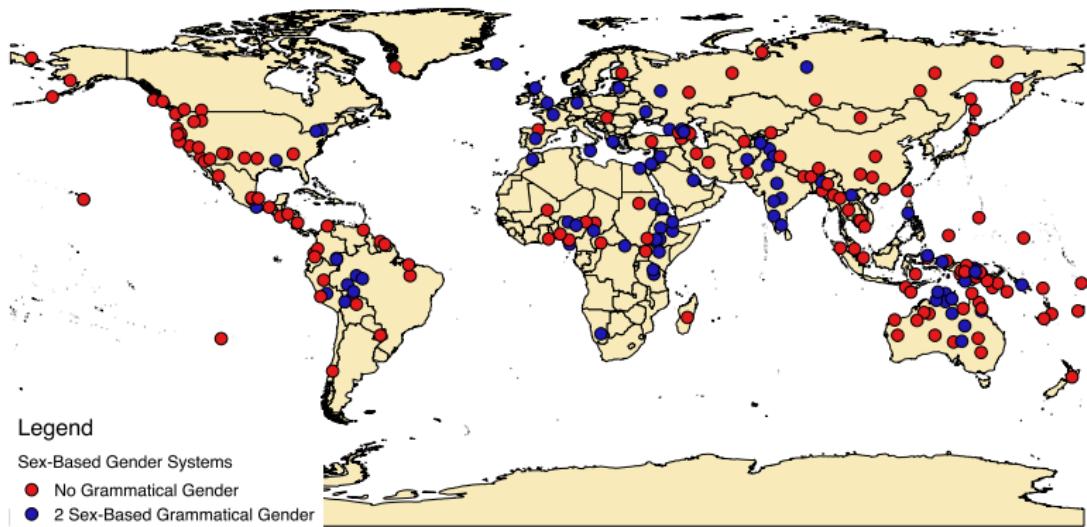
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Distribution of the Existence of Sex-Based Grammatical Gender



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 - English: *You*

Linguistic Data – Existence of Politeness Distinctions in Pronouns

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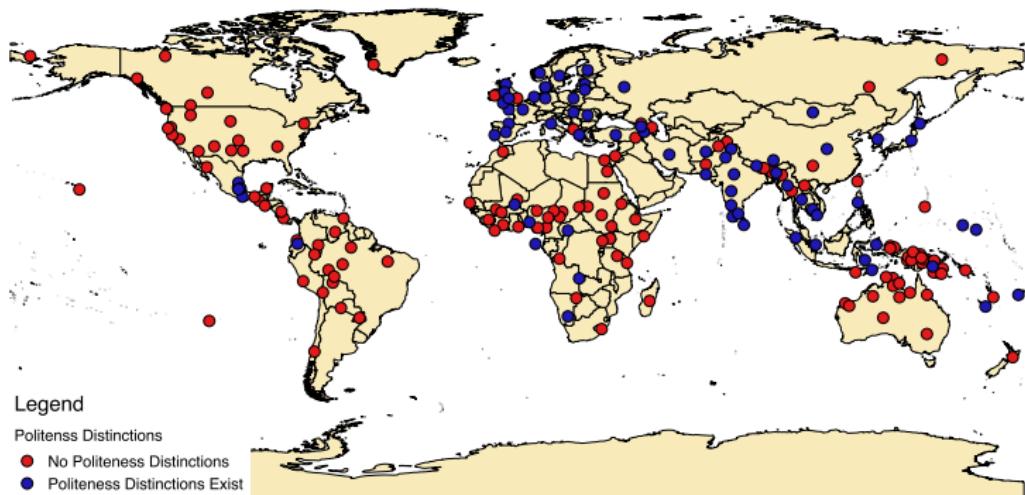
Linguistic Data – Existence of Politeness Distinctions in Pronouns

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Distribution of the Existence of Politeness Distinctions



Pre-1500CE Crop Return Data

Caloric Suitability Index (CSI)

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- Unaffected by human intervention

Pre-1500CE Crop Return Data

- Potential Crop Return

Pre-1500CE Crop Return Data

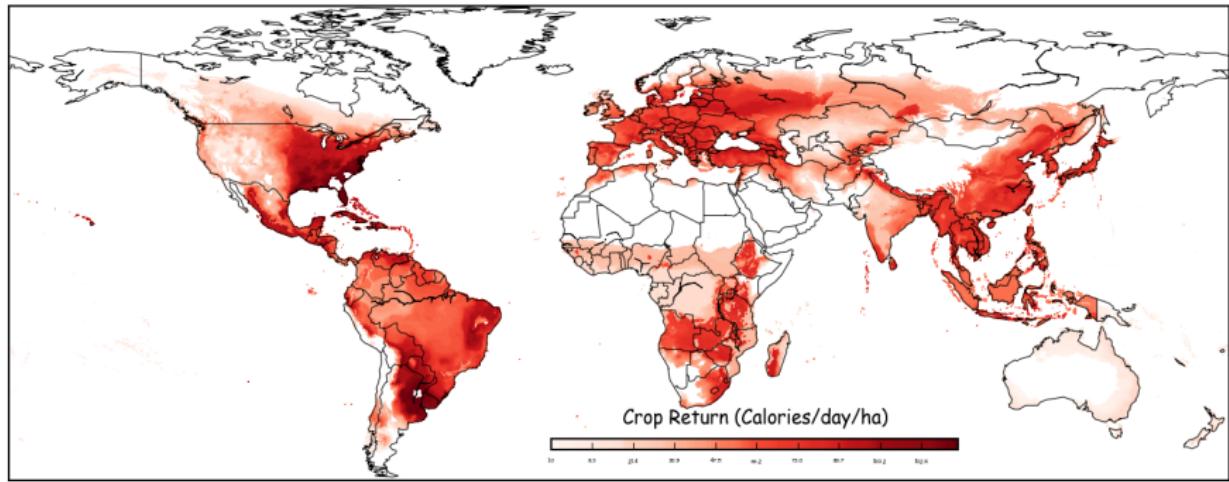
- Potential Crop Return
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$$\text{Potential Crop Return} = \frac{\text{Potential Crop Yield}}{\text{Potential Crop Growth Cycle}}$$

Potential Crop Return (pre-1500CE)



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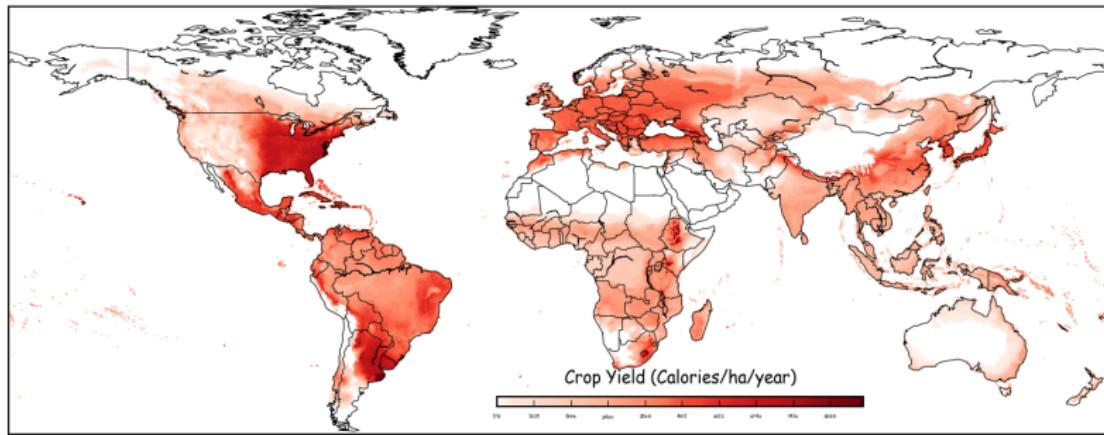
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 - All root crops

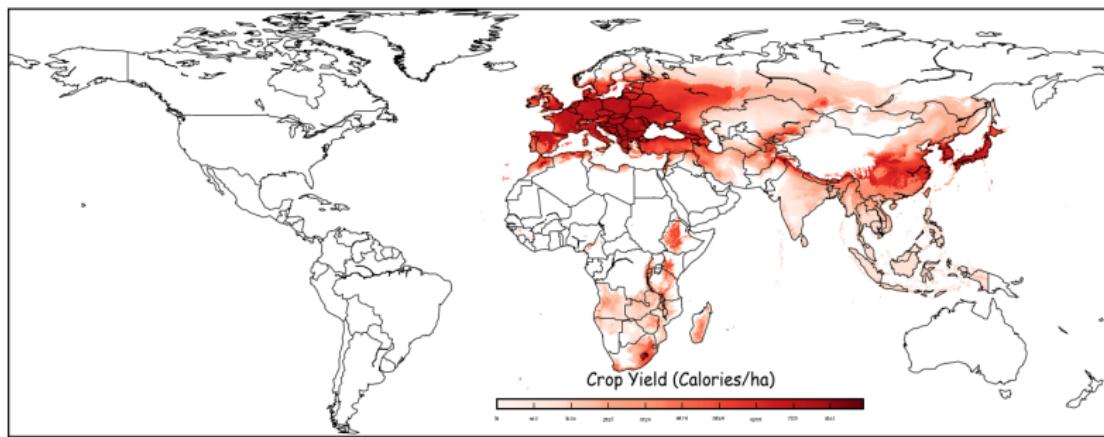
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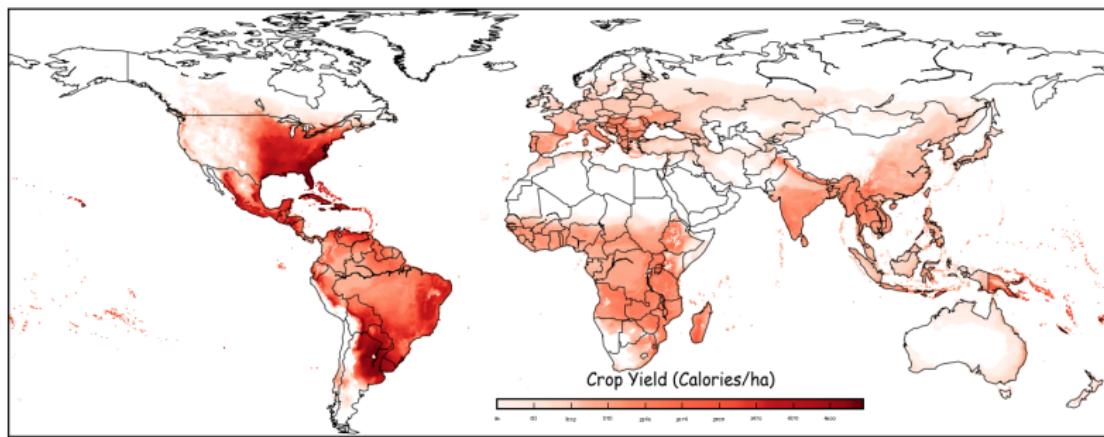
Global Distribution of CSI (pre-1500CE)



Global Distribution of Plow Positive CSI (pre-1500CE)



Global Distribution of Plow Negative CSI (pre-1500CE)



Ecological Diversity

- Ecological diversity: a Herfindahl index of the share of each territory that is occupied by different ecological zones

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- $\theta_{\ell j}$: Share of the homeland of language ℓ in ecological zone j

Empirical Specification

$$P(S_\ell | R_\ell, \{X_{\ell j}\}, \{\delta_c\}) = \Phi \left(\beta_0 + \beta_1 R_\ell + \sum_j \gamma_{0j} X_{\ell j} + \sum_c \gamma_c \delta_{\ell c} \right)$$

- S_ℓ \equiv Existence of structure S in language ℓ
- R_ℓ \equiv Geographical determinant in the ancestral region of language ℓ
- $X_{\ell j}$ \equiv Geographical characteristic j in the ancestral region of language ℓ
- $\delta_{\ell c}$ \equiv Regional FE s

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- Future tense
 - Geographical origin: Natural return to agricultural investment
 - Mechanism: Effect of natural return to agricultural investment on long-term orientation (Galor & Özak, 2016)

Crop Return & Future Tense



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 - e.g. disappearance of *Case Structures* in Romance languages

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Future Tense (Time Preference) \implies actual return to agricultural investment

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Remedy:

- Exploit variation in potential (rather than actual) return to agricultural investment

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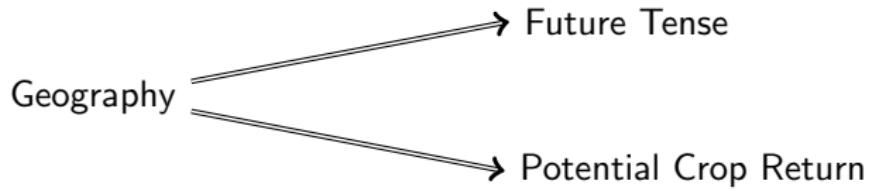
Potential Concerns:

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Remedy:

- Account for the confounding effects of:

Identification Strategy

Remedy:

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 - Geographical characteristics
 - (e.g., absolute latitude, elevation, ruggedness, temperature, precipitation, etc.)

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 - Account for host region FEs
 - Establish the persistent effect the geographical characteristics in the ancestral homeland of the language (rather than in current location)
 - Similar to 2nd generation migrants

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Potential Concerns:

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 - Constrain spatial diffusion
 - Constrain change in crop return

Pre-1500CE Crop Return and Future Tense

	Existence of Future Tense								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crop Return (pre-1500CE)	-0.06** (0.03)	-0.08** (0.03)	-0.08** (0.03)	-0.08** (0.03)	-0.08** (0.03)	-0.08** (0.03)	-0.09** (0.03)	-0.09*** (0.03)	-0.12*** (0.03)
Absolute Latitude		-0.10* (0.05)	-0.10* (0.05)	-0.10* (0.05)	-0.08 (0.05)	-0.07 (0.06)	-0.09 (0.10)	-0.13 (0.10)	
Elevation		-0.00 (0.03)	-0.02 (0.04)	-0.03 (0.04)	-0.01 (0.04)	-0.04 (0.05)	-0.04 (0.05)	-0.03 (0.05)	
Ruggedness			0.04 (0.04)	0.04 (0.04)	0.02 (0.04)	0.02 (0.05)	0.02 (0.04)		
Coast Length				-0.10*** (0.03)	-0.08*** (0.03)	-0.07** (0.03)	-0.08** (0.04)		
Precipitation					0.00 (0.08)	0.01 (0.08)	-0.00 (0.08)		
Precipitation (std)						-0.09*** (0.04)	-0.05 (0.06)	-0.05 (0.05)	
Precipitation Volatility						0.05 (0.08)	0.03 (0.08)	0.04 (0.08)	
Precipitation Spatial Correlation							-0.02 (0.04)	-1.05*** (0.31)	-0.97*** (0.31)
Temperature								-0.06 (0.08)	-0.06 (0.08)
Temperature (std)								-0.05 (0.05)	-0.05 (0.05)
Temperature Volatility								0.04 (0.09)	0.08 (0.09)
Temperature Spatial Correlation								1.04*** (0.31)	0.96*** (0.31)
Duration of Unproductive Period (pre-1500CE)									-0.10*** (0.03)
Regional FE	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo-R ²	0.01	0.04	0.05	0.05	0.05	0.07	0.09	0.12	0.14
Observations	275	275	275	275	275	275	275	275	275

Robustness

- Results are robust to

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 - Estimation method OLS

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 - Clustering at Language-family/genus level

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 - Selection on unobservables
 - Altonji et al
 - Oster

Robustness

	Existence of Future Tense								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crop Return (pre-1500CE)	-0.06** (0.03) ([0.04]) [0.04] {0.03}	-0.08** (0.03) ([0.04]) [0.04] {0.03}	-0.08** (0.03) ([0.04]) [0.04] {0.03}	-0.08** (0.03) ([0.04]) [0.04] {0.03}	-0.09** (0.03) ([0.04]) [0.04] {0.03}	-0.08** (0.03) ([0.04]) [0.04] {0.03}	-0.09** (0.04) ([0.04]) [0.04] {0.03}	-0.09** (0.03) ([0.04]) [0.04] {0.03}	-0.12*** (0.03) ([0.03]) [0.03] {0.03}
Regional FE	No	Yes							
Altonji et al		-4.14	-3.86	-3.86	-3.45	-3.55	-3.28	-3.16	-2.09
δ		-0.32	-0.40	-0.40	-0.37	-0.55	-0.67	-1.05	-0.75
β -Oster		-0.28	-0.25	-0.25	-0.27	-0.21	-0.20	-0.16	-0.23
R^2	0.01	0.06	0.07	0.07	0.07	0.09	0.11	0.15	0.17
Adjusted- R^2	0.01	0.03	0.04	0.04	0.04	0.05	0.06	0.09	0.11
Observations	275	275	275	275	275	275	275	275	275

Is Crop Return Uniquely Associated to Future?

Is Crop Return Uniquely Associated to Future?

	Language Structures									
	Temporal Structures				Non-Temporal Structures					
	Future	Past	Perfect	Gender	Possessive	Evidentiality	Consonants	C/V Ratio	Colors	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	
Crop Return (pre-1500CE)	-0.12*** (0.03)	-0.06 (0.04)	0.05 (0.04)	0.03 (0.03)	-0.07* (0.04)	0.00 (0.03)	0.08 (0.06)	-0.08 (0.05)	0.06 (0.34)	
All Geographic Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Regional FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted- R^2	0.11	0.08	0.14	0.20	0.15	0.20	0.31	0.19	-0.03	
Observations	275	218	218	243	224	386	540	541	117	

How Deep are the Roots of the Future Tense?

- All languages within a language family descended from the same proto-language

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- All languages within a language family descended from the same proto-language
 - ⇒ Crop return in the ancestral homeland (the proto-language's Urheimat) may affect
 - Future tense in the daughter languages
 - Share of daughter languages with a future tense

Persistent Effect of Urheimat Characteristics

	Existence of Future Tense							
	All Languages				Languages In/Near Urheimat			
	(1)	(2)	(3)	(4)	All	$\Delta R < 0.5SD$	$\Delta R < 0.25SD$	$\Delta R < 0.01SD$
Urheimat Crop Return (pre-1500CE)	-0.13*** (0.04)	-0.21*** (0.06)	-0.12*** (0.04)	-0.20*** (0.06)	-0.17*** (0.06)	-0.15*** (0.04)	-0.20** (0.08)	-0.24** (0.07)
Change in Crop Return (ΔR)			0.03 (0.05)	0.05 (0.04)	0.08 (0.05)	0.04 (0.17)	0.14 (0.41)	6.62 (31.72)
Regional FE	No	Yes	No	Yes	Yes	Yes	Yes	No
Urheimat Geographical Charac.	No	Yes	No	Yes	Yes	Yes	Yes	No
Change in Geographical Charac.	No	No	No	Yes	Yes	Yes	Yes	No
Pseudo- R^2	0.04	0.22	0.04	0.30	0.28	0.35	0.43	0.19
Observations	273	273	273	273	233	166	120	20
Language Families	75	75	75	75	74	70	56	20

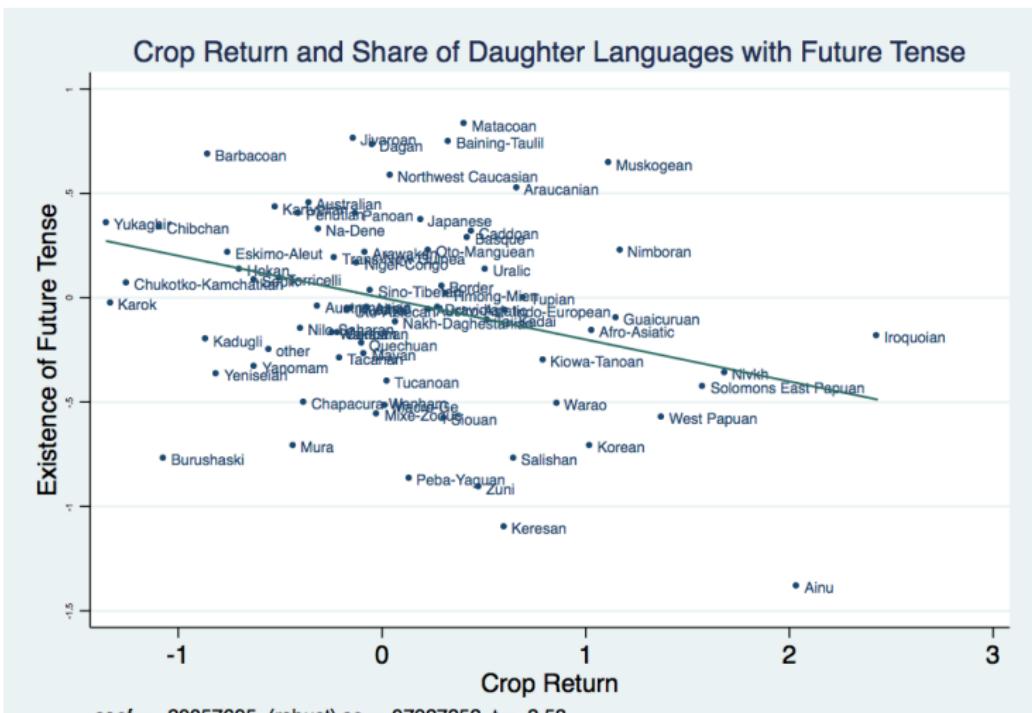
Languages Outside Urheimat

	Existence of Future Tense			
	Homeland		Urheimat	
	(1)	(2)	(3)	(4)
Crop Return (Pre-1500CE)	-0.01 (0.06)	-0.03 (0.04)	-0.14* (0.07)	-0.52*** (0.07)
Regional FE	No	Yes	No	Yes
Homeland Geographical Characteristics	No	Yes	No	No
Urheimat Geographical Characteristics	No	No	No	Yes
Adjusted- R^2	-0.01	0.12	0.04	0.17
Observations	163	163	163	163
Language Families	19	19	19	19

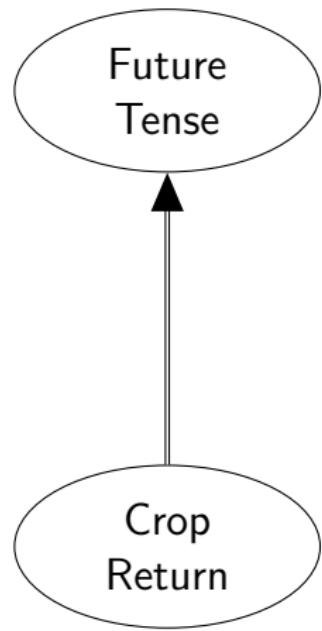
Persistent Effect of Urheimat Characteristics

	Share of Daughter Languages with Future Tense					
	(1)	(2)	(3)	(4)	(5)	(6)
Urheimat Crop Return (pre-1500CE)	-0.19** (0.06)	-0.25*** (0.04)	-0.25*** (0.05)	-0.24*** (0.05)	-0.20*** (0.05)	-0.23*** (0.06)
Regional FE	No	Yes	Yes	Yes	Yes	Yes
Main Geographical Controls	No	No	Yes	Yes	Yes	Yes
Precipitation Controls	No	No	No	Yes	Yes	Yes
Temperature Controls	No	No	No	No	Yes	Yes
Unproductive Period	No	No	No	No	No	Yes
Observations	74	74	74	74	74	74

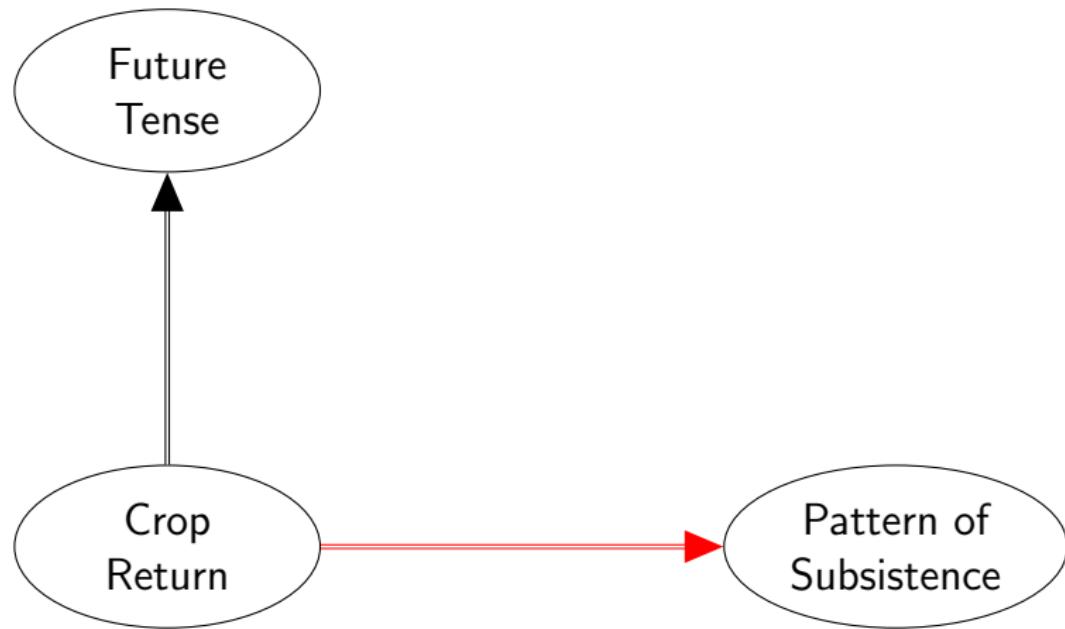
Urheimat's Crop Return & Share of Daughter Languages with a Future Tense



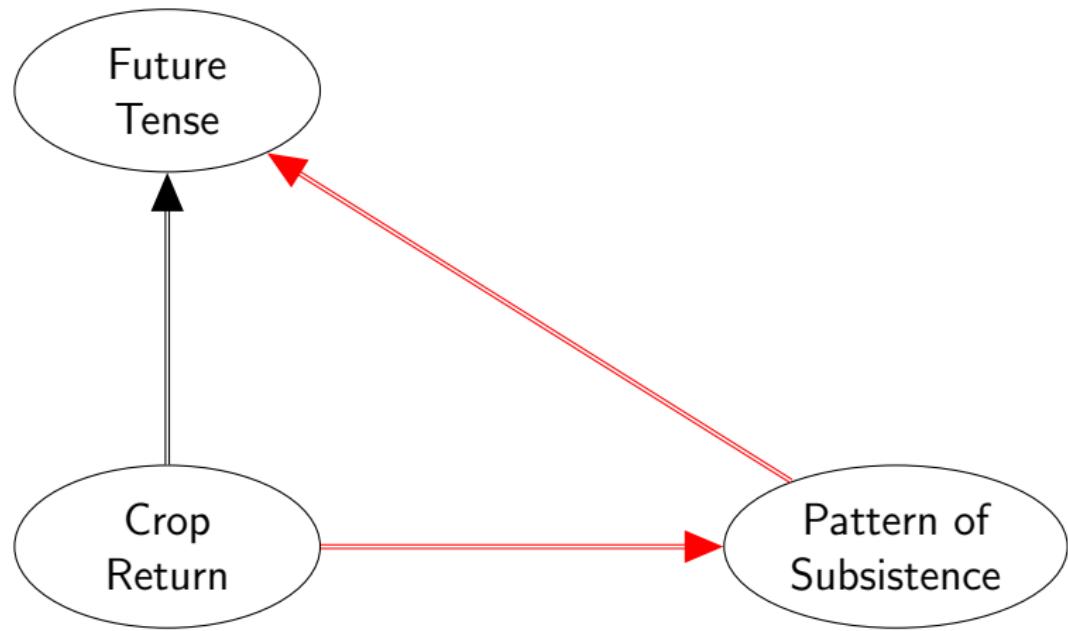
Mechanism: Crop Return & Patterns of Subsistence



Mechanism: Crop Return & Patterns of Subsistence



Mechanism: Crop Return & Patterns of Subsistence



Ethnographic Subsistence Patterns

- Ethnic groups' subsistence strategies

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- Ethnic groups' subsistence strategies
 - Hunting

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- Ethnic groups' subsistence strategies
 - Hunting
 - Gathering

Ethnographic Subsistence Patterns

- Ethnic groups' subsistence strategies
 - Hunting
 - Gathering
 - Fishing

Ethnographic Subsistence Patterns

- Ethnic groups' subsistence strategies
 - Hunting
 - Gathering
 - Fishing
 - Animal Husbandry

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- Ethnic groups' subsistence strategies
 - Hunting
 - Gathering
 - Fishing
 - Animal Husbandry
 - Farming

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- Ethnic groups' subsistence strategies
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 - Gathering
 - Fishing
 - Animal Husbandry
 - Farming
- Measure of Agricultural Intensity:

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 - Fishing
 - Animal Husbandry
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- Ethnic groups' subsistence strategies
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 - Gathering
 - Fishing
 - Animal Husbandry
 - Farming
- Measure of Agricultural Intensity:
 - Shares of subsistence associated with
 - Farming + Animal husbandry

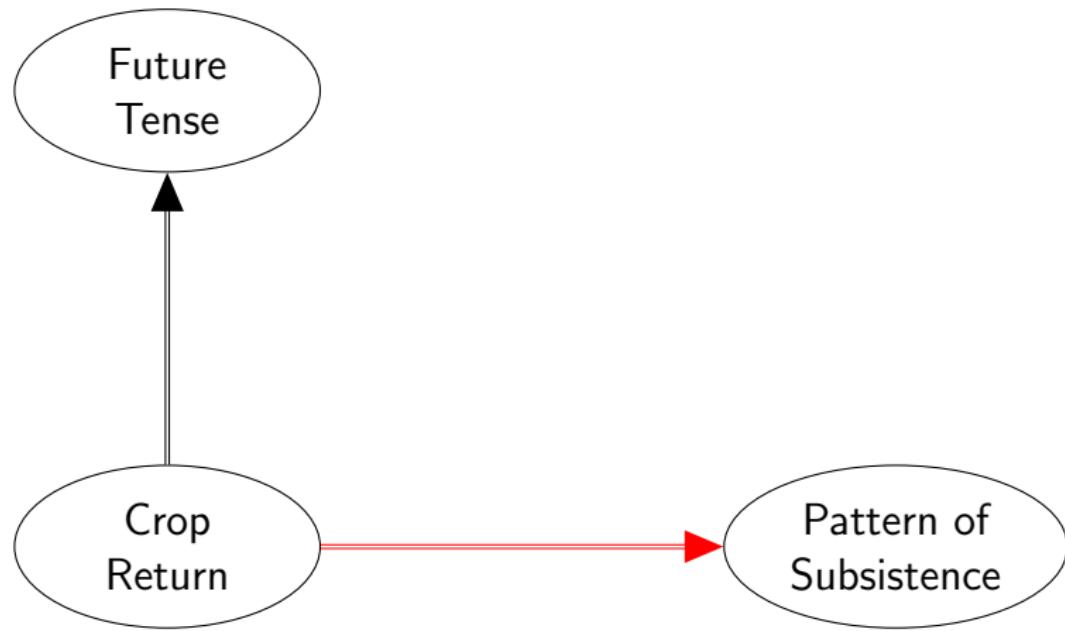
Crop Return & Agricultural Intensity

	Agricultural Intensity			
	Full Sample		Future Sample	
	(1)	(2)	(3)	(4)
Crop Return (pre-1500CE)	0.19*** (0.03)	0.22*** (0.02)	0.27*** (0.07)	0.30*** (0.06)
Regional FE	No	Yes	No	Yes
All Geographical Controls	No	Yes	No	Yes
Adjusted- R^2	0.04	0.64	0.07	0.61
Observations	1306	1306	264	264

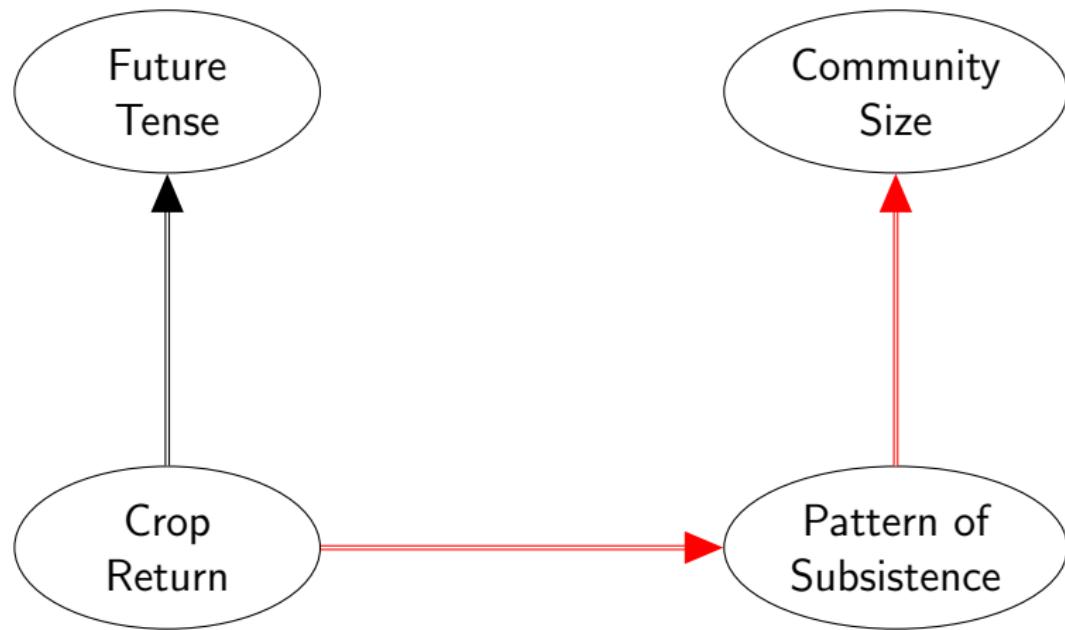
Agricultural Intensity and Future Tense

	Existence of Future Tense				
	(1)	(2)	(3)	(4)	(5)
Agricultural Intensity	-0.07** (0.03)	-0.10*** (0.04)	-0.10** (0.04)	-0.09** (0.04)	-0.10** (0.04)
Regional FE	No	Yes	Yes	Yes	Yes
Main Geographic Controls	No	No	Yes	Yes	Yes
Main Precipitation Controls	No	No	No	Yes	Yes
Main Temperature Controls	No	No	No	No	Yes
Pseudo- R^2	0.02	0.07	0.09	0.10	0.16
Observations	264	264	264	264	264

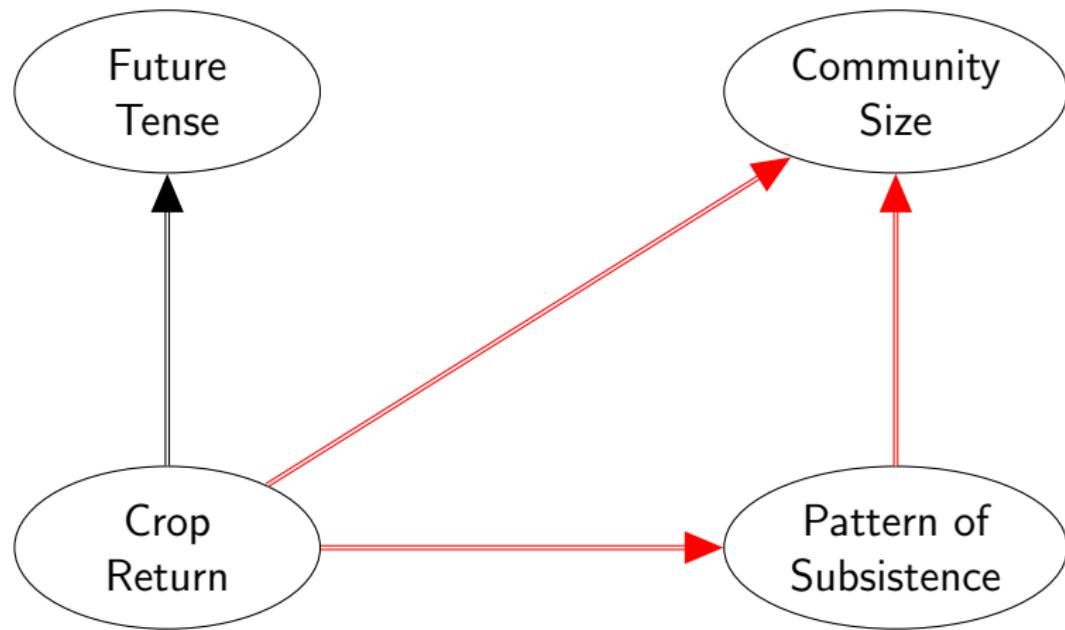
Mechanism: Crop Return & Population Scale



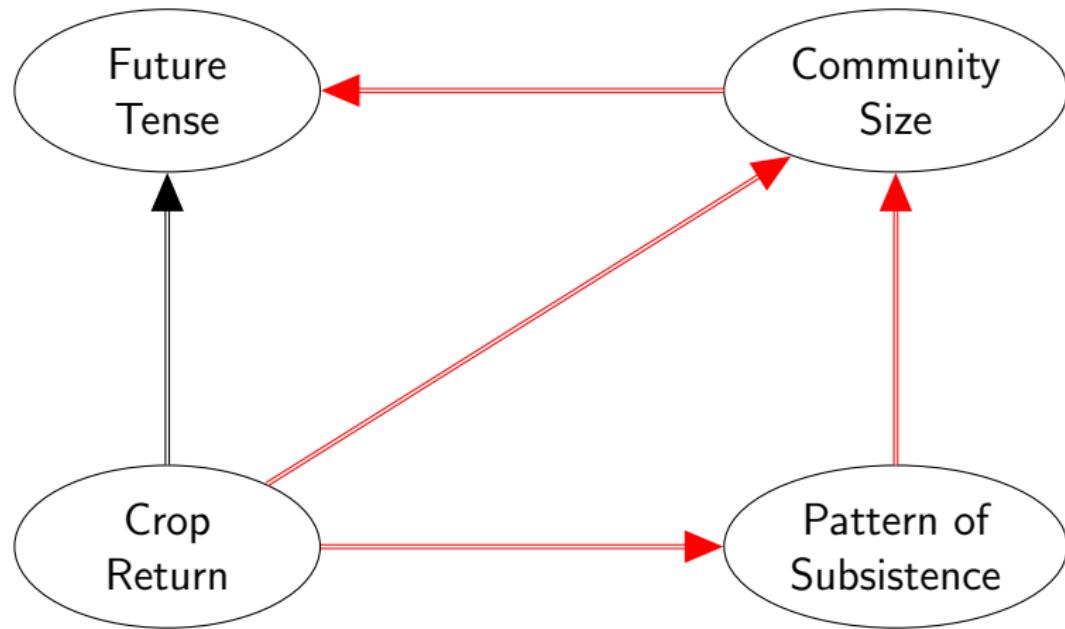
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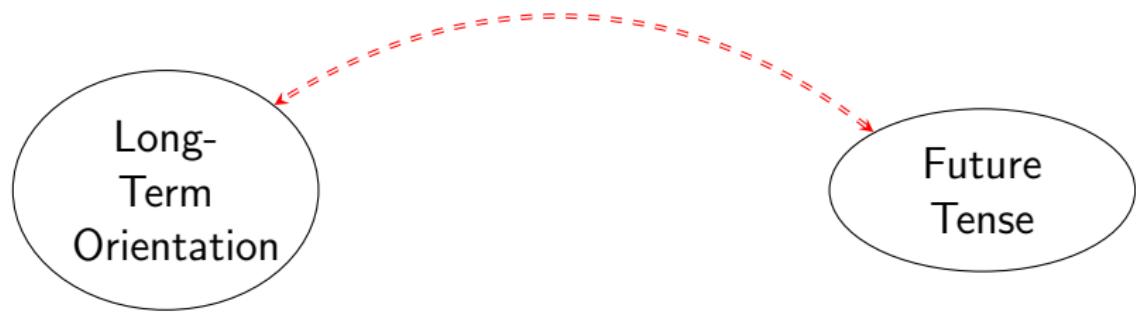
Crop Return, Agriculture & Size of Local Community

	Size of Local Community													
	Agricultural Intensity				Both									
	Full Sample	Future Sample	Full Sample	Future Sample	Full Sample	Future Sample	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Agricultural Intensity	0.61*** (0.03)	0.67*** (0.04)	0.62*** (0.05)	0.69*** (0.08)	0.58*** (0.03)	0.62*** (0.04)	0.55*** (0.06)	0.56*** (0.10)						
Crop Return (pre-1500CE)					0.11*** (0.03)	0.15*** (0.04)	0.20*** (0.06)	0.24*** (0.08)						
Regional FE	No	Yes	No	Yes	No	Yes	No	Yes						
All Geographical Controls	No	Yes	No	Yes	No	Yes	No	Yes						
Adjusted- R^2	0.37	0.46	0.38	0.45	0.38	0.47	0.41	0.49						
Observations	614	614	163	163	614	614	163	163						

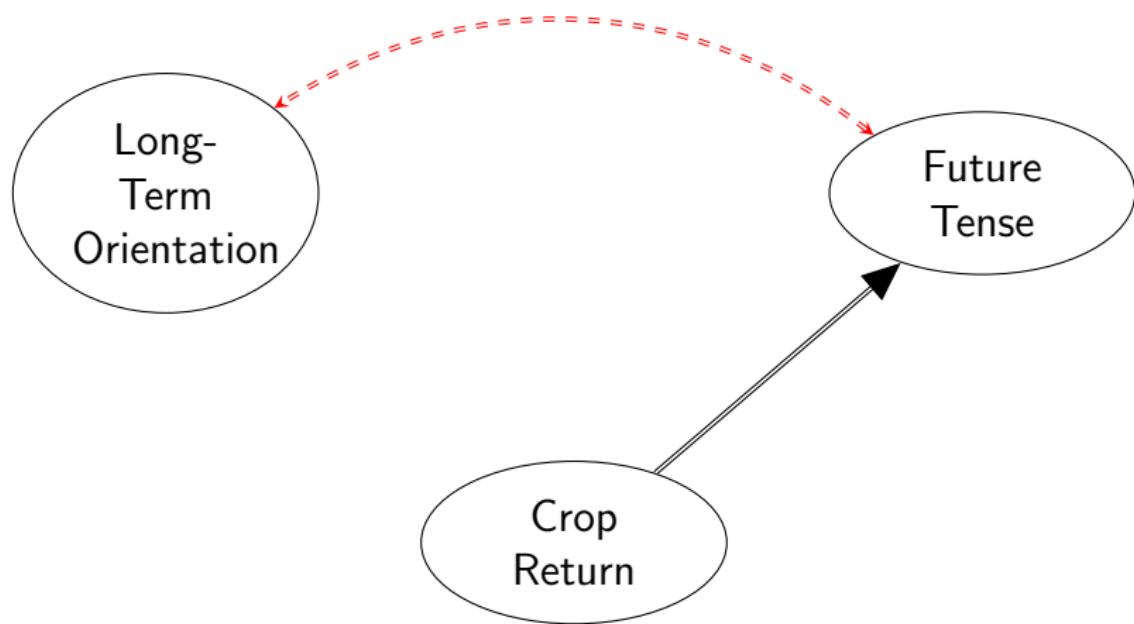
Mechanism: Efficiency Channel

	Existence of Future Tense				
	(1)	(2)	(3)	(4)	(5)
Size of Local Communities	-0.07*	-0.10**	-0.09**	-0.08*	-0.09**
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Regional FE	No	Yes	Yes	Yes	Yes
Main Geographic Controls	No	No	Yes	Yes	Yes
Main Precipitation Controls	No	No	No	Yes	Yes
Main Temperature Controls	No	No	No	No	Yes
Pseudo- R^2	0.02	0.09	0.12	0.14	0.18
Observations	163	163	163	163	163

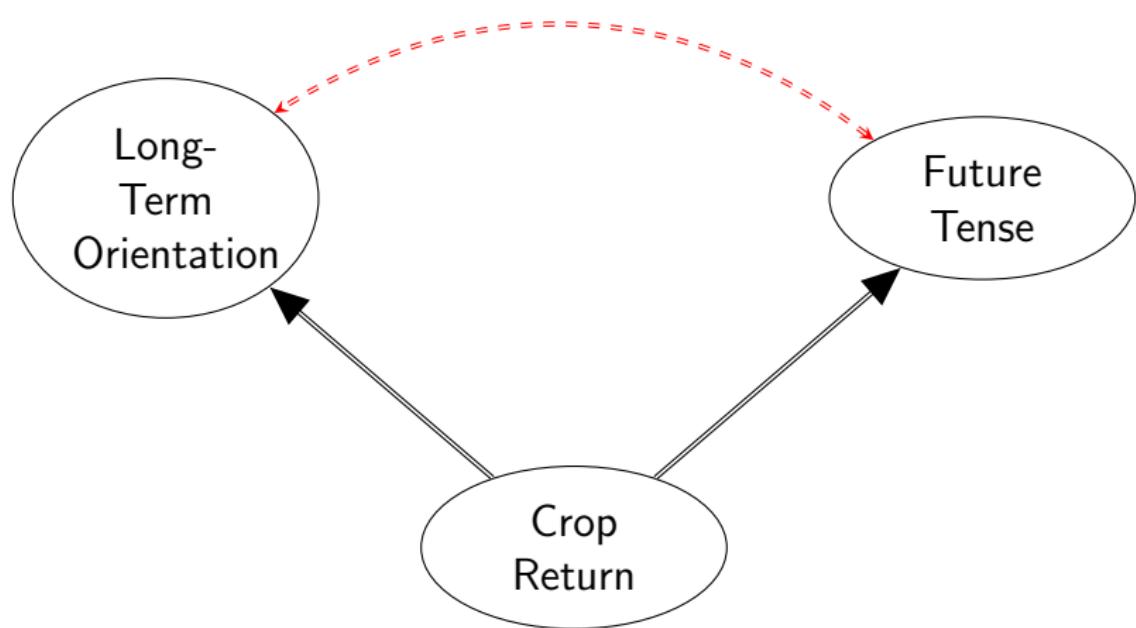
Crop Return, Long-Term Orientation & Future Tense



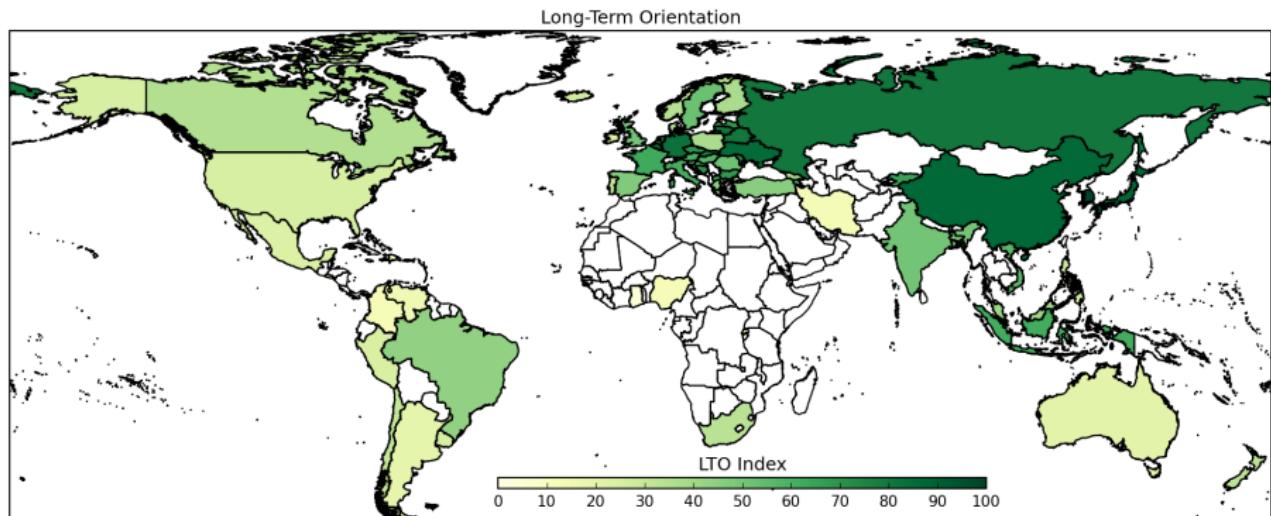
Crop Return, Long-Term Orientation & Future Tense



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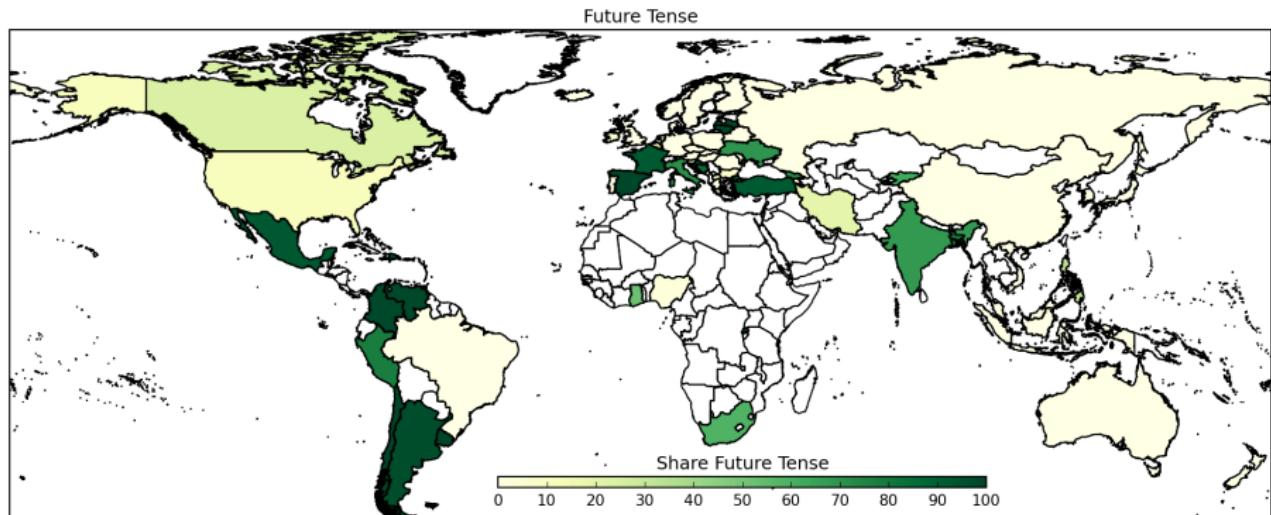


Long-Term Orientation & Future Tense



(a) LTO

Long-Term Orientation & Future Tense



(b) Future

Future Tense & Long-Term Orientation – Results

	Long Term Orientation				
	Hofstede				WVS
	(1)	(2)	(3)	(4)	(5)
Future	-0.32*** (0.11)	-0.32*** (0.09)	-0.25** (0.10)	-0.01 (0.09)	-0.26** (0.12)
Crop Return (Pre-1500, Ancestors)		0.54*** (0.10)	0.50*** (0.08)	0.46*** (0.09)	0.35** (0.14)
Main Geographic Controls	No	No	Yes	Yes	Yes
Regional FE	No	No	No	Yes	Yes
Adjusted- R^2	0.09	0.38	0.43	0.56	0.32
Observations	69	69	69	69	76

Geographical Origins of Sex-Based Grammatical Gender

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- Grammatical Gender ~ Gender bias

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- Grammatical Gender ~ Gender bias
 - Geographical origin: Predisposition for usage of the plow

Geographical Origins of Sex-Based Grammatical Gender

- Grammatical Gender ~ Gender bias
 - Geographical origin: Predisposition for usage of the plow
 - Mechanism: Effect on gender roles (Alesina et al., 2013)

Sex-Based Grammatical Gender

	Reduced Form		Mechanism			
	Grammatical Gender		Plow		Grammatical Gender	
	(1)	(2)	(3)	(4)	(5)	(6)
Plow Negative CSI (pre-1500CE)	-0.12** (0.05)	-0.20*** (0.07)	-0.25*** (0.02)	-0.06*** (0.02)		
Caloric Suitability Index (pre-1500CE)	0.15*** (0.05)	0.21*** (0.06)	0.25*** (0.02)	0.10*** (0.02)		
Plow Usage					0.37*** (0.10)	0.20 (0.12)
All Geographic Controls	No	Yes	No	Yes	No	Yes
Regional FE	No	Yes	No	Yes	No	Yes
Adjusted- R^2	0.03	0.21	0.20	0.47	0.13	0.28
Observations	217	217	1178	1178	114	114

The Geographical Origins of Politeness Distinctions

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- Politeness Distinctions ~ Obedience and power distance

The Geographical Origins of Politeness Distinctions

- Politeness Distinctions ~ Obedience and power distance
 - Geographical origin: Ecological diversity

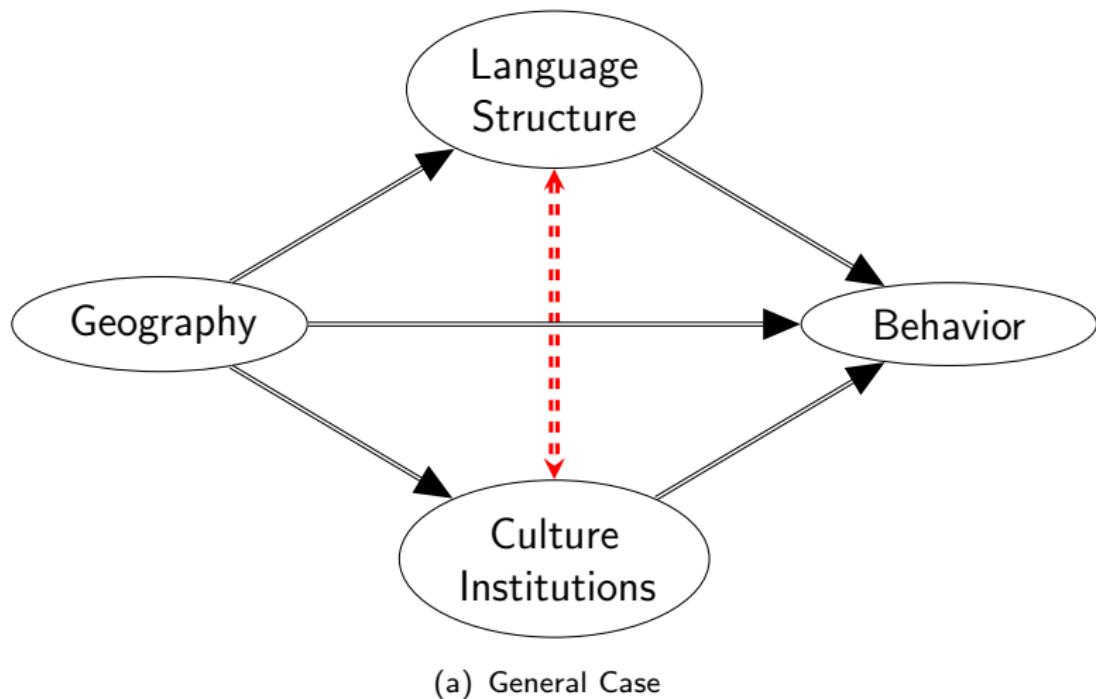
The Geographical Origins of Politeness Distinctions

- Politeness Distinctions ~ Obedience and power distance
 - Geographical origin: Ecological diversity
 - Mechanism: The effect of agricultural productivity (Diamond, 1997) and ecological diversity (Fenske, 2015, Depetris & Özak, 2016) on the emergence of hierarchical societies

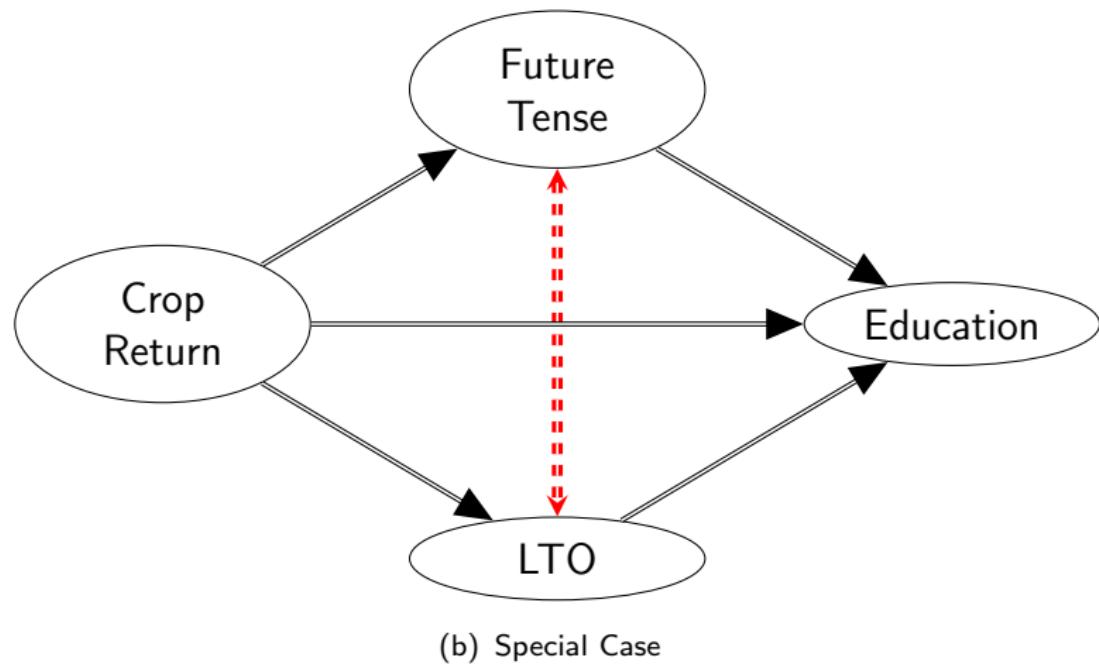
Politeness Distinctions

	Reduced Form		Mechanism			
	Politeness		Jurisdictional Hierarchy		Politeness	
	(1)	(2)	(3)	(4)	(5)	(6)
Ecological Diversity	0.14*** (0.03)	0.09** (0.04)	0.17*** (0.03)	0.10*** (0.03)		
Caloric Suitability Index (pre-1500CE)	0.11*** (0.03)	0.12*** (0.03)	0.17*** (0.03)	0.23*** (0.03)		
Jurisdictional Hierarchy					0.23*** (0.02)	0.18*** (0.04)
All Geographic Controls	No	Yes	No	Yes	No	Yes
Regional FE	No	Yes	No	Yes	No	Yes
Adjusted- <i>R</i> ²	0.15	0.31	0.05	0.32	0.37	0.49
Observations	198	198	1169	1169	113	113

Geography, Language & Contemporary Behavior



Crop Return, Future Tense & Contemporary Behavior



Main Identification Challenge

Main Identification Challenge

- Isolate the effects of Language from

Main Identification Challenge

- Isolate the effects of Language from
 - Other Cultural Characteristics

Main Identification Challenge

- Isolate the effects of Language from
 - Other Cultural Characteristics
 - Institutions

Main Identification Challenge

- Isolate the effects of Language from
 - Other Cultural Characteristics
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 - Geography

Identification Strategy

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- Conventional (Imperfect) Approach – The Epidemiological Approach

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 - Analyze migrants and their descendants

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 - Analyze migrants and their descendants
 - Account for location FEs
(geography, institutions, culture)
 - Account for individual characteristics
(e.g., age, gender, marital status, etc.)
 - Account for year FE
 - Migrants and their descendants in US Census
 - Post-2000 (Census + ACS)
 - Large sample

Major Concern in the Epidemiological Approach

Major Concern in the Epidemiological Approach

Potential Concerns:

Major Concern in the Epidemiological Approach

Potential Concerns:

- Omitted Ancestral Characteristics

Major Concern in the Epidemiological Approach

Potential Concerns:

- Omitted Ancestral Characteristics
 - Geography

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Remedy:

Major Concern in the Epidemiological Approach

Potential Concerns:

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 - Geography
 - Institutions
 - Other Cultural Characteristics

Remedy:

- Account for Ancestral FE

Major Concern in the Epidemiological Approach

Potential Concerns:

- Omitted Ancestral Characteristics
 - Geography
 - Institutions
 - Other Cultural Characteristics

Remedy:

- Account for Ancestral FE
 - **Major methodological contribution to the epidemiological approach**

Major Concern in the Epidemiological Approach

Potential Concerns:

- Omitted Ancestral Characteristics
 - Geography
 - Institutions
 - Other Cultural Characteristics

Remedy:

- Account for Ancestral FE
 - **Major methodological contribution to the epidemiological approach**
 - Exploit variations in spoken languages across individuals with same ancestral origin

Major Concern in the Epidemiological Approach

Potential Concerns:

- Omitted Ancestral Characteristics
 - Geography
 - Institutions
 - Other Cultural Characteristics

Remedy:

- Account for Ancestral FE
 - **Major methodological contribution to the epidemiological approach**
 - Exploit variations in spoken languages across individuals with same ancestral origin
 - Migrants from Belgium who speak Flemish, French or other languages

Major Concern in the Epidemiological Approach

Potential Concerns:

- Omitted Ancestral Characteristics
 - Geography
 - Institutions
 - Other Cultural Characteristics

Remedy:

- Account for Ancestral FE
 - **Major methodological contribution to the epidemiological approach**
 - Exploit variations in spoken languages across individuals with same ancestral origin
 - Migrants from Belgium who speak Flemish, French or other languages
 - Accounts for variations due to (cultural) differences across countries of origin

Identification Strategy

Identification Strategy

Potential Concerns:

Identification Strategy

Potential Concerns:

- Omitted Parental Characteristics

Identification Strategy

Potential Concerns:

- Omitted Parental Characteristics
 - Preferences

Identification Strategy

Potential Concerns:

- Omitted Parental Characteristics
 - Preferences
 - Background

Identification Strategy

Potential Concerns:

- Omitted Parental Characteristics
 - Preferences
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Remedy:

Identification Strategy

Potential Concerns:

- Omitted Parental Characteristics
 - Preferences
 - Background

Remedy:

- Account for parental characteristics

Identification Strategy

Potential Concerns:

- Omitted Parental Characteristics
 - Preferences
 - Background

Remedy:

- Account for parental characteristics
 - Education

Identification Strategy

Potential Concerns:

- Omitted Parental Characteristics
 - Preferences
 - Background

Remedy:

- Account for parental characteristics
 - Education
 - English proficiency

Empirical Specification

$$\begin{aligned}\text{College}_{istlp} = & \beta_0 + \beta_1 \text{Future}_{istlp} + \beta_2 \text{Return}_{istlp} \\ & + \sum_j \gamma_{0j} X_{istlpj} + \sum_{stpj} \gamma_{stpj} \delta_{stpj} + \epsilon_{istlp},\end{aligned}$$

- College_{istlp} : College education of individual i in state s in period t who speaks language l with parental ancestry p
- Return_{istlp} : Pre-1500CE crop return in the homeland of language l spoken by the individual
- $\{X_{istlpj}\}_j$: A set of additional geographical characteristics of the homeland of the language spoken by the individual
- $\{\delta_{stpj}\}_j$: A set of fixed-effects that account jointly for individual characteristics j and ancestry

College Education of Second Generation Migrants

	College Attendance					
	(1)	(2)	(3)	(4)	(5)	(6)
Future Tense	-0.201*** (0.013)	-0.207*** (0.007)	-0.201*** (0.007)	-0.046*** (0.011)		-0.041*** (0.012)
Crop Return (pre-1500CE)					0.010*** (0.003)	0.006* (0.003)
Main Geographical Controls	Yes	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Age FE	No	Yes	Yes	Yes	Yes	Yes
Gender FE	No	Yes	Yes	Yes	Yes	Yes
Marital Status FE	No	No	Yes	Yes	Yes	Yes
Parental Origin FE	No	No	No	Yes	Yes	Yes
Adjusted- R^2	0.05	0.07	0.08	0.13	0.13	0.13
R^2	0.05	0.11	0.17	0.45	0.45	0.45
Observations	165250	165250	165250	165250	165250	165250

Second Generation Migrants – Accounting for Parental Attributes

	College Attendance							
	Parental Education			Parental English			Both	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Future Tense	-0.047*** (0.006)	-0.043*** (0.007)	-0.038*** (0.008)		-0.038*** (0.008)	-0.035*** (0.008)		-0.034*** (0.008)
Crop Return (pre-1500CE)		0.010*** (0.002)	0.005*** (0.002)		0.004* (0.002)	0.000 (0.002)		0.005** (0.002)
Mom's College Attendance	0.130*** (0.003)	0.130*** (0.003)	0.130*** (0.003)				0.134*** (0.004)	0.134*** (0.004)
Dad's College Attendance	0.073*** (0.003)	0.073*** (0.003)	0.073*** (0.003)				0.146*** (0.004)	0.147*** (0.004)
Mom's English Level				0.012*** (0.001)	0.012*** (0.001)	0.012*** (0.001)	0.013*** (0.001)	0.014*** (0.001)
Dad's English Level				-0.001 (0.002)	-0.001 (0.002)	-0.001 (0.002)	0.006*** (0.002)	0.006*** (0.002)
Main Geographical Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Origin FE for Both Parents	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Age FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Gender FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Marital Status FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted- <i>R</i> ²	0.14	0.14	0.14	0.14	0.14	0.14	0.18	0.18
<i>R</i> ²	0.23	0.23	0.23	0.23	0.23	0.23	0.26	0.26
Observations	165250	165250	165250	98623	98623	98623	98623	98623

Robustness

- The analysis is robust to

Robustness

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 - Accounting for Other Language Structures Table

Robustness

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 - Sample selection

Robustness

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 - Accounting for Other Language Structures [Table](#)
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Robustness

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 - Bias due to local labor market conditions
 - Analysis with county FE [Table](#)

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Interpretation

- In the absence of parental origin FE
 - The effect of the future tense is indistinguishable from the effect of other ancestral cultural characteristics associated with LTO
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Interpretation

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 - Isolates the effect of the future tense from the effect of other ancestral cultural characteristics associated with LTO
 - Individuals that speak a language with future tense have a 5% lower probability of attending college

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 - Individuals that speak a language with future tense have a 20% lower probability of attending college
- Accounting for parental origin FE
 - Isolates the effect of the future tense from the effect of other ancestral cultural characteristics associated with LTO
 - Individuals that speak a language with future tense have a 5% lower probability of attending college
 - Future tense per se accounts for 25% of the effect of ancestral culture

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 - Individuals that speak a language with future tense have a 5% lower probability of attending college
 - Future tense per se accounts for 25% of the effect of ancestral culture
 - Large effect: $\approx 58\%$ of having college educated father
 $\approx 33\%$ of having college educated mother

Conclusions

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- Causes and consequences of the evolution of languages
 - Effect of the economic environment on languages
 - Effect of languages on human behavior

Geographical Origins and Economic Consequences of Language Structures

Oded Galor, Ömer Özak and Assaf Sarid

December 8, 2016

Sex-Based Gender System and Economic Behavior

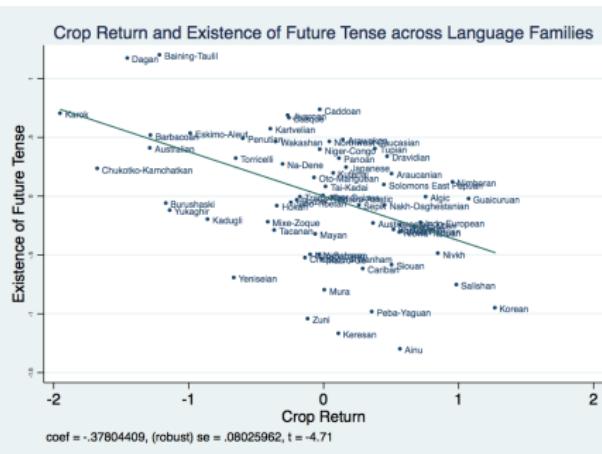
	Economic Outcomes of Women					
	College Attendance		Labor Force Participation			
	(1)	(2)	(3)	(4)	(5)	(6)
Existence of Gender System	-0.228*** (0.018)	-0.049*** (0.007)	-0.015*** (0.005)	0.029*** (0.009)	0.022*** (0.003)	0.037*** (0.009)
Mom's Education Level (HS+)		0.121*** (0.007)		0.019*** (0.004)		-0.002 (0.002)
Dad's Education Level (HS+)		0.137*** (0.007)		0.005 (0.004)		-0.018*** (0.002)
Education Level (HS+)				0.163*** (0.002)	0.168*** (0.003)	
Main Geographical Controls	Yes	Yes	Yes	Yes	Yes	Yes
Origin FE for Both Parents	No	Yes	No	Yes	No	Yes
County FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Age FE	Yes	Yes	Yes	Yes	Yes	Yes
Gender FE	Yes	Yes	Yes	Yes	Yes	Yes
Marital Status FE	Yes	Yes	Yes	Yes	Yes	Yes
Parental Origin FE	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted- <i>R</i> ²	0.08	0.16	0.04	0.05	0.07	0.08
<i>R</i> ²	0.24	0.31	0.21	0.21	0.23	0.24
Observations	39433	39433	39433	39433	39433	39433

Basic Result – OLS

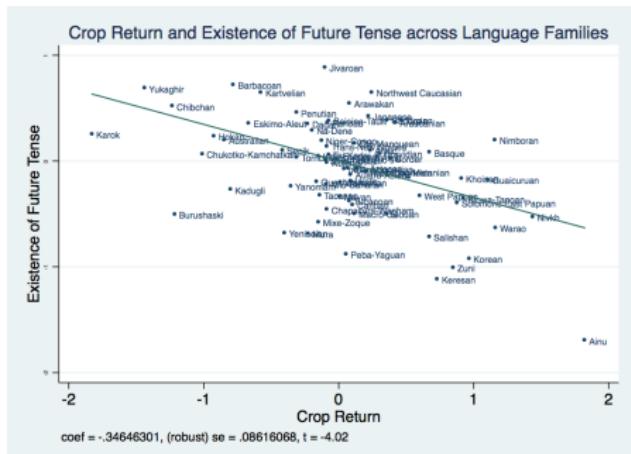
Back

Language Family Level Analysis Figures

Back



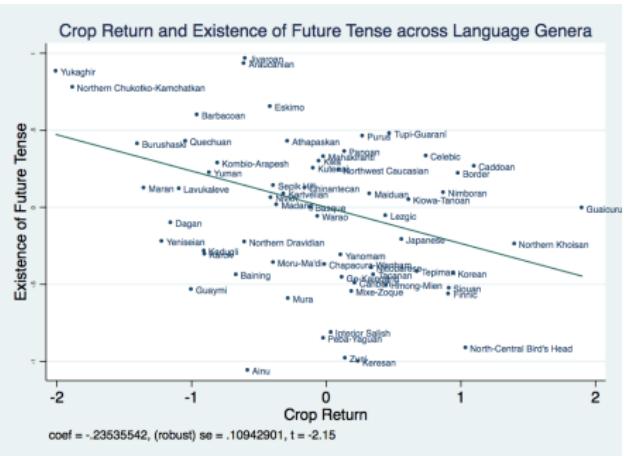
(a) Median



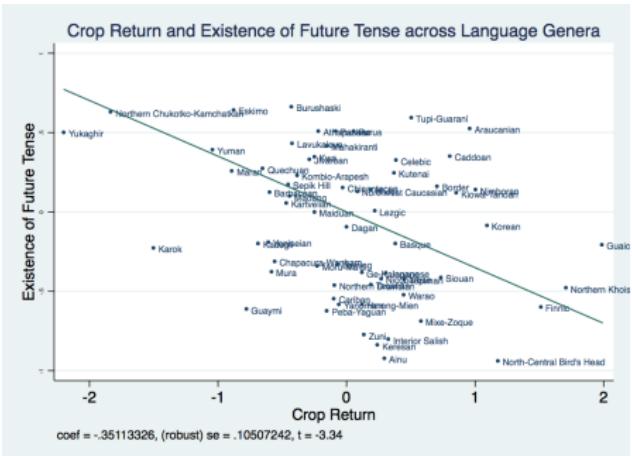
(b) Mean

Genus Level Analysis Figures

Back



(c) Median



(d) Mean

Language Family Level Analysis – Using Means

Back

		Existence of Future Tense (Mean)					
		(1)	(2)	(3)	(4)	(5)	(6)
Crop Return (pre-1500CE)		-0.28*** (0.07)	-0.39*** (0.07)	-0.38*** (0.07)	-0.42*** (0.06)	-0.47*** (0.07)	-0.44*** (0.08)
Unproductive Period (pre-1500CE)							0.04 (0.09)
Regional FE	No	Yes	Yes	Yes	Yes	Yes	Yes
Main Geographical Controls	No	No	Yes	Yes	Yes	Yes	Yes
Precipitation Controls	No	No	No	Yes	Yes	Yes	Yes
Temperature Controls	No	No	No	No	Yes	Yes	Yes
Pseudo- R^2	0.24	0.43	0.50	0.58	0.64	0.64	
Observations	73	73	73	73	73	73	

Language Family Level Analysis –Bootstrap I

Back

	Existence of Future Tense (median)					
	(1)	(2)	(3)	(4)	(5)	(6)
Crop Return (pre-1500CE)	-0.15*** (0.04)	-0.23*** (0.05)	-0.22*** (0.05)	-0.19*** (0.07)	-0.17** (0.08)	-0.19** (0.08)
Unproductive Period (pre-1500CE)						-0.10 (0.06)
Continental FE	No	Yes	Yes	Yes	Yes	Yes
Main Geographical Controls	No	No	Yes	Yes	Yes	Yes
Precipitation Controls	No	No	No	Yes	Yes	Yes
Temperature Controls	No	No	No	No	Yes	Yes
Adjusted- R^2	0.02	-0.04	0.07	0.06	0.02	0.11
Observations	76	76	76	76	76	76

Language Family Level Analysis –Bootstrap II

[Back](#)

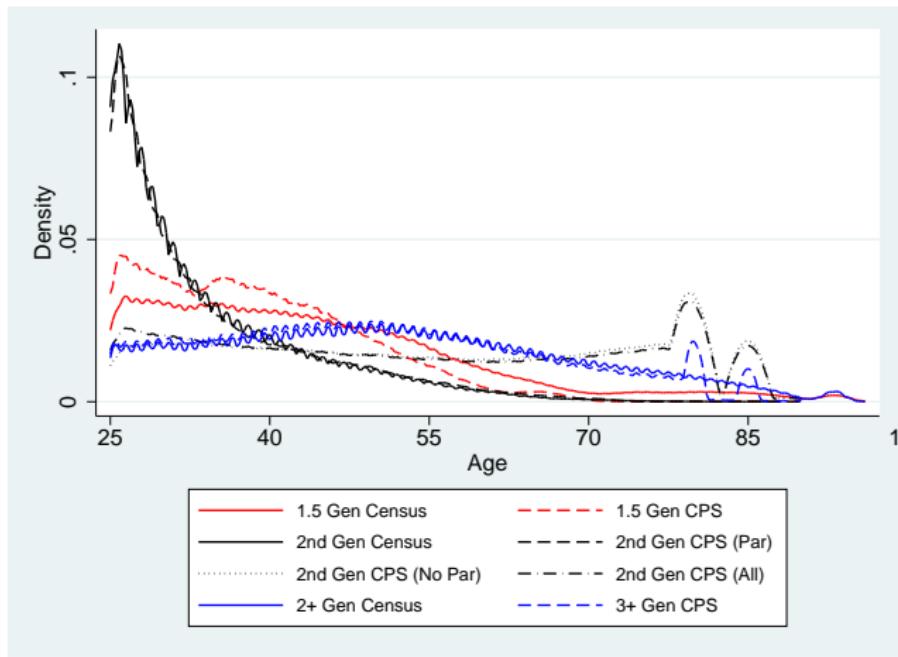
	Existence of Future Tense					
	(1)	(2)	(3)	(4)	(5)	(6)
Crop Return (pre-1500CE)	-0.17*** (0.04)	-0.24*** (0.04)	-0.23*** (0.05)	-0.20*** (0.07)	-0.19** (0.08)	-0.20*** (0.07)
Unproductive Period (pre-1500CE)						-0.10 (0.07)
Continental FE	No	Yes	Yes	Yes	Yes	Yes
Main Geographical Controls	No	No	Yes	Yes	Yes	Yes
Precipitation Controls	No	No	No	Yes	Yes	Yes
Temperature Controls	No	No	No	No	Yes	Yes
Adjusted- R^2	0.18	0.25	0.26	0.25	0.24	0.26
Observations	76	76	76	76	76	76

Age, Gender, Marital Status and Education Attendance

	Means							
	1.5 Generation		2nd Generation				2+ Generations	
	Census	CPS	Census	CPS (living with Parents)	CPS (not living with Parents)	CPS (All)	Census	CPS (3- Genera- tion)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Education Level (HS+)	0.596*** (0.001)	0.648*** (0.001)	0.552*** (0.001)	0.600*** (0.002)	0.568*** (0.000)	0.571*** (0.000)	0.535*** (0.000)	0.572*** (0.000)
Age	43.742*** (0.022)	38.625*** (0.024)	33.913*** (0.022)	34.092*** (0.032)	55.963*** (0.017)	54.376*** (0.017)	51.685*** (0.004)	50.133*** (0.004)
Gender	1.518*** (0.001)	1.518*** (0.001)	1.457*** (0.001)	1.462*** (0.002)	1.537*** (0.000)	1.531*** (0.000)	1.526*** (0.000)	1.527*** (0.000)
Marital Status	2.702*** (0.003)	2.737*** (0.005)	4.933*** (0.004)	5.099*** (0.005)	2.597*** (0.002)	2.779*** (0.002)	2.524*** (0.000)	2.489*** (0.001)
Observations	429372	174094	181099	94331	1205633	1299964	20596324	14180541

Back

Age Density Distribution of All Samples



Back

2nd Generation Migrants – Accounting for Other Language Structures

Back

	College Attendance						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Future Tense	-0.043*** (0.007)	-0.049*** (0.008)	-0.041*** (0.008)	-0.041*** (0.014)	-0.045*** (0.008)	-0.047*** (0.008)	-0.048*** (0.008)
Crop Return (pre-1500CE)	0.005*** (0.002)	0.009*** (0.003)	0.008*** (0.003)	-0.003 (0.003)	0.008** (0.003)	0.011*** (0.003)	0.011*** (0.003)
Mom's College Attendance	0.130*** (0.003)	0.131*** (0.003)	0.131*** (0.003)	0.133*** (0.003)	0.132*** (0.003)	0.132*** (0.003)	0.132*** (0.003)
Dad's College Attendance	0.073*** (0.003)	0.075*** (0.003)	0.075*** (0.003)	0.076*** (0.003)	0.076*** (0.003)	0.075*** (0.003)	0.075*** (0.003)
Past Tense	0.015 (0.014)						
Perfect Tense		-0.011 (0.007)					
Existence of Gender System			-0.030* (0.018)				
Evidentiality				0.018** (0.008)			
Consonant Inventories					0.001 (0.007)		
Consonant-Vowel Ratio						0.001 (0.004)	
Main Geographical Controls	Yes						
Origin FE for Both Parents	Yes						
State FE	Yes						
Year FE	Yes						
Age FE	Yes						
Gender FE	Yes						
Marital Status FE	Yes						
Adjusted-R ²	0.14	0.14	0.14	0.14	0.14	0.14	0.14
R ²	0.23	0.23	0.23	0.23	0.23	0.23	0.23
Observations	165250	158239	158239	153996	155905	157002	157002

College Education of One-and-a-Half Generation Migrants

Back

	College Attendance					
	(1)	(2)	(3)	(4)	(5)	(6)
Future Tense	-0.205*** (0.013)	-0.208*** (0.007)	-0.204*** (0.005)	-0.056*** (0.007)		-0.054*** (0.007)
Crop Return (pre-1500CE)					0.009*** (0.002)	0.003 (0.002)
Main Geographical Controls	Yes	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Age FE	No	Yes	Yes	Yes	Yes	Yes
Gender FE	No	Yes	Yes	Yes	Yes	Yes
Marital Status FE	No	No	Yes	Yes	Yes	Yes
Parental Origin FE	No	No	No	Yes	Yes	Yes
Adjusted- R^2	0.06	0.09	0.10	0.15	0.15	0.15
R^2	0.06	0.11	0.17	0.48	0.48	0.48
Observations	422081	422081	422081	422081	422081	422081

College Education of Second and Higher Generation Migrants

	College Attendance				
	(1)	(2)	(3)	(4)	(5)
Future Tense	-0.100*** (0.014)	-0.132*** (0.005)	-0.125*** (0.004)		-0.111*** (0.004)
Crop Return (pre-1500CE)				0.034*** (0.001)	0.019*** (0.001)
Main Geographical Controls	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Age FE	No	Yes	Yes	Yes	Yes
Gender FE	No	Yes	Yes	Yes	Yes
Marital Status FE	No	No	Yes	Yes	Yes
Adjusted- R^2	0.02	0.07	0.08	0.08	0.08
R^2	0.02	0.07	0.09	0.09	0.09
Observations	12206839	12206839	12206839	12206839	12206839

Back

No English and Spanish Speakers

	College Attendance					
	No English			No Spanish		
	(1)	(2)	(3)	(4)	(5)	(6)
Future Tense	-0.021** (0.009)		-0.022** (0.009)	-0.029*** (0.006)		-0.027*** (0.006)
Crop Return (pre-1500CE)		0.000 (0.002)	-0.001 (0.001)		0.004*** (0.002)	0.002 (0.001)
Mom's College Attendance	0.114*** (0.007)	0.114*** (0.007)	0.114*** (0.007)	0.124*** (0.007)	0.123*** (0.007)	0.124*** (0.007)
Dad's College Attendance	0.135*** (0.007)	0.135*** (0.007)	0.135*** (0.007)	0.131*** (0.007)	0.130*** (0.007)	0.131*** (0.007)
Main Geographical Controls	Yes	Yes	Yes	Yes	Yes	Yes
Origin FE for Both Parents	Yes	Yes	Yes	Yes	Yes	Yes
County FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Age FE	Yes	Yes	Yes	Yes	Yes	Yes
Gender FE	Yes	Yes	Yes	Yes	Yes	Yes
Marital Status FE	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted- <i>R</i> ²	0.19	0.19	0.19	0.19	0.19	0.19
<i>R</i> ²	0.34	0.34	0.34	0.34	0.34	0.34
Observations	52537	52537	52537	55176	55176	55176

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Accounting for Local Labor Market Conditions

	College Attendance								
	Parental Education			Parental English			Both		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Future Tense	-0.032*** (0.005)		-0.029*** (0.005)	-0.030*** (0.006)		-0.030*** (0.006)	-0.029*** (0.005)		-0.027*** (0.005)
Crop Return (pre-1500CE)		0.006*** (0.002)	0.003** (0.001)		0.003* (0.002)	0.000 (0.001)		0.005*** (0.001)	0.003** (0.001)
Mom's College Attendance	0.131*** (0.006)	0.131*** (0.006)	0.131*** (0.006)				0.133*** (0.006)	0.133*** (0.006)	0.133*** (0.006)
Dad's College Attendance	0.141*** (0.006)	0.142*** (0.006)	0.141*** (0.006)				0.143*** (0.006)	0.143*** (0.006)	0.143*** (0.006)
Mom's English Level				0.013*** (0.002)	0.013*** (0.002)	0.013*** (0.002)	0.014*** (0.001)	0.014*** (0.001)	0.014*** (0.001)
Dad's English Level				-0.001 (0.002)	-0.001 (0.002)	-0.001 (0.002)	0.006*** (0.001)	0.006*** (0.001)	0.006*** (0.001)
Main Geographical Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Origin FE for Both Parents	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Age FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Gender FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Marital Status FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted-R ²	0.18	0.18	0.18	0.14	0.14	0.14	0.18	0.18	0.18
R ²	0.30	0.30	0.30	0.27	0.27	0.27	0.30	0.30	0.30
Observations	91613	91613	91613	91613	91613	91613	91613	91613	91613

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Urheimat Analysis of Grammatical Gender

	Existence of Sex-Based Gender System			
	Homeland		Urheimat	
	(1)	(2)	(3)	(4)
Plow Negative CSI (pre-1500CE)	-0.10 (0.12)	-0.17 (0.11)	0.22 (0.19)	-0.42** (0.17)
Caloric Suitability Index (pre-1500CE)	0.06 (0.11)	0.09 (0.08)	0.32*** (0.07)	1.07*** (0.12)
Regional FE	No	Yes	No	Yes
Homeland Geographical Characteristics	No	Yes	No	No
Urheimat Geographical Characteristics	No	No	No	Yes
Adjusted- R^2	-0.00	0.19	0.38	0.68
Observations	100	100	100	100
Language Families	19	19	19	19

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Urheimat Analysis of Politeness Distinctions

	Existence Politeness Distinctions			
	Homeland		Urheimat	
	(1)	(2)	(3)	(4)
Ecological Diversity	0.14*** (0.03)	0.13*** (0.03)	0.04 (0.15)	0.35** (0.15)
Caloric Suitability Index (pre-1500CE)	0.16*** (0.05)	0.13*** (0.04)	0.18 (0.14)	-0.28** (0.12)
Regional FE	No	Yes	No	Yes
Homeland Geographical Characteristics	No	Yes	No	No
Urheimat Geographical Characteristics	No	No	No	Yes
Adjusted- R^2	0.15	0.31	0.12	0.40
Observations	116	116	116	116
Language Families	19	19	19	19

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