

Geographical Origins and Economic Consequences of Language Structures

Oded Galor, Ömer Özak and Assaf Sarid

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Research Objectives

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- Coevolution of culture and language in the development process

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 - Role of cultural traits in the evolution of language structures

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- Causes and consequences of the evolution of language structures
 - Effect of the geographic environment on language structures
 - Effect of language-embodied cultural traits on human behavior

Fundamental Questions

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- Have language structures merely encoded existing cultural traits or have they influenced human behavior and values?
- What are the geographical roots of the coevolution of linguistic and cultural traits?
- Are the geographical origins of this evolutionary process critical for the understanding of the development process?

Main Hypotheses

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

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- Language-embodied cultural traits have affected human behavior and development outcomes

Language Structures

- Future Tense

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- Grammatical Gender

Language Structures

- Future Tense
- Grammatical Gender
- Politeness Distinctions

Language, Culture and Their Geographical Origins

[More](#)

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- Structure of Future Tense reinforces Long-Term Orientation

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- Politeness Distinctions reinforces Obedience and Power Distance
 - Geographical origin: Ecological diversity
 - ⇒ Hierarchical society (Fenske, JEEA, 2015)

The Structure of the Future Tense

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 - Periphrastic future tense

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 - Spanish, French, Italian

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⇒ Capture long-term oriented intentions

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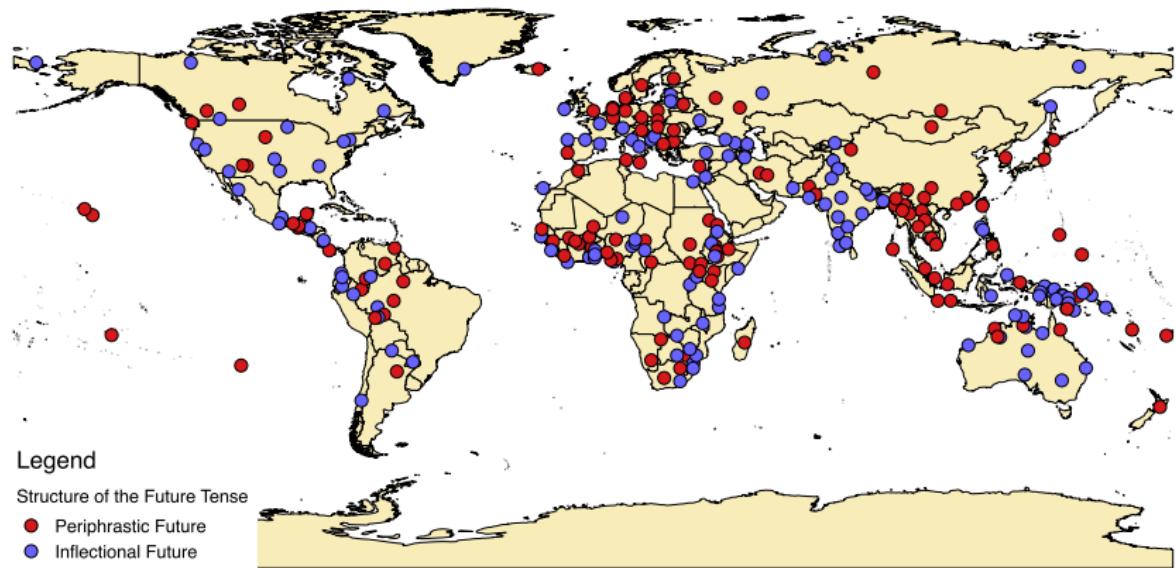
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Distribution of the Structure of the Future Tense



Sex-Based Grammatical Gender

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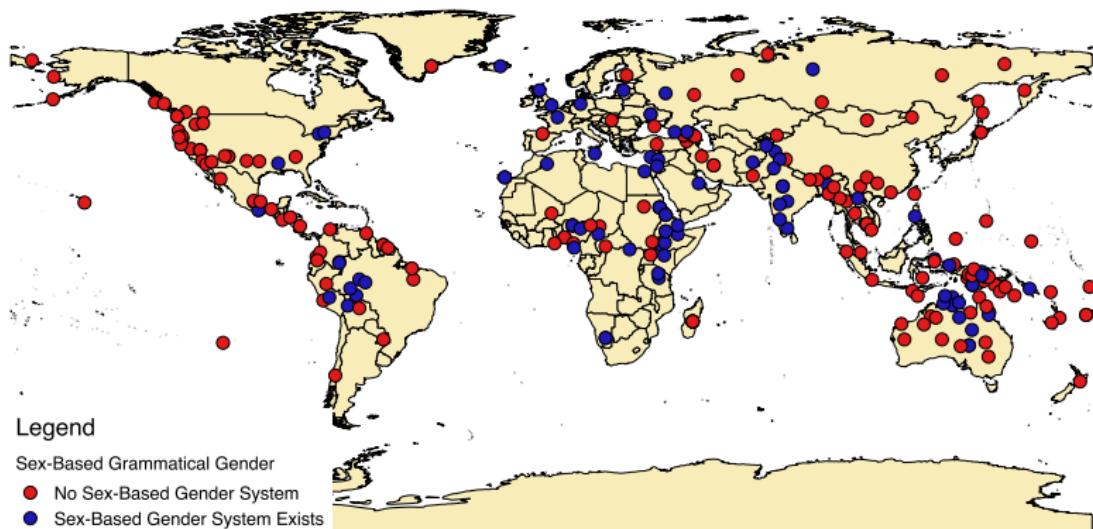
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 - Belong to 76 language families

Distribution of the Existence of Sex-Based Grammatical Gender



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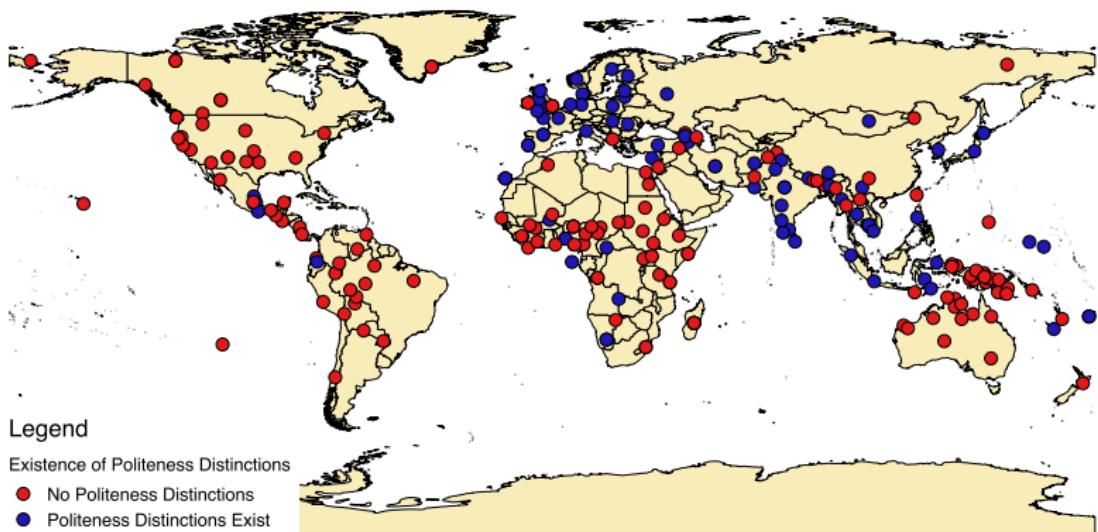
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 - English: *You*
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 - 207 indigenous languages
 - Belong to 69 language families

Distribution of the Existence of Politeness Distinctions



Geographical Origins of Language Structures

- Empirical specification

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

- $S_\ell \equiv$ Existence of structure S in language ℓ
- $R_{\ell S} \equiv$ Geographical determinant of structure S in language ℓ
- $X_{\ell j} \equiv$ Geographical characteristic j of language ℓ
- $\delta_{\ell c} \equiv$ Regional FEs

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Crop Return & Future Tense

Map



Crop Return & Future Tense

[Map](#)

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 - Calories per hectare per day of the most productive crop pre-1500

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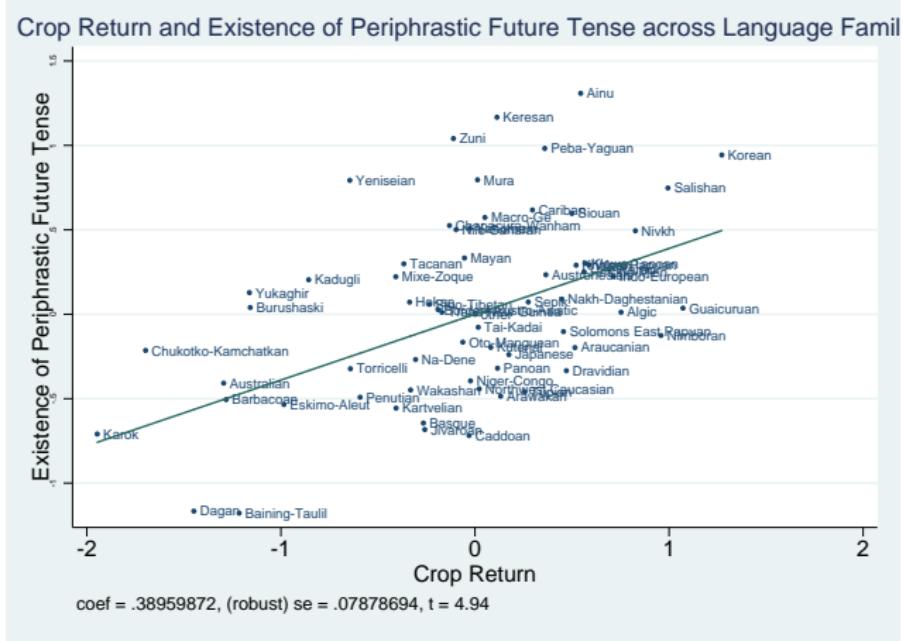


- Potential Crop Return
 - Calories per hectare per day of the most productive crop pre-1500
 - Reflecting early stages of development
 - Climatic measures (Unaffected by human intervention)

Pre-1500CE Crop Return and Periphrastic Future Tense

	Existence of Periphrastic Future Tense								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crop Return (pre1500CE)	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)	0.03 (0.05)	
Ruggedness				-0.04 (0.04)	-0.04 (0.04)	-0.02 (0.04)	-0.02 (0.05)	-0.02 (0.04)	-0.02 (0.04)
Coast Length					0.10*** (0.03)	0.08*** (0.03)	0.07** (0.03)	0.08** (0.04)	
Precipitation (mm/month)						-0.00 (0.08)	-0.01 (0.08)	0.00 (0.08)	
Precipitation (mm/month) (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 (Daily Mean)							0.06 (0.08)	0.06 (0.08)	
Temperature (Daily Mean) (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)	
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

Periphrastic Future and Crop Return in Language Families



Identification Strategy

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Potential Concerns:

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

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Remedy:

Identification Strategy

Potential Concerns:

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Remedy:

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

Identification Strategy

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Identification Strategy

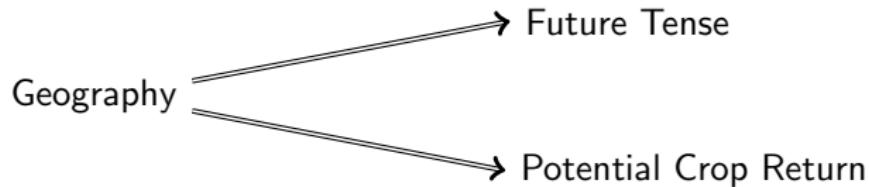
Potential Concerns:

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Identification Strategy

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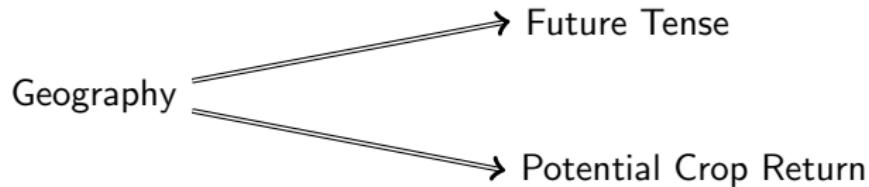
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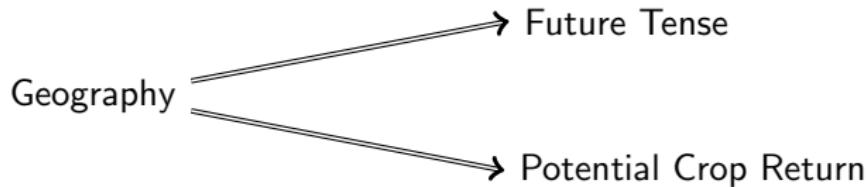


- Sorting

Identification Strategy

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- Sorting

Long-term oriented individuals who spoke languages with a periphrastic future tense could have sorted into regions with high return to agricultural investment

Identification Strategy

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- Account for the confounding effects of:

Identification Strategy

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- Account for the confounding effects of:
 - Geographical characteristics
(e.g., absolute latitude, elevation, ruggedness, temperature, precipitation, etc.)

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- Analysis of languages outside their ancestral homeland

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- Analysis of languages outside their ancestral homeland
 - Establish the persistent effect of geographical characteristics in the ancestral homeland of the language

Identification Strategy

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- Analysis of languages outside their ancestral homeland
 - Establish the persistent effect of geographical characteristics in the ancestral homeland of the language
 - Account for host region FEs

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 - Regional FEs
- Analysis of languages outside their ancestral homeland
 - Establish the persistent effect of geographical characteristics in the ancestral homeland of the language
 - Account for host region FEs
- Establish the effect even in regions where crop return is similar to that in the ancestral homeland

Robustness

- Results are robust to

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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 with Future?

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	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)	0.09 (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	244	224	386	540	541	117	

Sorting? Deep Roots of Periphrastic Future Tense

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 - Structure of future tense in the daughter languages

Persistent Effect of Urheimat Characteristics

	Existence of Future Tense								
	All Languages				Languages In/Near Urheimat				
	(1)	(2)	(3)	(4)	(5)	All	$\Delta R < 0.5SD$	$\Delta R < 0.25SD$	$\Delta R < 0.01SD$
Urheimat Crop Return (Pre-1500CE)	0.13*** (0.04)	0.18*** (0.05)	0.12*** (0.04)	0.16*** (0.05)	0.16*** (0.05)	0.15*** (0.05)	0.17*** (0.05)	0.26** (0.10)	
Change in Crop Return			-0.03 (0.05)	-0.04 (0.04)	-0.08* (0.04)	-0.05 (0.21)	-0.20 (0.54)	-0.12 (21.01)	
Regional FE	No	Yes	No	Yes	Yes	Yes	Yes	Yes	No
Urheimat Geographical Charac.	No	Yes	No	Yes	Yes	Yes	Yes	Yes	No
Change in Geographical Charac.	No	No	No	Yes	Yes	Yes	Yes	Yes	No
Adjusted- R^2	0.05	0.18	0.05	0.22	0.19	0.20	0.21	0.14	
Observations	273	273	273	273	233	165	123	20	
Language Families	75	75	75	75	74	69	59	20	

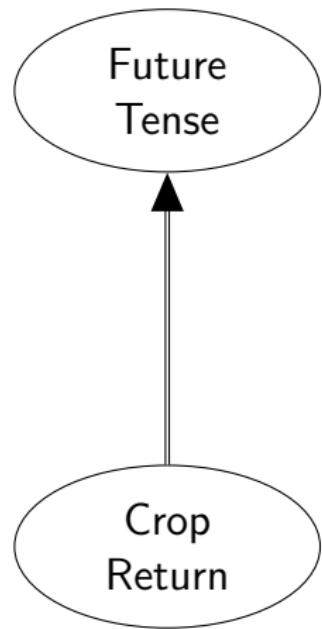
Languages Outside Urheimat

	Existence of Periphrastic 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

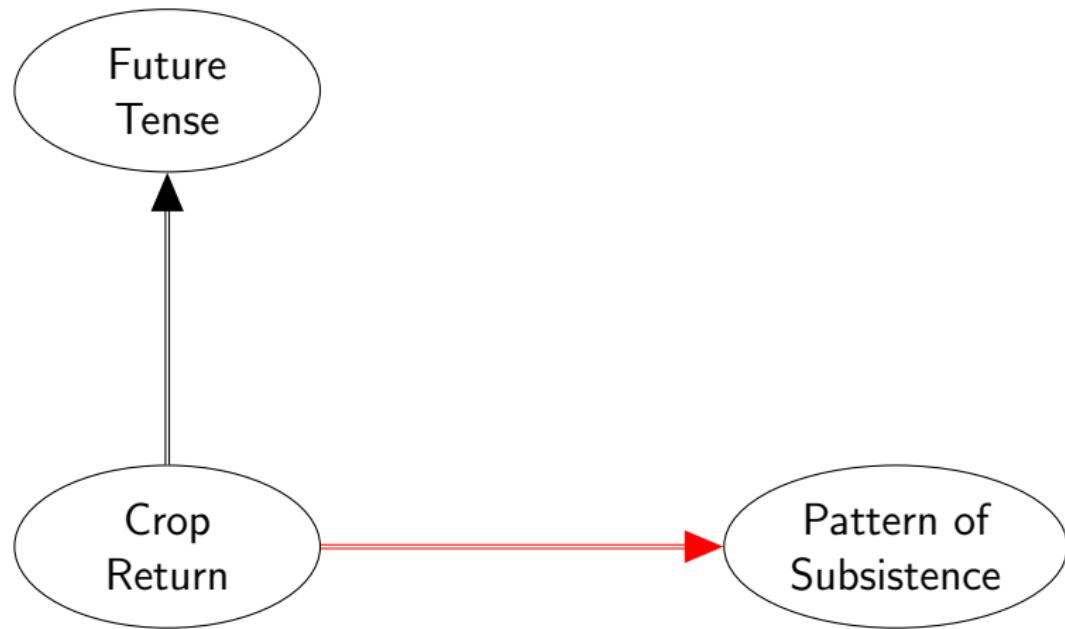
Persistent Effect of Urheimat Characteristics

	Share of Daughter Languages with Future Tense					
	(1)	(2)	(3)	(4)	(5)	(6)
Urheimat's 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

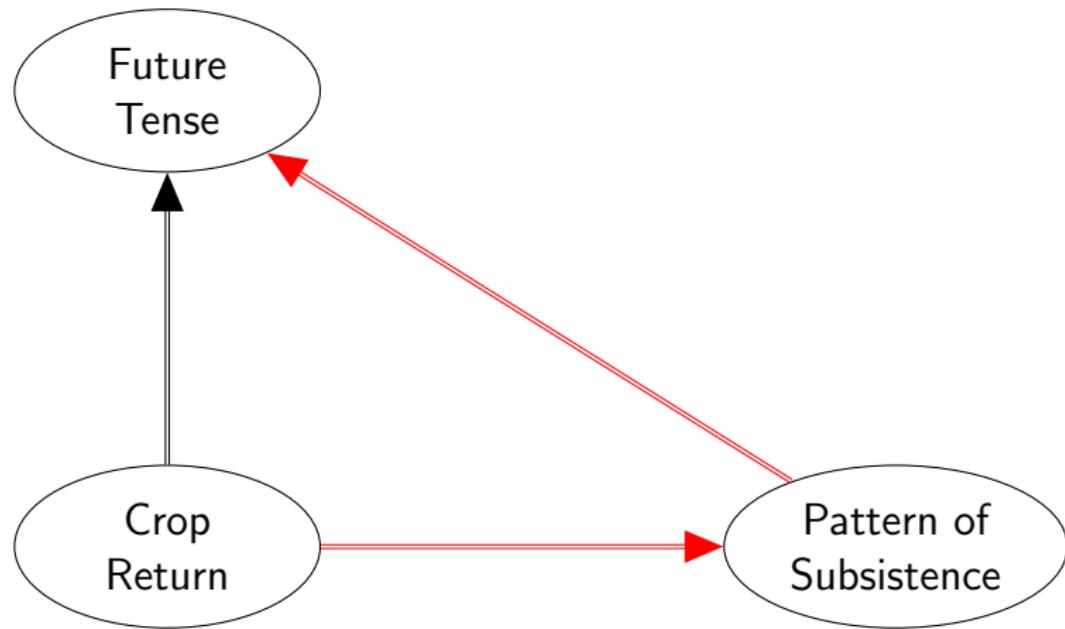
Crop Return & Patterns of Subsistence



Crop Return & Patterns of Subsistence



Crop Return & Patterns of Subsistence



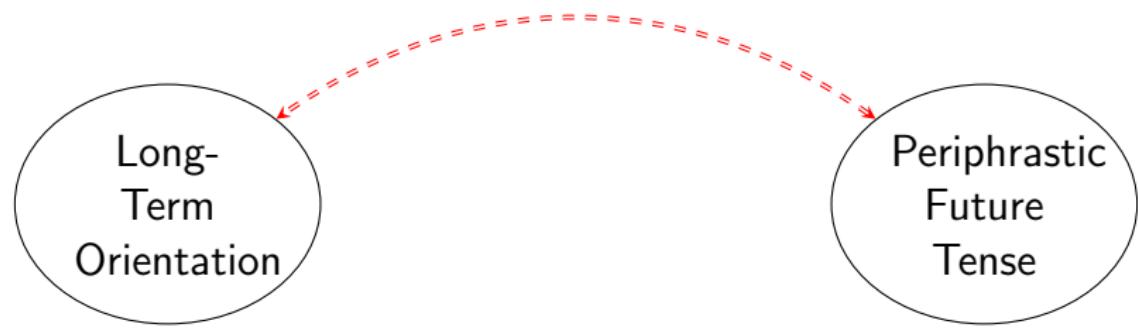
Crop Return & Agricultural Intensity

	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

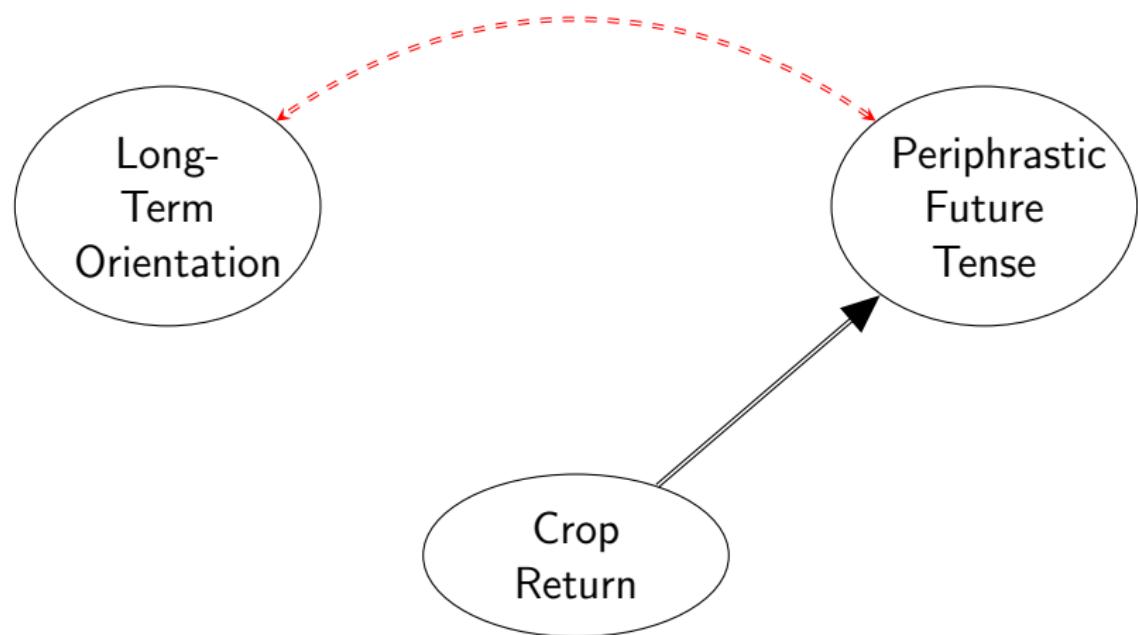
Agricultural Intensity and Future Tense

	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)
Continental 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

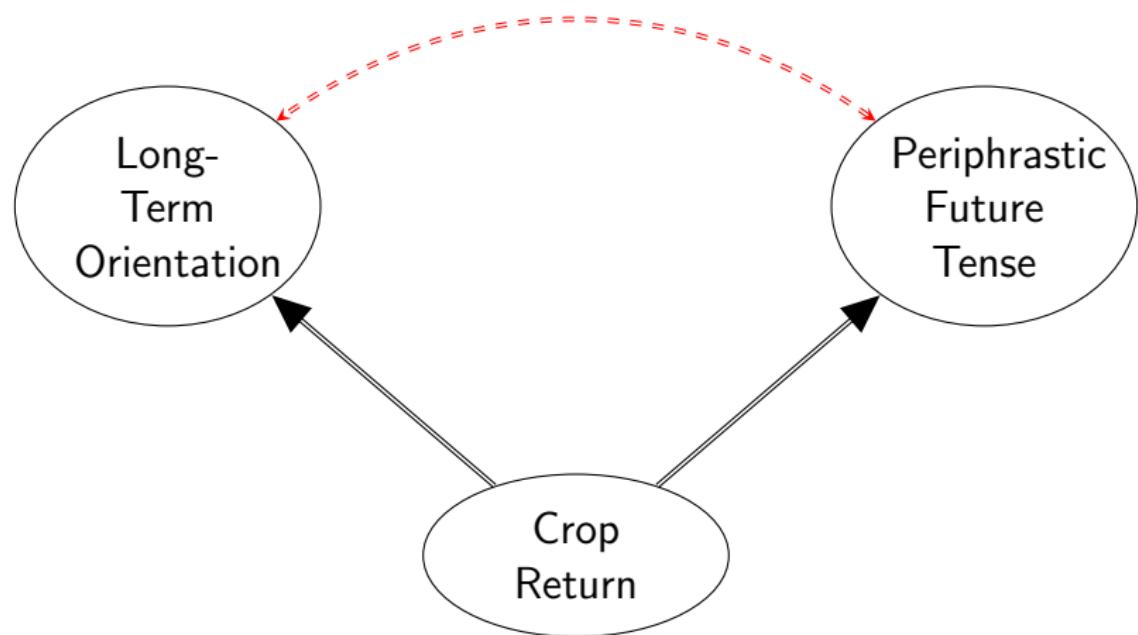
Future Tense, Long-Term Orientation & Crop Return



Future Tense, Long-Term Orientation & Crop Return



Future Tense, Long-Term Orientation & Crop Return



Periphrastic Future Tense & Long-Term Orientation

Maps

	Long Term Orientation				
	Hofstede				WVS
	(1)	(2)	(3)	(4)	(5)
Periphrastic Future Tense	0.35*** (0.11)	0.31*** (0.09)	0.22** (0.10)	0.02 (0.10)	0.20* (0.11)
Crop Return (Pre-1500, Ancestors)		0.52*** (0.09)	0.49*** (0.08)	0.46*** (0.09)	0.33** (0.15)
Main Geographic Controls	No	No	Yes	Yes	Yes
Regional FE	No	No	No	Yes	Yes
Adjusted- R^2	0.11	0.38	0.41	0.56	0.30
Observations	69	69	69	69	76

Geographical Origins of Sex-Based Grammatical Gender

Geographical Origins of Sex-Based Grammatical Gender

- Grammatical Gender reinforces Gender roles

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 - Geographical origin: Land suitability for plow usage

Geographical Origins of Sex-Based Grammatical Gender

- Grammatical Gender reinforces Gender roles
 - Geographical origin: Land suitability for plow usage
- ⇒ Gender-based division of labor (Alesina et al., QJE, 2013)

Plow Suitability

Maps

- Plow positive crops (Pryor, 1985)

Plow Suitability

Maps

- Plow positive crops (Pryor, 1985)
 - Grains: wheat, barley, rye, buckwheat, teff, and wet rice

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 - Grains: sorghum, dry rice, and maize

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Maps

- Plow positive crops (Pryor, 1985)
 - Grains: wheat, barley, rye, buckwheat, teff, and wet rice
- Plow negative crops (Pryor, 1985)
 - Grains: sorghum, dry rice, and maize
 - Root & tree crops

Sex-Based Grammatical Gender

Other

Sex-Based Grammatical Gender

Other

	Reduced Form		Mechanism			
	Grammatical Gender		Plow Usage		Grammatical Gender	
	(1)	(2)	(3)	(4)	(5)	(6)
Average Caloric Yield (Plow Negative Crops, pre-1500)	-0.12** (0.05)	-0.20*** (0.07)	-0.25*** (0.02)	-0.06*** (0.02)		
Average Caloric Yield (All Crops, pre-1500)	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- <i>R</i> ²	0.03	0.21	0.20	0.47	0.13	0.28
Observations	217	217	1178	1178	114	114

Urheimat

The Geographical Origins of Politeness Distinctions

Def

The Geographical Origins of Politeness Distinctions

Def

- Politeness Distinctions reinforces Obedience and Power Distance

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

The Geographical Origins of Politeness Distinctions

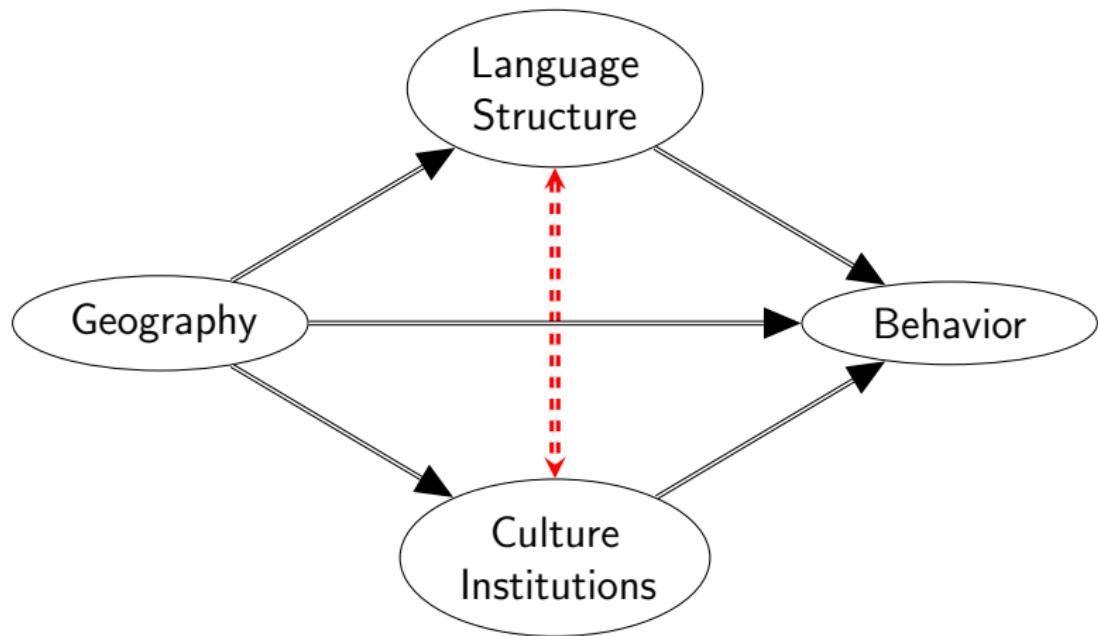
Def

- Politeness Distinctions reinforces Obedience and Power Distance
 - Geographical origin: Ecological diversity
 - Ecological diversity: a Herfindahl index of the share of each territory that is occupied by different ecological zones
- ⇒ Hierarchical society (Fenske, JEEA, 2015)

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)		
Average Caloric Yield (All Crops, pre-1500)	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- R^2	0.15	0.31	0.05	0.32	0.37	0.49
Observations	198	198	1169	1169	113	113

Geography, Language & 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
 - Institutions
 - Geography

Identification Strategy

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- Conventional Approach – The Epidemiological Approach

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 - Analyze migrants and their descendants

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 - Account for year FE
 - Migrants and their descendants in US Census
 - Post-2000 (Census + ACS)

Limitation of the Epidemiological Approach

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- Confounding Effects of Omitted Ancestral Characteristics

Limitation of the Epidemiological Approach

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 - Geography

Limitation of the Epidemiological Approach

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Remedy:

Limitation of the Epidemiological Approach

- Confounding Effects of Omitted Ancestral Characteristics
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Remedy:

- Account for Ancestral FE

Limitation of the Epidemiological Approach

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Remedy:

- Account for Ancestral FE
 - Exploit variations in spoken languages across individuals with same ancestral origin

College Education of Second Generation Migrants

	College Attendance					
	(1)	(2)	(3)	(4)	(5)	(6)
Periphrastic 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) (mean)					0.013*** (0.004)	0.007* (0.004)
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)	(9)
Periphrastic Future Tense	0.047*** (0.007)	0.043*** (0.007)	0.038*** (0.008)		0.038*** (0.009)	0.035*** (0.008)		0.034*** (0.009)	
Crop Return (pre-1500CE)		0.013*** (0.003)	0.007*** (0.003)		0.005 (0.003)	0.000 (0.003)		0.006** (0.003)	0.003 (0.003)
Mother's College Attendance	0.130*** (0.003)	0.130*** (0.003)	0.130*** (0.003)				0.134*** (0.004)	0.134*** (0.004)	0.134*** (0.004)
Father's College Attendance	0.073*** (0.003)	0.073*** (0.003)	0.073*** (0.003)				0.146*** (0.004)	0.147*** (0.004)	0.146*** (0.004)
Mother's English Level				0.012*** (0.001)	0.012*** (0.001)	0.012*** (0.001)	0.013*** (0.001)	0.014*** (0.001)	0.013*** (0.001)
Father's English Level				-0.001 (0.002)	-0.001 (0.002)	-0.001 (0.002)	0.006*** (0.002)	0.006*** (0.002)	0.006*** (0.002)
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- <i>R</i> ²	0.14	0.14	0.14	0.14	0.14	0.14	0.18	0.18	0.18
<i>R</i> ²	0.23	0.23	0.23	0.23	0.23	0.23	0.26	0.26	0.26
Observations	165250	165250	165250	98623	98623	98623	98623	98623	98623

Robustness

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Robustness

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 - Accounting for other Language Structures [Table](#)

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Robustness

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 - Analysis with county FE [Table](#)

Interpretation

- In the absence of parental origin FE

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 - Individuals that speak a language with periphrastic future tense have 5 percentage points higher probability of attending college
 - Language-embodied effect of cultural trait per se accounts for 25% of the effect of ancestral culture

Sex-Based Gender and Economic Behavior

Other

	Female College Attendance				
	(1)	(2)	(3)	(4)	(5)
Existence of Gender System	-0.228*** (0.018)	-0.024*** (0.009)	-0.017* (0.009)	-0.049*** (0.007)	-0.046*** (0.008)
Average Caloric Yield (Plow Negative Crops, pre-1500)			-0.013* (0.005)		-0.007 (0.004)
Average Caloric Yield (All Crops, pre-1500)			0.007 (0.003)		0.000 (0.003)
Mother's College Attendance				0.121*** (0.007)	0.121*** (0.007)
Father's College Attendance				0.137*** (0.007)	0.137*** (0.007)
Main Geographical Controls	Yes	Yes	Yes	Yes	Yes
Origin FE for Both Parents	No	Yes	Yes	Yes	Yes
County FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Age FE	Yes	Yes	Yes	Yes	Yes
Gender FE	Yes	Yes	Yes	Yes	Yes
Marital Status FE	Yes	Yes	Yes	Yes	Yes
Parental Origin FE	Yes	Yes	Yes	Yes	Yes
Adjusted- <i>R</i> ²	0.08	0.13	0.13	0.16	0.16
<i>R</i> ²	0.24	0.28	0.28	0.31	0.31
Observations	39433	39433	39433	39433	39433

Conclusions

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Supportive evidence for

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- Coevolution of culture & language in the process of development

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- Coevolution of culture & language in the process of development
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 - Effect of the economic environment on languages
 - Effect of language-embodied cultural traits on human behavior

Geographical Origins and Economic Consequences of Language Structures

Oded Galor, Ömer Özak and Assaf Sarid

July 5, 2017

Mechanisms

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- Coevolution of culture and language structures

Mechanisms

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- Coevolution of culture and language structures
 - Communication function of language

Mechanisms

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 - Communication function of language
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Mechanisms

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Mechanisms

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 - Evolution of language structures required society wide adoption of linguistic mutations

Mechanisms

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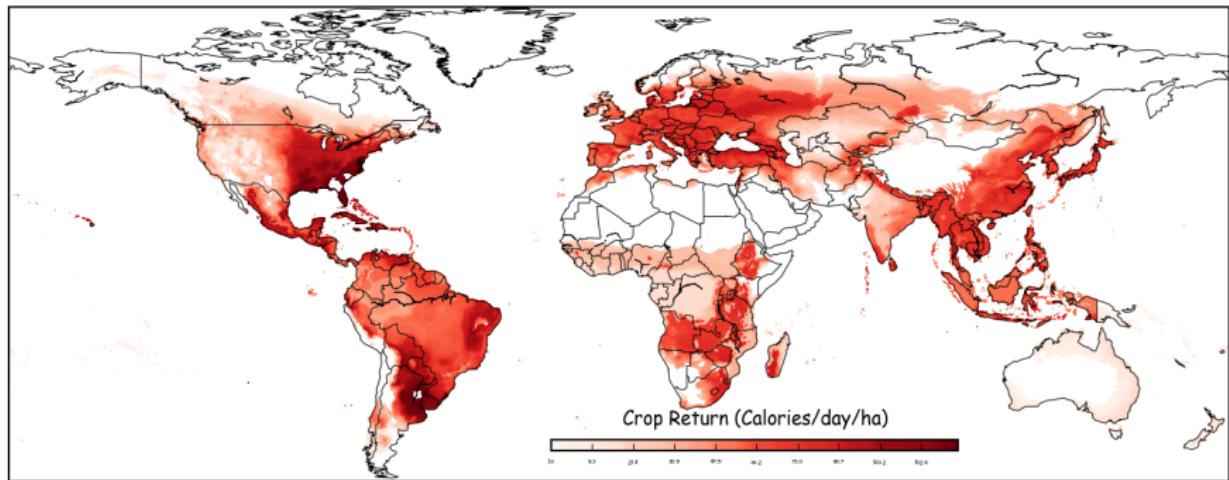
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Mechanisms

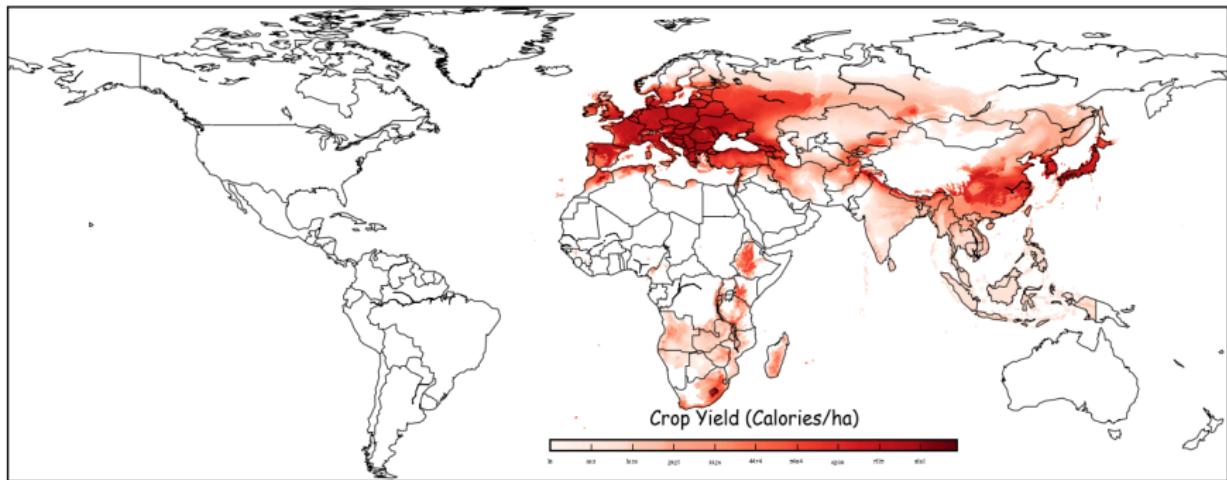
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 - Cultural traits encoded in language are more persistent

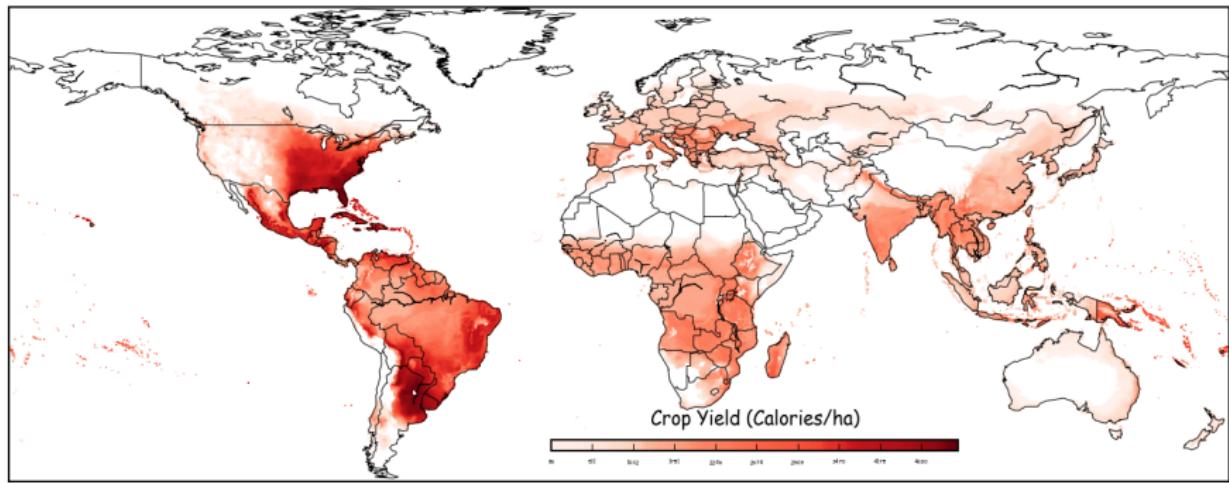
Potential Crop Return (pre-1500CE)

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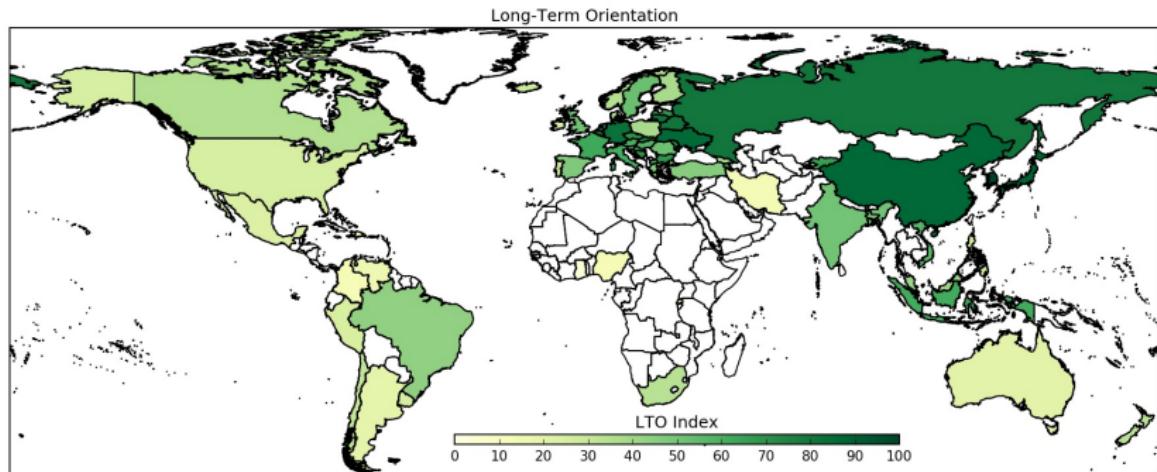
Global Distribution of Plow Positive CSI (pre-1500CE)

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

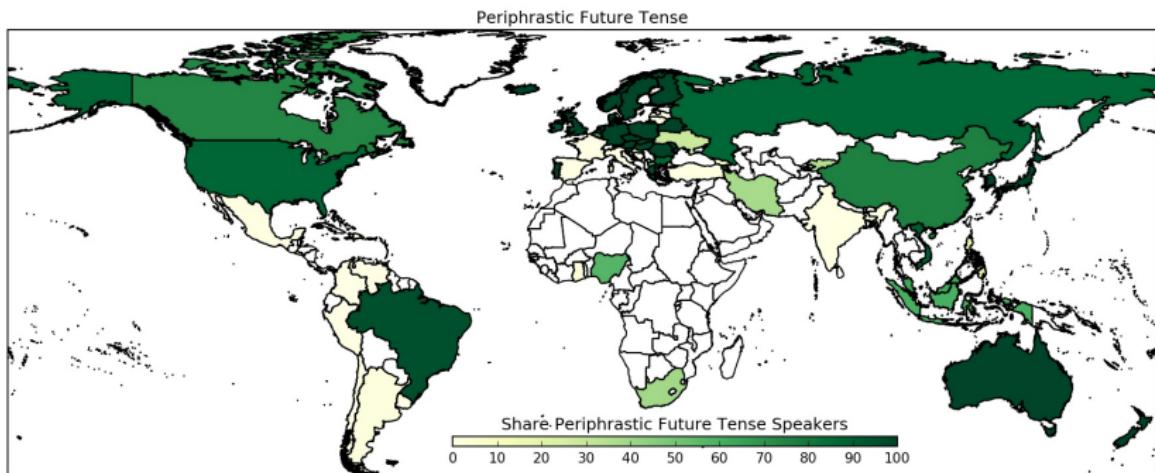
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Long-Term Orientation

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(a) LTO

Periphrastic Future Tense

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(b) Periphrastic Future

Ecological Diversity

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

$$E_\ell = 1 - \sum_{j=1}^{16} (\theta_{\ell j})^2$$

Ecological Diversity

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$$E_\ell = 1 - \sum_{j=1}^{16} (\theta_{\ell j})^2$$

- E_ℓ : Ecological diversity in the homeland of language ℓ

Ecological Diversity

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

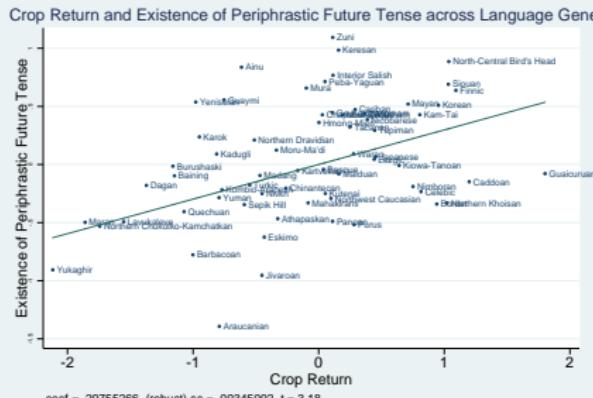
$$E_\ell = 1 - \sum_{j=1}^{16} (\theta_{\ell j})^2$$

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

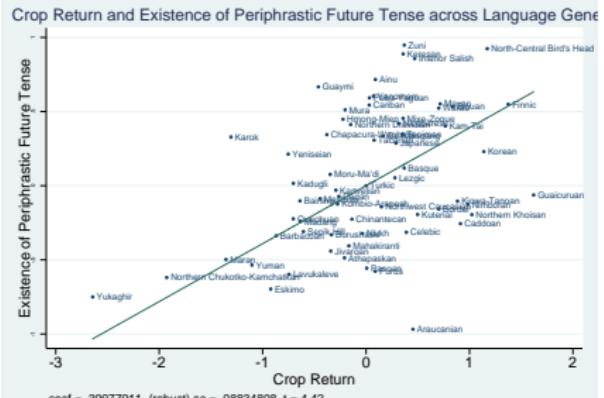
Basic Result – OLS

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Genus Level Analysis Figures

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(c) Median



(d) Mean

Grammatical Gender

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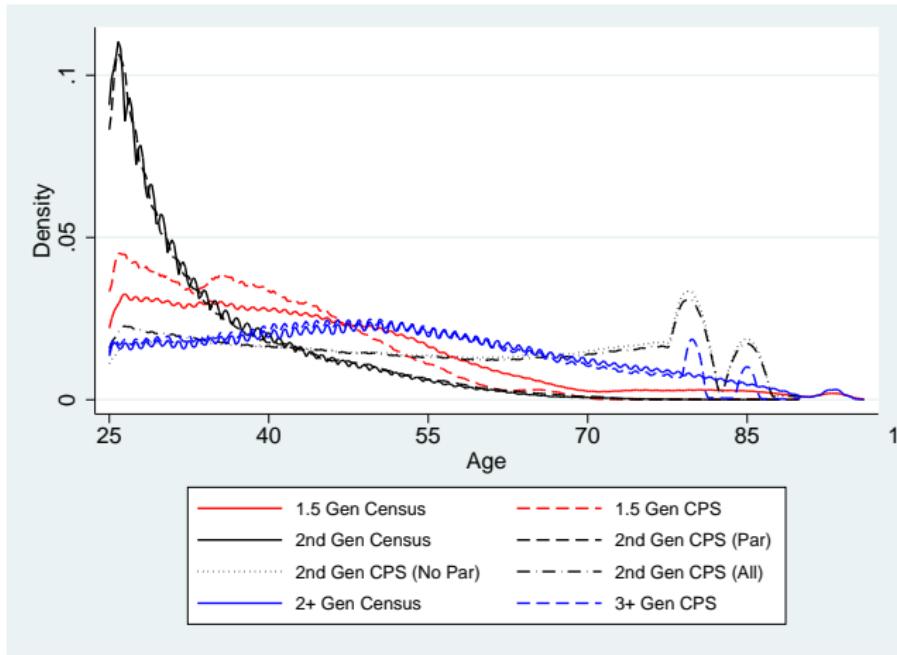
	Reduced Form		Mechanism			
	Grammatical Gender		Plow Usage		Grammatical Gender	
	(1)	(2)	(3)	(4)	(5)	(6)
Average Caloric Yield (Plow Negative Crops, pre-1500)	-0.27*** (0.09)	-0.35** (0.14)	-0.25*** (0.02)	-0.06*** (0.02)		
Average Caloric Yield (All Crops, pre-1500)	0.26*** (0.09)	0.37*** (0.12)	0.25*** (0.02)	0.10*** (0.02)		
Plow Usage					0.75*** (0.21)	0.68** (0.31)
All Geographic Controls	No	Yes	No	Yes	No	Yes
Regional FE	No	Yes	No	Yes	No	Yes
Adjusted- <i>R</i> ²	0.04	0.18	0.20	0.47	0.16	0.27
Observations	181	181	1178	1178	105	105

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

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Age Density Distribution of All Samples



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2nd Generation Migrants – Accounting for Other Language Structures

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	College Attendance						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Periphrastic 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)	0.007*** (0.003)	0.012*** (0.003)	0.011*** (0.003)	-0.004 (0.004)	0.010** (0.004)	0.015*** (0.004)	0.014*** (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

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	College Attendance					
	(1)	(2)	(3)	(4)	(5)	(6)
Periphrastic 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)					0.011*** (0.003)	0.004 (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	0.06	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

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	College Attendance				
	(1)	(2)	(3)	(4)	(5)
Periphrastic 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

No English and Spanish Speakers

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	College Attendance					
	No English			No Spanish		
	(1)	(2)	(3)	(4)	(5)	(6)
Periphrastic Future Tense	0.021** (0.009)		0.022** (0.009)	0.029*** (0.006)		0.027*** (0.006)
Crop Return (pre-1500CE) (mean)		0.001 (0.002)	-0.001 (0.002)		0.005*** (0.002)	0.002 (0.002)
Mother'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)
Father'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

Accounting for Local Labor Market Conditions

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	College Attendance								
	Parental Education			Parental English			Both		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Periphrastic 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)
Mother'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)
Father'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)
Mother'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)
Father'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								
Origin FE for Both Parents	Yes								
County FE	Yes								
Year FE	Yes								
Age FE	Yes								
Gender FE	Yes								
Marital Status FE	Yes								
Adjusted- <i>R</i> ²	0.18	0.18	0.18	0.14	0.14	0.14	0.18	0.18	0.18
<i>R</i> 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

Urheimat Analysis of Grammatical Gender

	Existence of Sex-Based Gender System			
	Homeland		Urheimat	
	(1)	(2)	(3)	(4)
Average Caloric Yield (Plow Negative Crops, pre-1500)	-0.10 (0.12)	-0.17 (0.11)	0.22 (0.19)	-0.42** (0.17)
Average Caloric Yield (All Crops, pre-1500)	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)
Average Caloric Yield (All Crops, pre-1500)	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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Gender and Economic Behavior

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	Female College Attendance				
	(1)	(2)	(3)	(4)	(5)
Existence of Gender System	-0.093*** (0.006)	-0.011*** (0.004)	-0.008** (0.004)	-0.006** (0.003)	-0.006* (0.003)
Average Caloric Yield (Plow Negative Crops, pre-1500)			-0.032*** (0.010)		-0.011 (0.008)
Average Caloric Yield (All Crops, pre-1500)			0.009 (0.007)		0.002 (0.006)
Mother's College Attendance				0.124*** (0.007)	0.124*** (0.007)
Father's College Attendance				0.138*** (0.007)	0.138*** (0.007)
Main Geographical Controls	Yes	Yes	Yes	Yes	Yes
Origin FE for Both Parents	No	Yes	Yes	Yes	Yes
County FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Age FE	Yes	Yes	Yes	Yes	Yes
Gender FE	Yes	Yes	Yes	Yes	Yes
Marital Status FE	Yes	Yes	Yes	Yes	Yes
Parental Origin FE	Yes	Yes	Yes	Yes	Yes
Adjusted- <i>R</i> ²	0.08	0.13	0.13	0.16	0.16
<i>R</i> ²	0.25	0.28	0.28	0.31	0.31
Observations	38845	38845	38845	38845	38845