

The Agricultural Origins of Time Preference

Oded Galor and Ömer Özak

“Patience is bitter, but its fruit is sweet.”

– Aristotle

Main Objectives

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 - The effect of the economic environment on the evolutionary processes that shape the composition of human traits
 - The impact of the evolution in the composition of human traits on the growth process

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 - Comparative economic development

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 - Increased the representation of traits that were complementary to the growth process, reinforcing the growth process
 - Contributed to regional variation in economic performance across the globe

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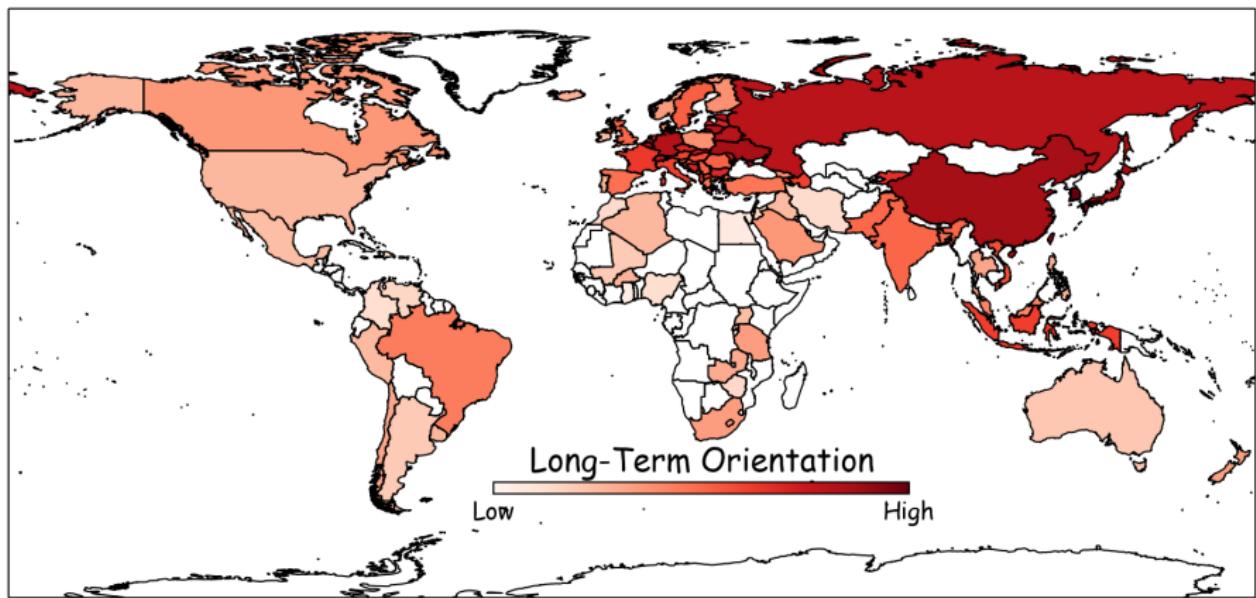
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Cross Country Variation in Long-Term Orientation



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 - Prevalence of long-term orientation
 - Economic behavior: education, saving, non-smoking, and technological adoption

Formation of Time Preference: Mechanism

- Occupational Choice

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- Intergenerational transmission of time preference

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Formation of Time Preference: Mechanism

Individuals with higher long-term orientation:

- Chose more lucrative investment opportunities (associated with delayed return)
- Gained socio-economic status, which reinforced their outlook on long-term orientation
- Generated higher income & reproductive success
- Transmitted their enhanced long-term orientation to their offspring

Structure of the presentation

- 1 Introduction
- 2 Model
- 3 Data
- 4 Country-Level Analysis
- 5 Second Generation Migrants
- 6 Individual-Level WVS
- 7 Conclusions

The Model

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where $R^1 > R^0 > 1$ Malthusian

Member i of generation t

- Preferences

$$u^{i,t} = \ln c_{i,t} + \beta_t^i [\gamma \ln n_{i,t+1} + (1 - \gamma) \ln c_{i,t+1}]$$

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- Rate of time preference $\equiv \rho_t^i \geq 0$

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Cost of raising a child $\equiv \tau > 0$

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$$v^{i,t} = \begin{cases} \ln R^0 + \beta_t^i [\ln R^0 + \xi] & \text{under endowment mode} \end{cases}$$

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$$\xi \equiv \gamma \ln(\gamma/\tau) + (1 - \gamma) \ln(1 - \gamma)$$

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$$\hat{\beta} = \frac{\ln R^0}{\ln R^1 - \ln R^0} \in (0, 1)$$

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$$\frac{\partial \hat{\beta}}{\partial R^1} < 0$$

Time Preference, Income and Fertility

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$$n_{i,t+1} = \begin{cases} \frac{\gamma}{\tau} R^0 \equiv n^E & \text{if } \beta_t^i \leq \hat{\beta} \\ \frac{\gamma}{\tau} R^1 \equiv n^I & \text{if } \beta_t^i > \hat{\beta} \end{cases}$$

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\Rightarrow

$$n^I > n^E$$

Evolution of Time Preference

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- Parents transmit their time preference to their children

$$\beta_{t+1}^i = \begin{cases} \beta_t^i & \text{if } \beta_t^i \leq \hat{\beta} \\ \phi(\beta_t^i; R^1) & \text{if } \beta_t^i \geq \hat{\beta} \end{cases}$$

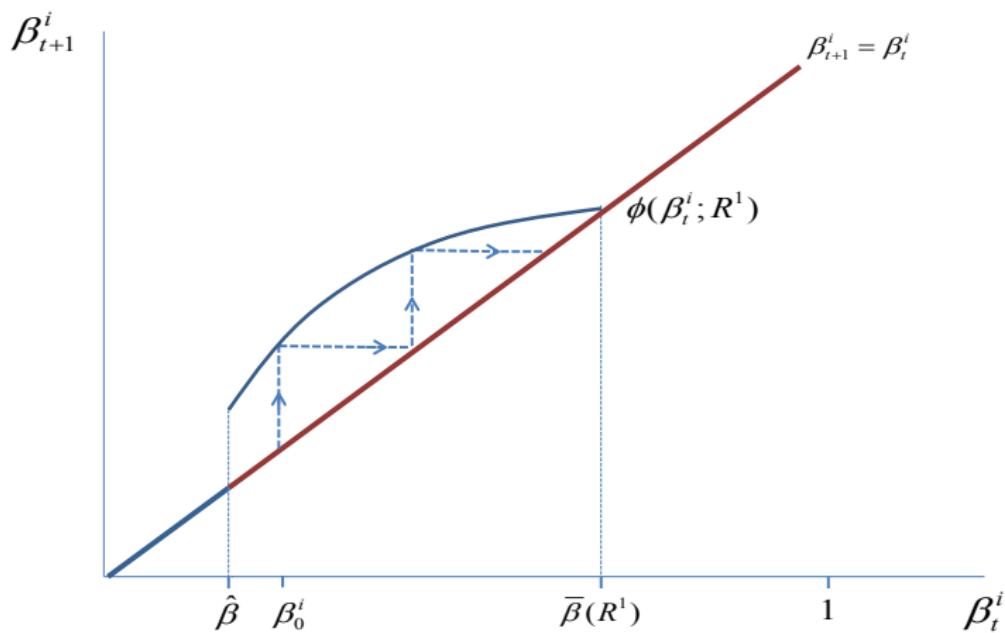
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- Engagement in the investment mode enhances long-term orientation

The Evolution of Time Preference within a Dynasty



Evolution of the Composition of Each Generation

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- Evolution of population of each type in generation t

$$L_t^E = (n^E)^t L_0^E$$

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- Vanishes asymptotically

$$\lim_{t \rightarrow \infty} \theta_t^E = 0$$

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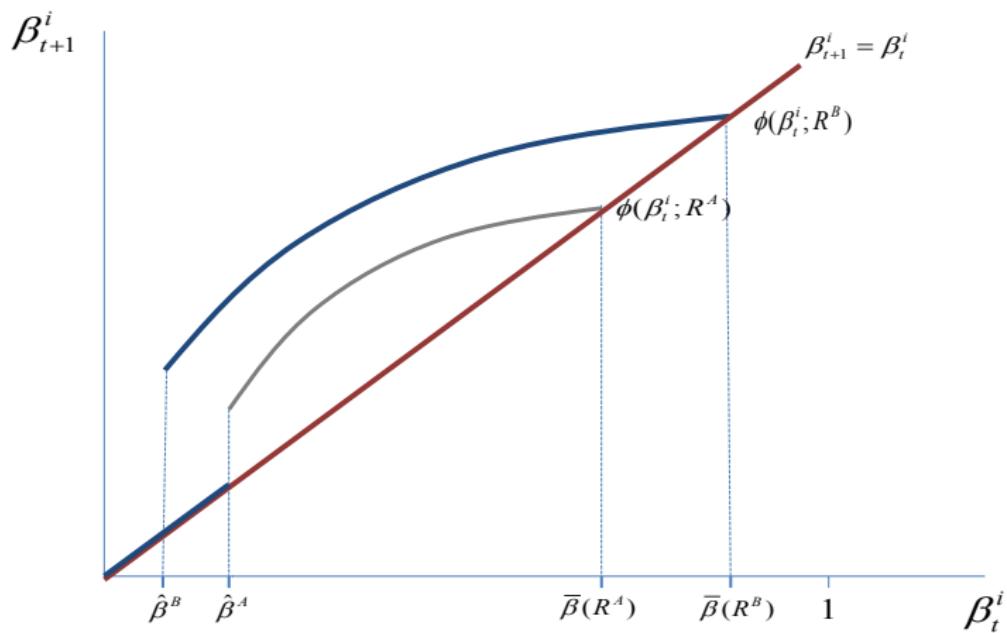
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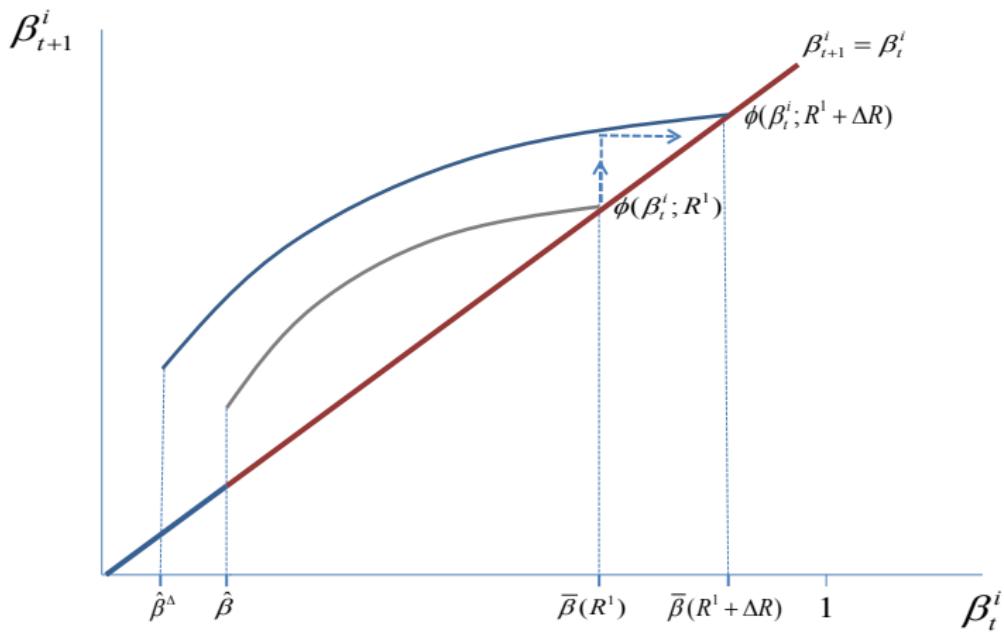
- Increases in return to investment

$$\frac{\partial \bar{\beta}(R^1)}{\partial R^1} > 0$$

Cross-Country Differences in Return to Investment



Effect of an Increase in Return to Investment



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- An increase in the crop growth cycle generates conflicting effects on long-term orientation
 - Holding the crop yield constant, longer growth cycle reduces the return to investment
 - Longer duration of investment mitigates the aversion from delayed consumption

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 - Major crops

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 - Caloric content per gram for each crop

Caloric Suitability Index (CSI)

- Potential Crop Yield

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- Potential Crop Yield
 - Cell: Calories per hectare per year of the most productive crop

Caloric Suitability Index (CSI)

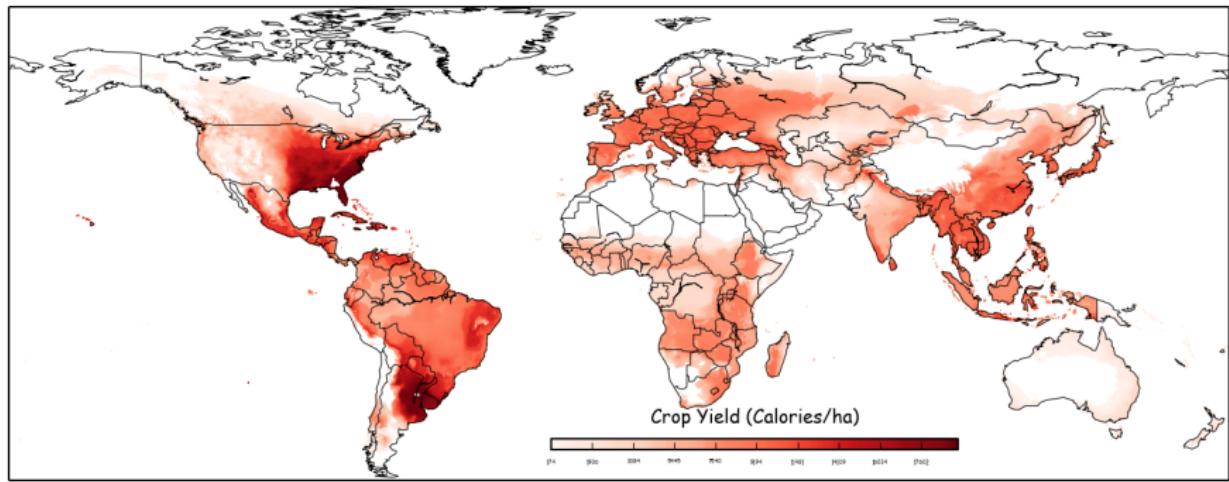
- Potential Crop Yield
 - Cell: Calories per hectare per year of the most productive crop
- Potential Crop Growth Cycles

Caloric Suitability Index (CSI)

- Potential Crop Yield
 - Cell: Calories per hectare per year of the most productive crop
- Potential Crop Growth Cycles
 - Cell: average of days elapsed from planting to harvesting for the most productive crop

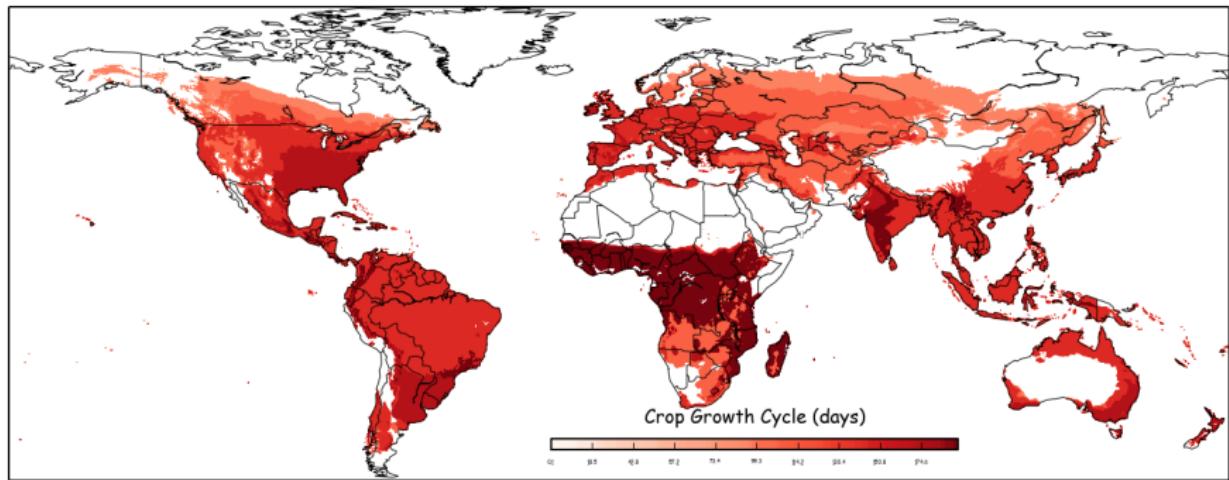
Potential Crop Yield pre-1500CE

Post-1500CE



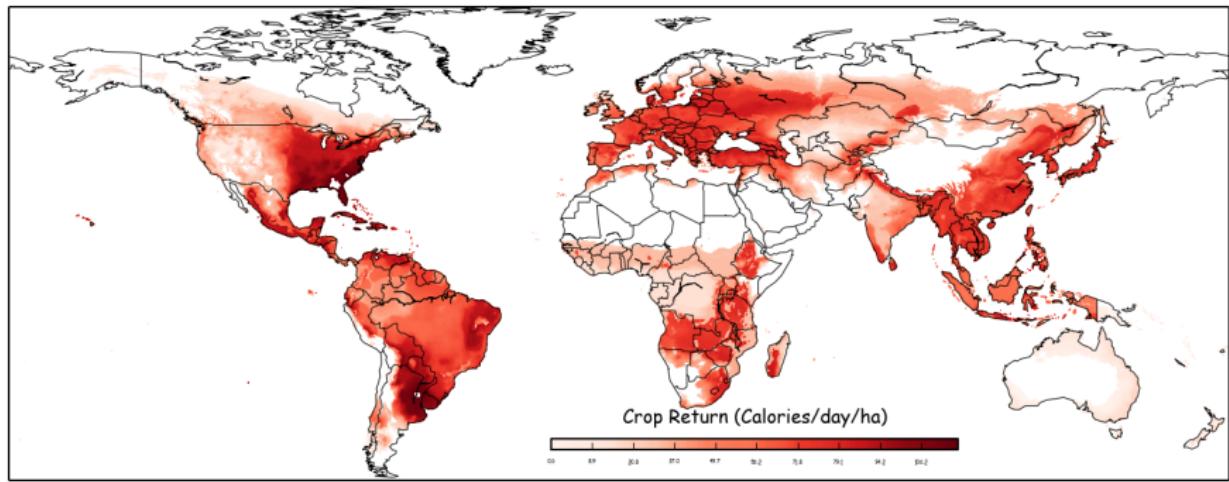
Potential Crop Growth Cycle pre-1500CE

Post-1500CE

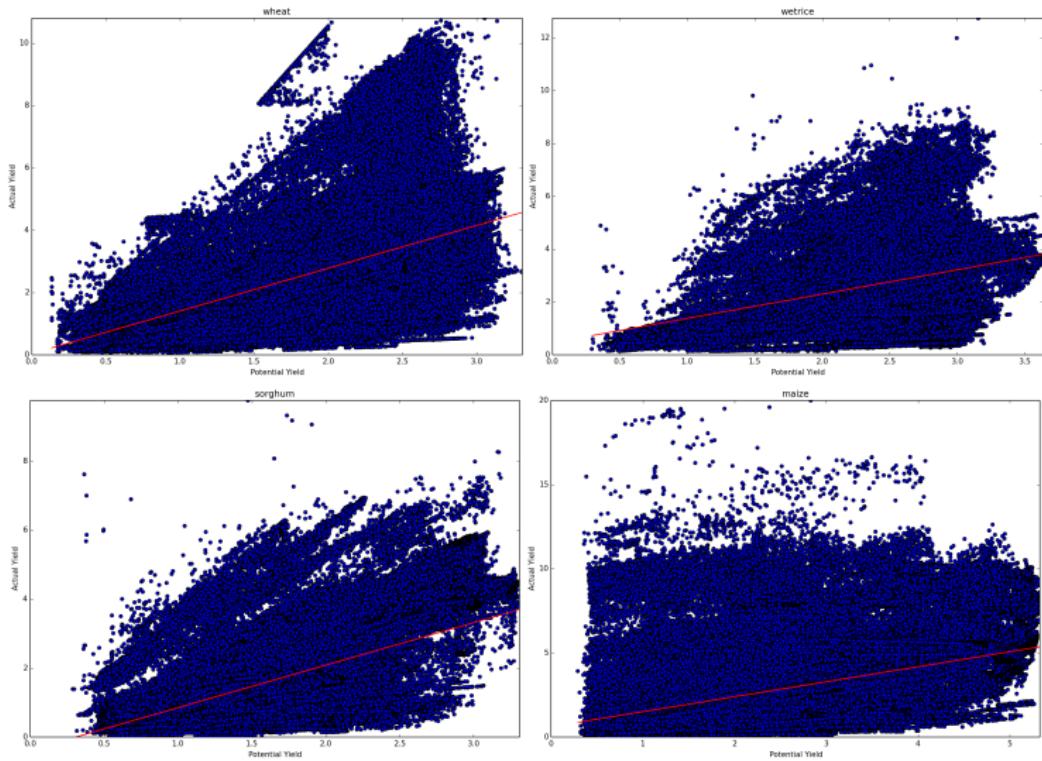


Potential Crop Return pre-1500CE

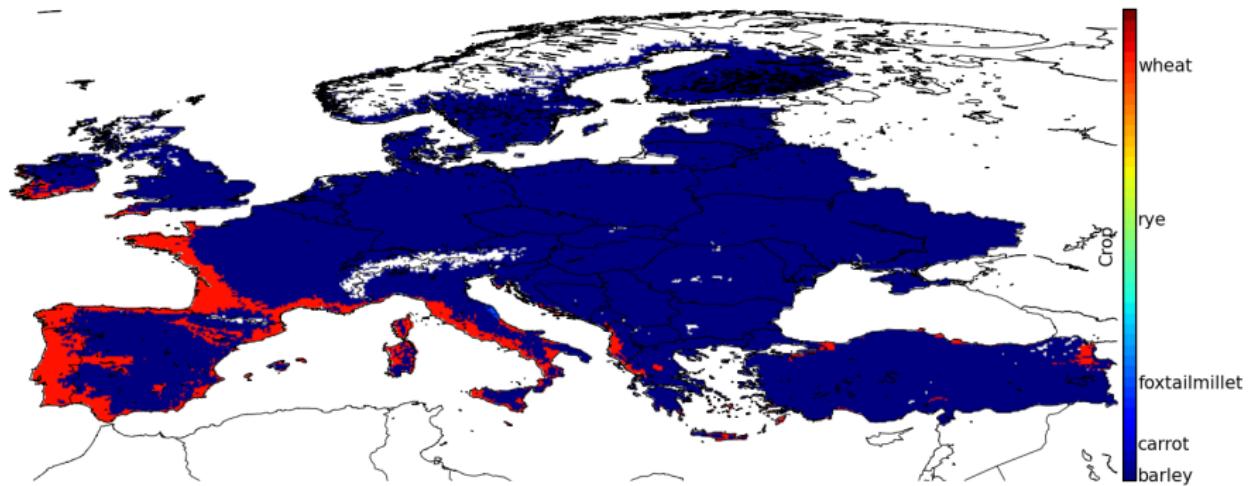
Post-1500CE



Potential vs Actual Yield

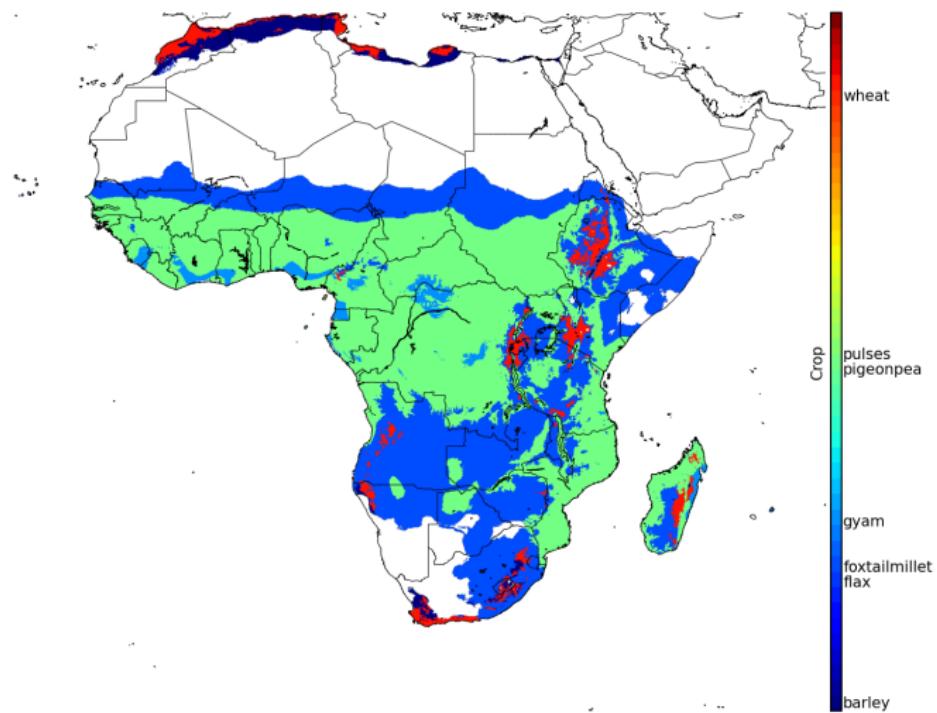


Most Productive Crops pre-1500CE



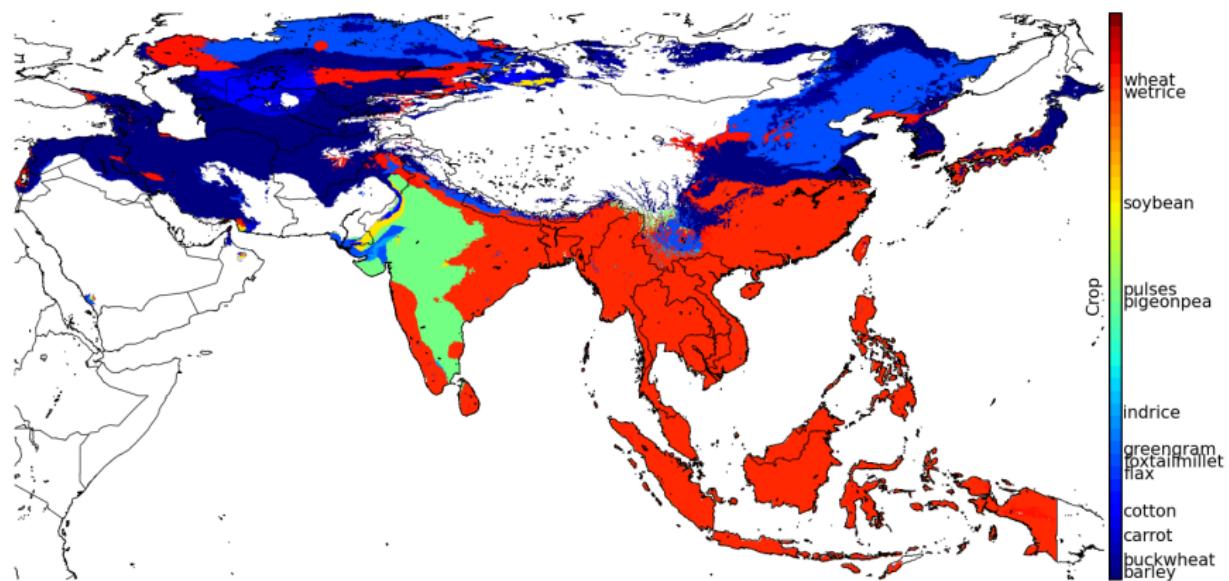
Other Rule

Most Productive Crops pre-1500CE



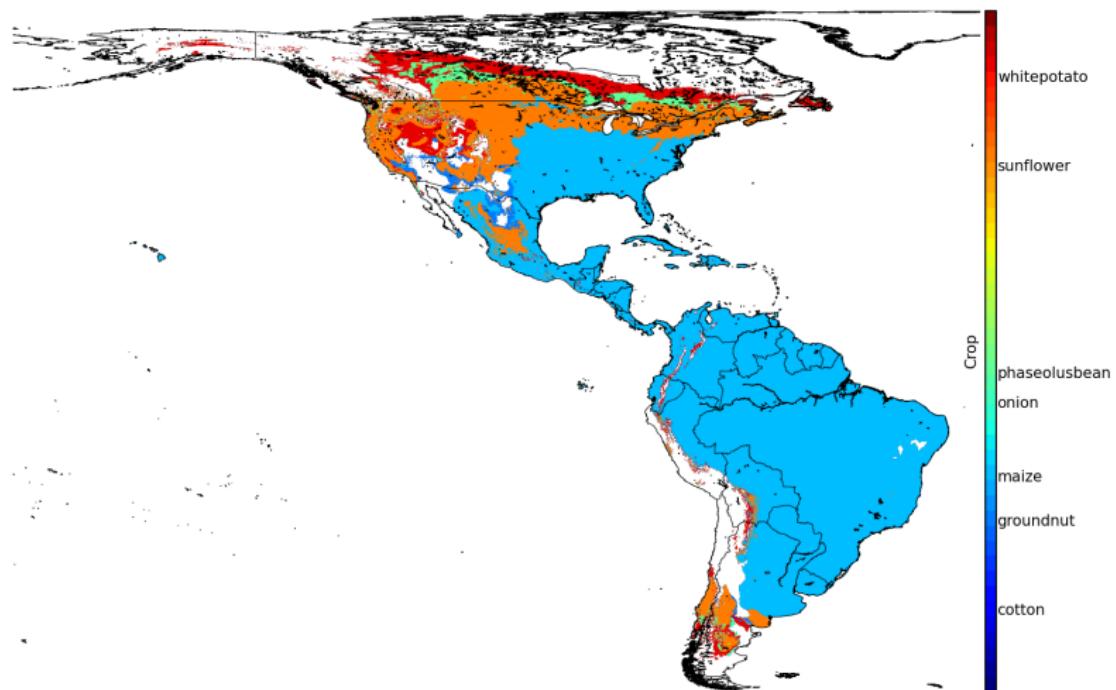
Other Rule

Most Productive Crops pre-1500CE



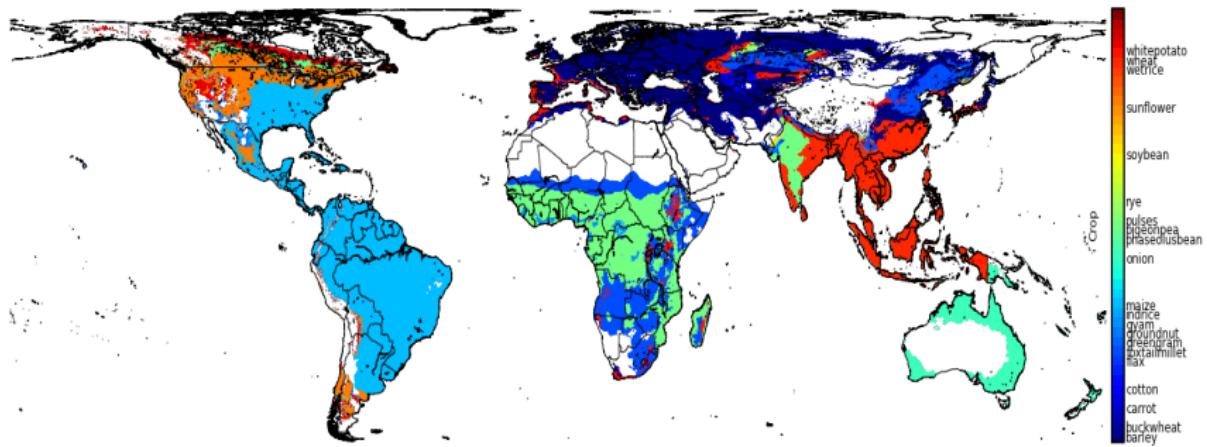
Other Rule

Most Productive Crops pre-1500CE

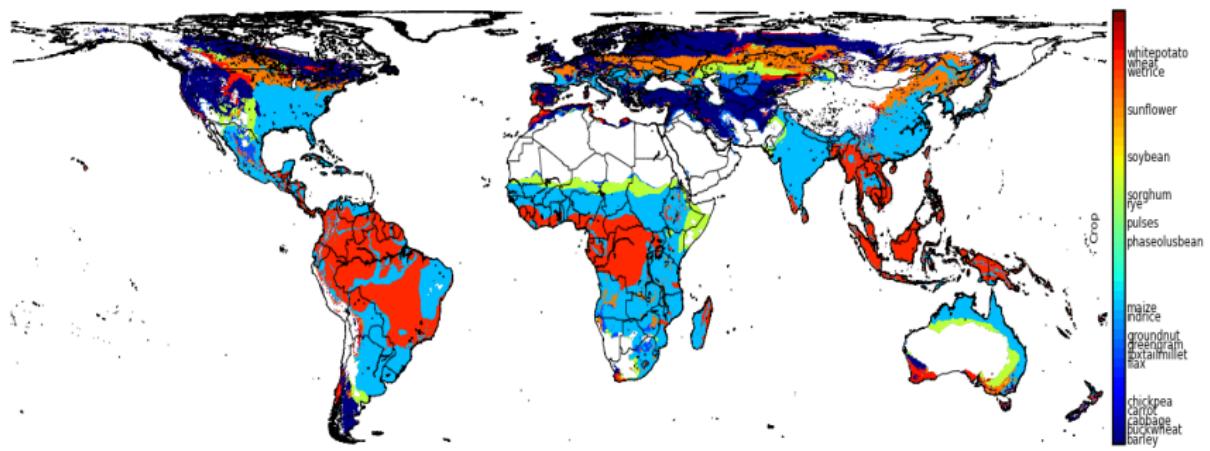


Other Rule

Most Productive Crops pre-1500CE



Most Productive Crops post-1500CE



LTO, Crop Yield, Growth Cycle and Return - Old World

Region	Crop	Top Crop			All Crops			LTO
		Yield	Cycle	Return	Yield	Cycle	Return	
Europe	Barley	8371	125	68	6117	112	52	66
Asia	Rice	8709	139	63	5973	127	46	64
SSA	Pea	4495	190	23	4180	189	22	20

Country-Level Analysis

- Long-Term Orientation

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 - Country-level measure (Hofstede, 1991)

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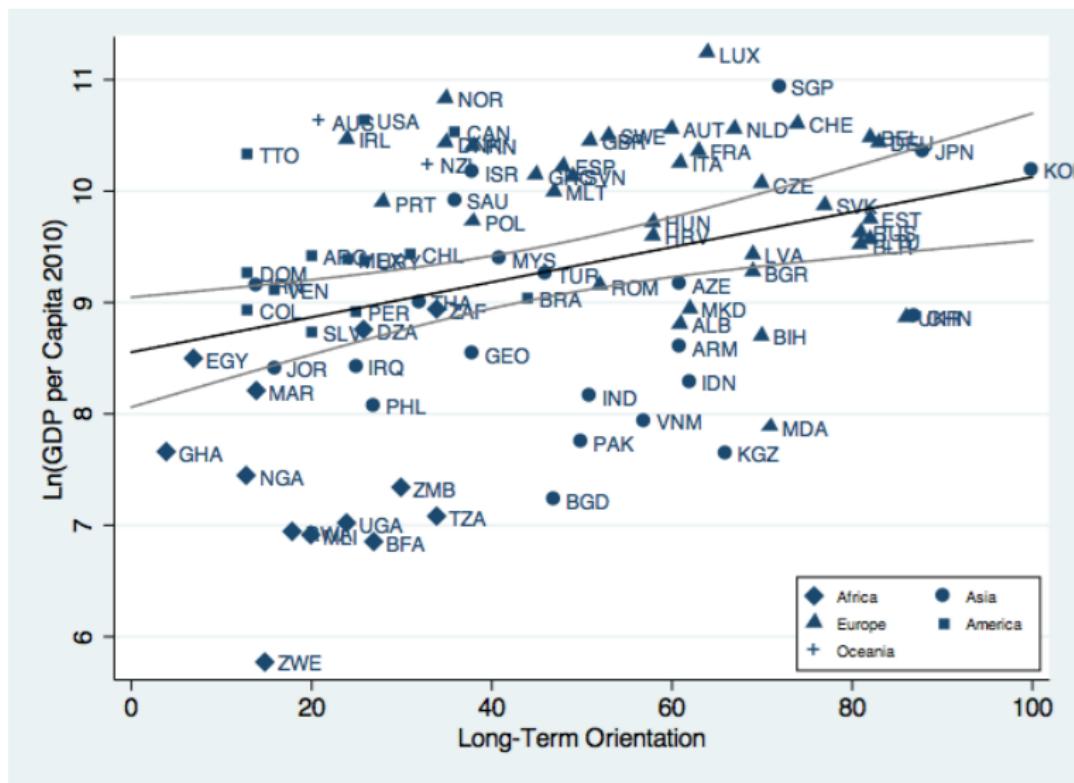
“the fostering of virtues oriented toward future rewards, in particular, perseverance and thrift”

Country-Level Analysis

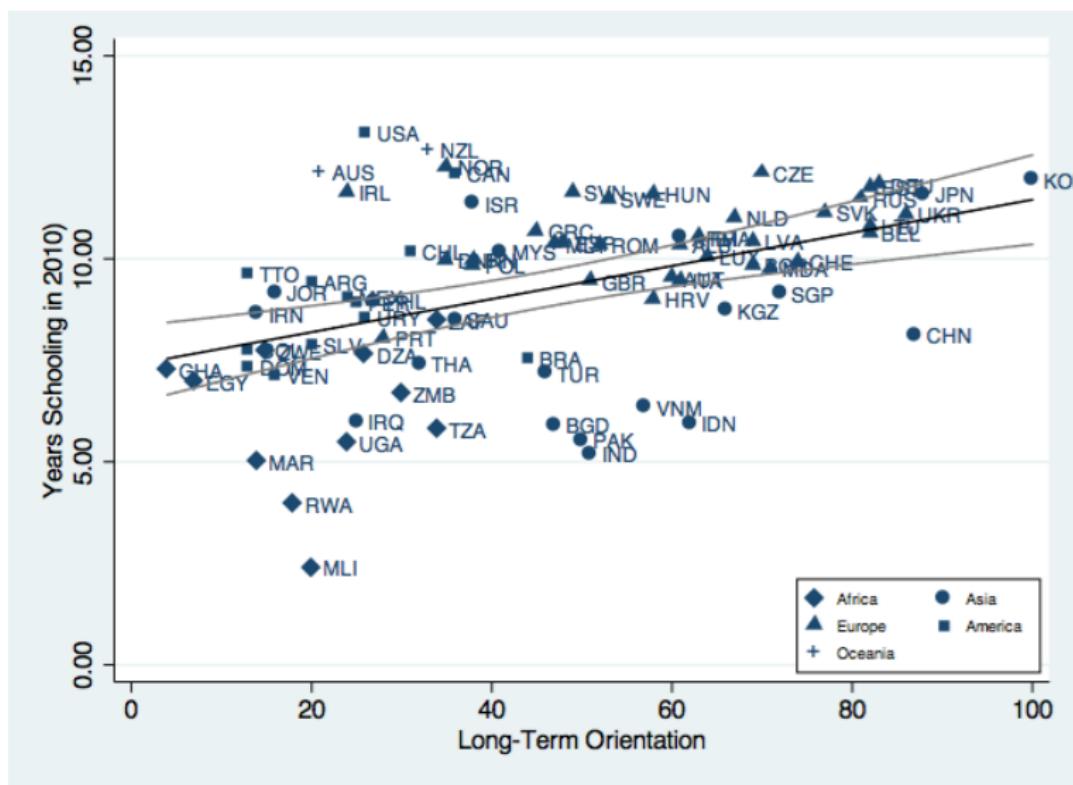
- Long-Term Orientation
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“the fostering of virtues oriented toward future rewards, in particular, perseverance and thrift”
 - 0 (Short-Term) to 100 (Long-Term)

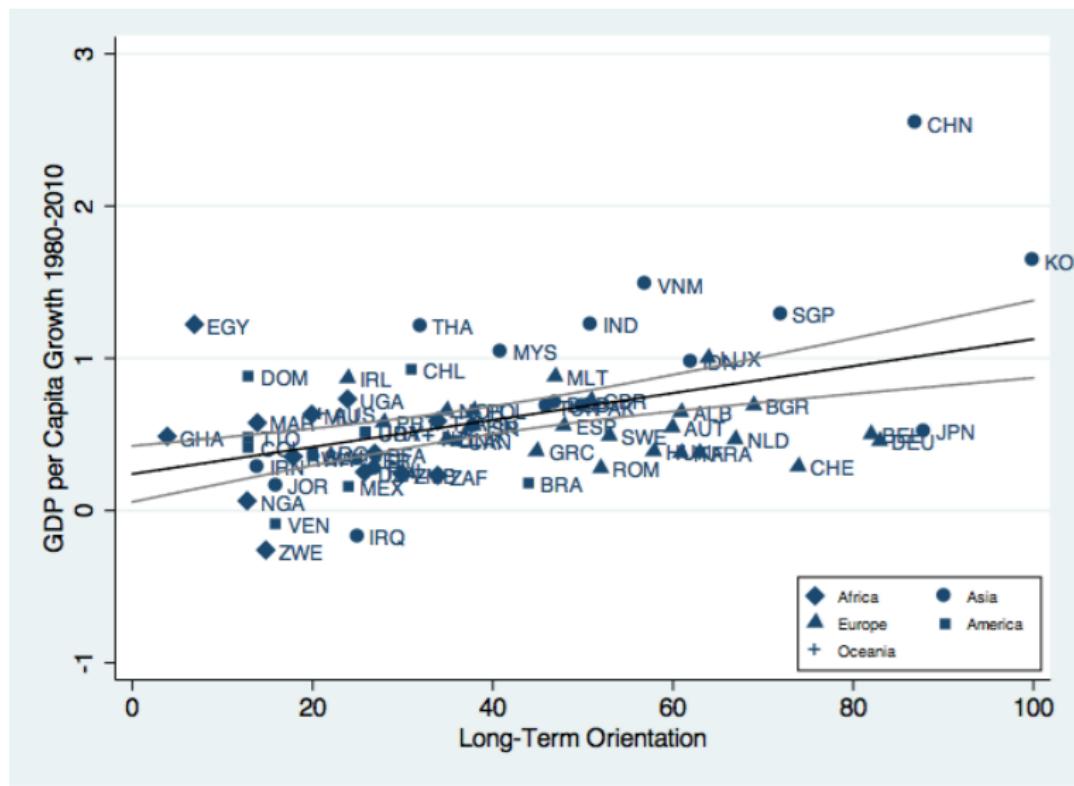
Correlations: Long-Term Orientation and Development



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Correlations: Long-Term Orientation and Development



Crop Yield and Long-Term Orientation

Identification Strategy

Potential Concerns:

Identification Strategy

Potential Concerns:

- Reverse causality:

Identification Strategy

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- Reverse causality:

Time preference \Rightarrow actual return to agricultural investment

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Time preference \Rightarrow actual return to agricultural investment

- Choice of crops

Identification Strategy

Potential Concerns:

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- Choice of technology

Identification Strategy

Potential Concerns:

- Reverse causality:

Time preference \Rightarrow actual return to agricultural investment

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- Choice of technology

Remedy:

Identification Strategy

Potential Concerns:

- Reverse causality:

Time preference \Rightarrow actual return to agricultural investment

- Choice of crops
- Choice of technology

Remedy:

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

Identification Strategy

Potential Concerns:

Identification Strategy

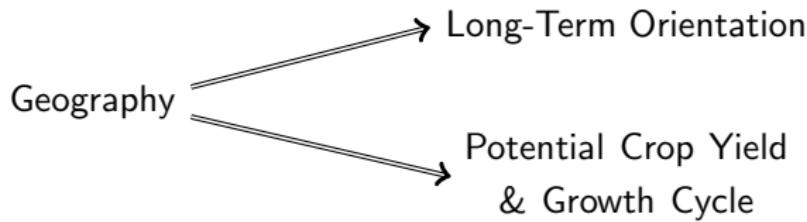
Potential Concerns:

- Omitted Variable:

Identification Strategy

Potential Concerns:

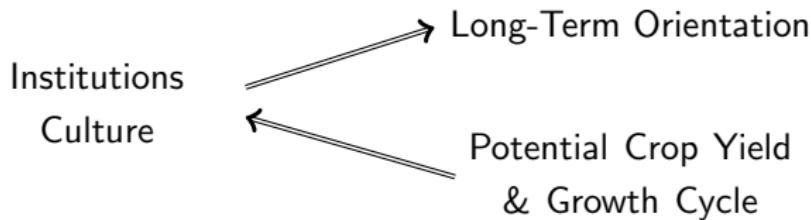
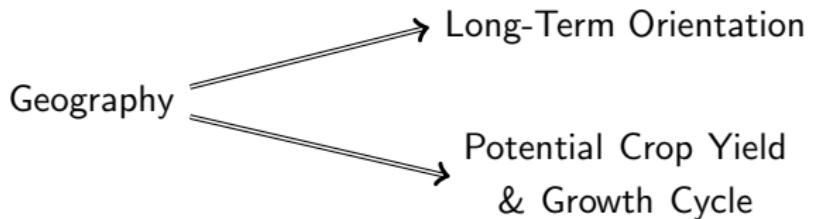
- Omitted Variable:



Identification Strategy

Potential Concerns:

- Omitted Variable:



Identification Strategy

Remedy:

Identification Strategy

Remedy:

- 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, roughness, distance to waterways, etc.)

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- Account for the confounding effects of:
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 - Adjusting for the roots of contemporary populations

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- Analysis of 2nd generation migrants:

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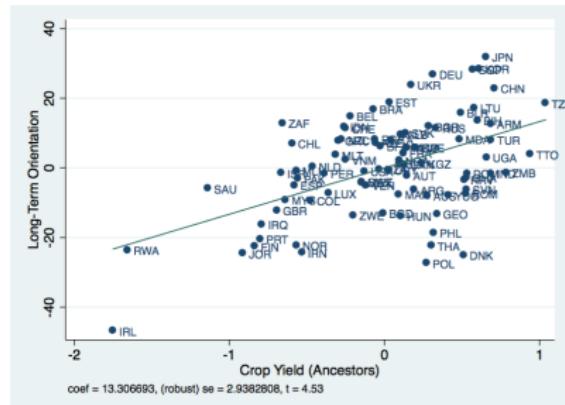
Empirical Specification

$$\begin{aligned} LTO_i = & \beta_0 + \beta_1 \text{crop yield}_i + \beta_2 \text{crop growth cycle}_i \\ & + \sum_j \gamma_{0j} X_{ij} + \gamma_1 YST_i + \delta_c \Delta_i + \epsilon_i, \end{aligned}$$

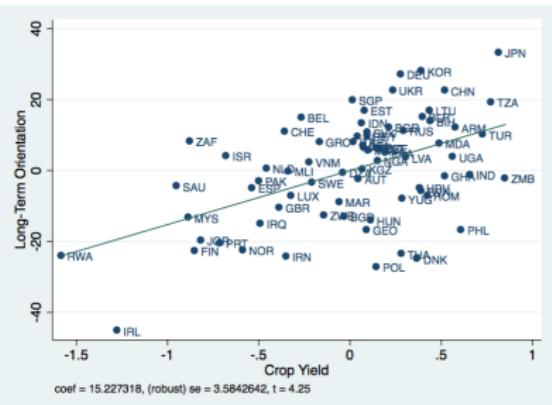
- LTO_i ≡ Long-Term Orientation measure
- X_{ij} ≡ Geographical controls
- YST_i ≡ Years since transition to agriculture
- Δ_i ≡ Continental FEs

Crop Yield and Long-Term Orientation

Partial Correlation: Crop Yield and LTO



(a) Ancestry Adjusted



(b) Old World

Identification Strategy

Potential Concerns: Selection

Identification Strategy

Potential Concerns: Selection

- High long-term orientation individuals settled in regions which reward LTO

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Remedy:

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Remedy:

- Exploit natural experiment associated with Columbian Exchange
 - Changes in the spectrum of potential crops in the post-1500 period Crops
- Assignment of potentially superseding crops to existing individuals across regions Random

Identification Strategy

Potential Concerns: Historical vs Contemporary Effect

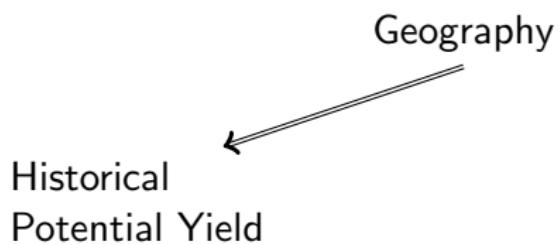
Identification Strategy

Potential Concerns: Historical vs Contemporary Effect

Geography

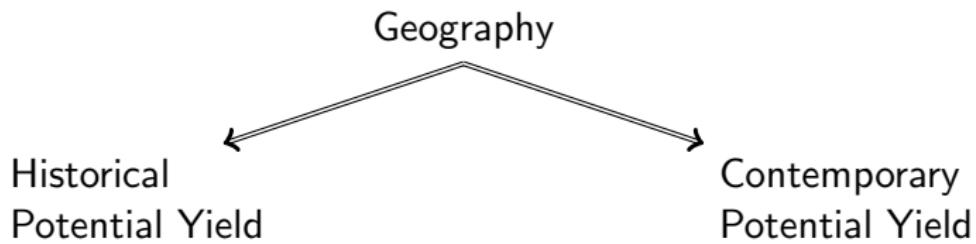
Identification Strategy

Potential Concerns: Historical vs Contemporary Effect



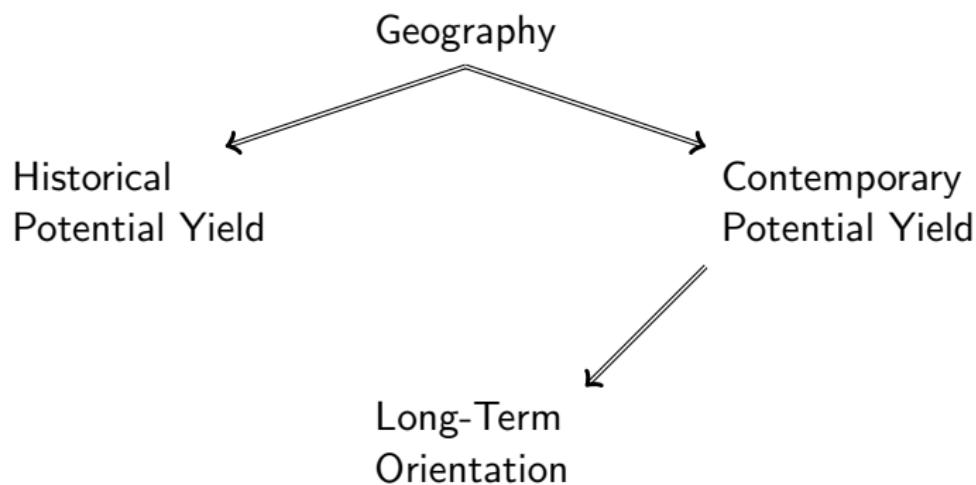
Identification Strategy

Potential Concerns: Historical vs Contemporary Effect



Identification Strategy

Potential Concerns: Historical vs Contemporary Effect



Pre-1500CE Crop Yield and LTO

△ > 0

Natives

Excluding the Persistence of Development Channel

- Agricultural productivity (crop yield)

Excluding the Persistence of Development Channel

- Agricultural productivity (crop yield)
 - Population density

Excluding the Persistence of Development Channel

- Agricultural productivity (crop yield)
 - Population density
 - Urbanization

Excluding the Persistence of Development Channel

- Agricultural productivity (crop yield)
 - Population density
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- Persistence of pre-industrial development

Excluding the Persistence of Development Channel

- Agricultural productivity (crop yield)
 - Population density
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 - Income, education, etc.

Excluding the Persistence of Development Channel

- Agricultural productivity (crop yield)
 - Population density
 - Urbanization
- Persistence of pre-industrial development
 - Income, education, etc.
 - Long-term orientation

Excluding the Pre-Industrial Development Channel

	Long-Term Orientation							
	Population Density		Urbanization		GDP per capita			
	1500CE		1500CE		1800CE		1870CE	1913CE
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Crop Yield (Anc., pre-1500)	11.05*** (2.53)	11.52*** (2.33)	10.01*** (3.68)	11.08*** (3.68)	11.54*** (3.18)	11.54*** (3.22)	14.19*** (5.08)	12.66** (5.02)
Crop Yield Change (post-1500)	10.76*** (2.89)	10.40*** (2.78)	8.77** (3.35)	9.96*** (3.35)	10.05*** (3.23)	10.22*** (3.23)	15.55*** (3.22)	14.92*** (3.29)
Crop Growth Cycle (Anc., pre-1500)	-8.06* (4.06)	-10.43*** (3.63)	-5.06 (5.28)	-7.30 (5.37)	-8.60* (4.68)	-8.75* (4.84)	-12.58* (6.44)	-10.28 (6.46)
Crop Growth Cycle Ch. (post-1500)	-0.46 (1.72)	-1.06 (1.84)	1.06 (2.91)	0.55 (2.95)	0.07 (2.37)	0.03 (2.41)	2.14 (3.38)	3.31 (3.35)
Population density in 1500 CE	3.76** (1.86)							
Urbanization rate in 1500 CE				1.90 (2.24)				
Urbanization rate in 1800 CE						-0.57 (1.22)		
GDP per capita 1870							10.57*** (3.65)	
GDP per capita 1913								10.99*** (3.53)
Semi-Partial R ²								
Crop Yield (Anc., pre-1500)	0.08***	0.09***	0.04***	0.04***	0.07***	0.07***	0.09***	0.07**
Crop Yield Change (post-1500)	0.05***	0.05***	0.03**	0.03***	0.04***	0.04***	0.10***	0.09***
Crop Growth Cycle (Anc., pre-1500)	0.02*	0.03***	0.00	0.01	0.02*	0.02*	0.04*	0.03
Crop Growth Cycle Ch. (post-1500)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Population density in 1500 CE	0.01**							
Urbanization rate in 1500 CE				0.00				
Urbanization rate in 1800 CE					0.00			
GDPpc 1870						0.05***		
GDPpc 1913							0.05***	
Continental FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Geography & Neolithic	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted-R ²	0.65	0.67	0.60	0.60	0.63	0.62	0.59	0.59
Observations	87	87	65	65	79	79	50	50

Excluding Other Channels

Excluding Other Channels

- Average Suitability PCA

Excluding Other Channels

- Average Suitability PCA
- Plow

Excluding Other Channels

- Average Suitability PCA
- Plow
- Future Time Reference (FTR)

Excluding Other Channels

- Average Suitability PCA
- Plow
- Future Time Reference (FTR)

→ Long-Term Orientation

Excluding Other Channels

	Long-Term Orientation								
	Agricultural Suitability			Plow			Future Time Reference		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crop Yield (Ancestors, pre-1500)	12.02*** (2.69)	11.46*** (2.91)	10.36*** (3.32)	12.85*** (2.65)	12.80*** (2.67)	12.72*** (2.70)	13.05*** (2.75)	14.10*** (2.77)	13.95*** (2.80)
Crop Yield Change (post-1500)	10.70*** (2.71)	10.50*** (2.70)	10.03*** (2.73)	10.93*** (2.77)	10.93*** (2.78)	11.17*** (2.76)	10.30*** (3.16)	9.89*** (2.88)	10.13*** (3.02)
Crop Growth Cycle (Ancestors, pre-1500)	-7.63* (3.85)	-7.71* (3.94)	-8.04* (4.09)	-10.02** (3.94)	-10.13** (3.92)	-10.50*** (3.94)	-10.87** (4.14)	-10.05** (3.80)	-10.21** (3.97)
Crop Growth Cycle Change (post-1500)	-0.90 (1.62)	-0.96 (1.68)	-1.16 (1.76)	-1.30 (1.69)	-1.40 (1.66)	-1.63 (1.61)	-1.09 (1.62)	-0.86 (1.72)	-0.97 (1.70)
Land Suitability	0.83 (2.07)								
Land Suitability (Ancestors)		2.34 (3.20)							
Plow				1.62 (3.17)					
Plow (Ancestors)					3.35 (3.92)				
Strong FTR						-3.68** (1.68)			
Strong FTR (Ancestors)							-2.59 (1.76)		
	Semi-Partial R^2								
Crop Yield (Ancestors, pre-1500)	0.07***	0.05***	0.03***	0.08***	0.08***	0.08***	0.08***	0.09***	0.09***
Crop Yield Change (post-1500)	0.05***	0.05***	0.04***	0.05***	0.05***	0.05***	0.04***	0.03***	0.04***
Crop Growth Cycle (Ancestors, pre-1500)	0.01*	0.01*	0.02*	0.03**	0.03**	0.03***	0.03**	0.02**	0.02**
Crop Growth Cycle Change (post-1500)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Land Suitability	0.00								
Land Suitability (Ancestors)		0.00							
Plow				0.00					
Plow (Ancestors)					0.00				
Strong FTR						0.02**			
Strong FTR (Ancestors)							0.01		
Continental FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Geography & Neolithic	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted- R^2	0.68	0.67	0.68	0.67	0.66	0.67	0.70	0.72	0.70
Observations	85	85	85	87	87	87	71	71	71

Excluding Other Cultural Channels

Excluding Other Cultural Channels

Long-Term Orientation is correlated with other cultural traits.

Excluding Other Cultural Channels

Long-Term Orientation is correlated with other cultural traits.

Potential concern:

Excluding Other Cultural Channels

Long-Term Orientation is correlated with other cultural traits.

Potential concern:

→ Potential yield determines other cultural traits

Excluding Other Cultural Channels

Long-Term Orientation is correlated with other cultural traits.

Potential concern:

- Potential yield determines other cultural traits
- Other cultural traits determine LTO

Excluding Other Cultural Channels

Corr

	Cultural Indices						
	Long-Term Orientation	Restraint vs Indulgence	Trust	Indivi- dualism	Power Distance	Coope- ration	Uncertainty Avoidance
			(1)	(2)	(3)	(4)	(5)
Crop Yield (Ancestors, pre-1500)	10.03*** (3.05)	6.58 (3.99)	-7.11* (3.72)	-10.88 (6.59)	6.69 (5.92)	-7.60 (5.98)	3.03 (5.55)
Crop Yield Change (Anc., post-1500)	9.03*** (2.16)	7.91** (3.10)	-0.53 (3.48)	-3.05 (2.62)	2.50 (2.18)	-1.51 (2.23)	-0.39 (2.21)
Crop Growth Cycle (Ancestors, pre-1500)	-5.98** (2.75)	-4.59 (3.57)	0.35 (3.47)	2.20 (3.82)	-2.50 (4.11)	3.50 (4.15)	4.06 (4.33)
Crop Growth Cycle Change (Anc., post-1500)	-0.77 (1.60)	2.02 (2.42)	1.96 (2.09)	-3.72 (3.18)	-0.89 (2.90)	3.00 (2.51)	-0.05 (3.24)
Land Suitability (Ancestors)	2.33 (3.15)	0.91 (4.86)	-6.17 (5.10)	6.94 (4.99)	7.75* (4.22)	12.54*** (3.91)	6.08 (3.98)
Neolithic Transition Timing (Ancestors)	-7.58** (3.04)	-0.19 (4.62)	0.56 (4.09)	-0.60 (3.32)	-2.13 (4.40)	1.22 (5.85)	-8.88** (3.77)
Continental FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
All Geographical Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted- <i>R</i> ²	0.68	0.41	0.46	0.68	0.39	0.46	0.60
Observations	85	83	83	60	60	60	60

Excluding Other Cultural Channels

	Long-Term Orientation						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crop Yield (Ancestors, pre-1500)	10.03*** (3.05)	9.38*** (3.21)	10.30*** (3.41)	13.54** (6.49)	11.47* (6.78)	12.76* (6.78)	11.17* (6.53)
Crop Yield Change (Anc., post-1500)	9.03*** (2.16)	8.55*** (2.53)	8.97*** (2.23)	7.45*** (2.47)	6.88** (2.63)	7.11*** (2.53)	6.84*** (2.50)
Crop Growth Cycle (Ancestors, pre-1500)	-5.98** (2.75)	-5.71* (3.08)	-6.05** (2.76)	-5.53 (4.88)	-5.14 (5.32)	-5.75 (5.14)	-5.29 (4.89)
Crop Growth Cycle Change (Anc., post-1500)	-0.77 (1.60)	-0.88 (1.71)	-0.71 (1.84)	0.17 (3.11)	-0.61 (3.11)	-1.16 (3.20)	-0.59 (3.03)
Restraint vs. Indulgence		2.18 (2.22)					
Trust			0.63 (3.10)				
Individualism				4.80 (3.96)			
Power Distance					-0.45 (3.90)		
Cooperation						3.95 (4.20)	
Uncertainty Avoidance							1.18 (6.06)
Land Suitability (Ancestors)	2.33 (3.15)	2.30 (3.30)	2.35 (3.51)	-2.71 (4.93)	-1.13 (4.76)	-3.67 (5.54)	-1.61 (5.32)
Neolithic Transition Timing (Ancestors)	-7.58** (3.04)	-7.49** (3.05)	-7.51** (3.14)	-7.86 (5.32)	-8.03 (5.34)	-8.22 (5.07)	-7.53 (5.91)
Continental FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
All Geographical Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted- <i>R</i> ²	0.68	0.68	0.67	0.59	0.58	0.59	0.58
Observations	85	83	83	60	60	60	60

Robustness

- Including Cells with Zero Caloric Output [Table Zeroes](#)

Robustness

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- Daily Return [Table Daily](#)

Robustness

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- Daily Return [Table Daily](#)
- Trade [Table Trade](#)

Robustness

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Robustness

- Including Cells with Zero Caloric Output [Table Zeroes](#)
- Daily Return [Table Daily](#)
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- Climatic Variability [Table Climatic](#)

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- Spatial Autocorrelation (Cliff and Ord, 1973; Conley, 1999)
- Omitted Variable Bias (Altonji, Elder, and Taber, 2005; Bellows and Miguel, 2009; Oster, 2014) [Table AET](#) [Table AET Changes](#)

Crop Yield, LTO and Technological Adoption

	Major Technological Changes (Probit)						
	(1)	(2)	(3)	(4)	(5)	(6)	
Crop Yield (pre-1500)	0.10** (0.05)	0.13** (0.05)	0.15*** (0.05)	0.17** (0.06)	0.30*** (0.05)	0.29*** (0.06)	
Crop Yield Ch. (post-1500)			0.06 (0.05)	0.09* (0.05)	0.16*** (0.04)	0.21*** (0.06)	
Crop Cycle (pre-1500)				-0.13 (0.08)	-0.22*** (0.08)	-0.21** (0.09)	
Crop Growth Cycle Ch. (post-1500)					-0.12* (0.06)	-0.23*** (0.06)	-0.19*** (0.07)
Geographical Controls	No	Yes	Yes	Yes	Yes	Yes	
Language Family FE	No	No	No	No	Yes	Yes	
Continental FE	No	No	No	No	No	Yes	
Pseudo- R^2	0.04	0.13	0.15	0.18	0.43	0.45	
Observations	86	86	86	86	86	86	

Crop Yield, LTO and Education

	Years of Schooling in 2005					
	(1)	(2)	(3)	(4)	(5)	(6)
Crop Yield (Ancestors, pre-1500)	0.93*** (0.24)	0.90*** (0.30)	0.90*** (0.24)	0.90*** (0.29)	0.84*** (0.23)	0.88*** (0.28)
Crop Growth Cycle (Ancestors, pre-1500)	-0.08 (0.20)	-0.05 (0.23)	-0.04 (0.19)	-0.04 (0.23)	0.03 (0.24)	0.03 (0.32)
Crop Yield Change (post-1500)		-0.05 (0.27)		0.02 (0.26)		0.09 (0.34)
Crop Growth Cycle Change (post-1500)		0.00 (0.16)		0.02 (0.16)		0.08 (0.17)
Geographical Controls	Yes	Yes	Yes	Yes	Yes	Yes
Timing of Neolithic	No	No	Yes	Yes	Yes	Yes
Continental FE	No	No	No	No	Yes	Yes
Adjusted- <i>R</i> ²	0.52	0.51	0.53	0.52	0.59	0.58
Observations	129	129	129	129	129	129

Second Generation Migrants Analysis

Data

Analysis of 2nd generation migrants:

Second Generation Migrants Analysis

Data

Analysis of 2nd generation migrants:

- Accounts for host country FEs
(geography, institutions, culture)

Second Generation Migrants Analysis

Data

Analysis of 2nd generation migrants:

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- Accounts for individual characteristics
(e.g., age, gender, education, etc.)

Second Generation Migrants Analysis

Data

Analysis of 2nd generation migrants:

- Accounts for host country FEs
(geography, institutions, culture)
- Accounts for individual characteristics
(e.g., age, gender, education, etc.)
- Focus on portable component of the effect of crop yield

Correlations: Long-Term Orientation and Education

	Years of Schooling							
	Second Generation Migrants				All Individuals			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Long-Term Orientation	0.35*** (0.13)	0.37*** (0.14)	0.36** (0.14)	0.32** (0.13)	0.79*** (0.05)	0.88*** (0.05)	0.70*** (0.05)	0.63*** (0.04)
Country FE	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Sex & Age	No	No	Yes	Yes	No	No	Yes	Yes
Pray & Health	No	No	No	Yes	No	No	No	Yes
Adjusted- R^2	0.01	0.10	0.10	0.11	0.04	0.15	0.19	0.21
R^2	0.01	0.13	0.13	0.16	0.04	0.15	0.20	0.21
Observations	705	705	705	705	42016	42016	42016	42016

Income

Empirical Specification

$$\begin{aligned} LTO_{ic} = & \beta_0 + \beta_1 \text{crop yield}_{ip} + \beta_2 \text{crop growth cycle}_{ip} \\ & + \sum_j \gamma_{0j} X_{ipj} + \gamma_1 YST_{ip} + \sum_j \gamma_{2j} Y_{ij} + \delta_c \Delta_i + \epsilon_i, \end{aligned}$$

- LTO_{ic} \equiv Long-Term Orientation of individual i in country c
- X_{ipj} \equiv Geographical controls in parent's country of origin
- YST_{ip} \equiv Years since transition to agriculture in parent's country of origin
- Y_{ij} \equiv Individual controls (age, sex, education, marital status, health status, religiosity)
- Δ_i \equiv Host country fixed effects

Crop Yield and Long-Term Orientation in Second Generation Migrants

	Long-Term Orientation							
	Either Parent		Mother		Father		Both	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Crop Yield (Ancestors, pre-1500)	2.29*** (0.80)	2.61*** (0.97)	2.99*** (1.10)	3.44*** (1.30)	2.70** (1.04)	3.34*** (1.13)	5.63** (2.43)	6.11** (2.54)
Crop Yield Change (post-1500)	0.52 (0.65)	0.65 (0.61)	0.32 (0.71)	0.87 (0.77)	0.57 (0.85)	0.52 (0.89)	1.83 (1.29)	2.15 (1.76)
Crop Growth Cycle (Ancestors, pre-1500)	-0.82 (1.00)		-1.17 (1.56)		-1.84 (1.32)			-2.07 (2.54)
Crop Growth Cycle Change (post-1500)	-0.10 (0.63)		-0.92 (0.68)		0.48 (0.78)			-0.07 (1.33)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Individual Characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
All Geographical Controls & Neolithic	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted- R^2	0.06	0.05	0.05	0.05	0.06	0.06	0.04	0.04
Observations	2584	2584	1596	1596	1686	1686	568	568

Crop Yield and Saving in Second Generation Migrants

	Saving							
	Either Parent		Mother		Father		Both	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Crop Yield (Ancestors, pre-1500)	0.04** (0.02)	0.06** (0.03)	0.04* (0.02)	0.06** (0.03)	0.05** (0.02)	0.07** (0.03)	0.02 (0.03)	0.03 (0.03)
Crop Yield Change (post-1500)	0.03* (0.01)	0.04** (0.02)	0.04*** (0.01)	0.04** (0.02)	0.02 (0.02)	0.04** (0.02)	0.08*** (0.02)	0.07** (0.03)
Crop Growth Cycle (Ancestors, pre-1500)	-0.04 (0.03)		-0.03 (0.04)		-0.05 (0.04)			-0.03 (0.04)
Crop Growth Cycle Change (post-1500)	-0.01 (0.02)		0.00 (0.01)		-0.02 (0.02)			0.02 (0.02)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Individual Characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Geography & Neolithic	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted- R^2	0.15	0.15	0.15	0.15	0.15	0.15	0.18	0.18
Observations	2559	2559	1582	1582	1665	1665	562	562

Crop Yield and Smoking in Second Generation Migrants

	Smoking							
	Either Parent					Both		
	Habit					Ever	Habit	Ever
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Crop Yield (Ancestors, pre-1500)	-0.02** (0.01)	-0.02*** (0.01)	-0.02** (0.01)	-0.03** (0.01)	-0.04*** (0.02)	-0.08*** (0.02)	-0.05*** (0.02)	-0.13*** (0.03)
Crop Yield Change (post-1500)			-0.02** (0.01)	-0.00 (0.01)	-0.00 (0.02)	0.06 (0.04)	-0.01 (0.03)	-0.02 (0.03)
Crop Growth Cycle (Ancestors, pre-1500)				0.02 (0.01)	0.04** (0.02)	0.02 (0.02)	0.02 (0.03)	0.10*** (0.03)
Crop Growth Cycle Change (post-1500)					-0.00 (0.02)	0.00 (0.04)	-0.00 (0.03)	0.04* (0.03)
Individual Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Geographical Controls & Neolithic	No	No	No	Yes	Yes	Yes	Yes	Yes
Adjusted- R^2	0.06	0.07	0.07	0.07	0.07	0.11	0.07	0.15
Observations	1561	1561	1561	1561	1561	935	817	496

Individual-Level Analysis (WVS) Data

Individual-level analysis:

Individual-Level Analysis (WVS)

Data

Individual-level analysis:

- Accounts for individual characteristics
(e.g., age, gender, education, etc.)

Individual-Level Analysis (WVS)

Data

Individual-level analysis:

- Accounts for individual characteristics
(e.g., age, gender, education, etc.)
- Country FE
(geography, institutions, culture)

Empirical Specification

$$\begin{aligned} LTO_{ircw} = & \beta_0 + \beta_1 \text{crop yield}_{rc} + \beta_2 \text{crop growth cycle}_{rc} \\ & + \sum_j \gamma_{0j} X_{rc} + \gamma_1 YST_{rc} + \sum_j \gamma_{2j} Y_{ircwj} + \delta_{cw} \Delta_{cw} + \epsilon_{ircw} \end{aligned}$$

- $LTO_{ircw} \equiv$ Long-Term Orientation of individual i in region r of country c in wave w
- $X_{rc} \equiv$ Geographical controls in region r of country c
- $YST_{rc} \equiv$ Years since transition to agriculture in region r of country c
- $Y_{ircwj} \equiv$ Individual controls (age, sex, education, income)
- $\Delta_{cw} \equiv$ Continent/Country and Wave fixed effects

Crop Yield and Long-Term Orientation (WVS)

Robustness

Results are robust to:

Robustness

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- Estimation method Probit

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Robustness

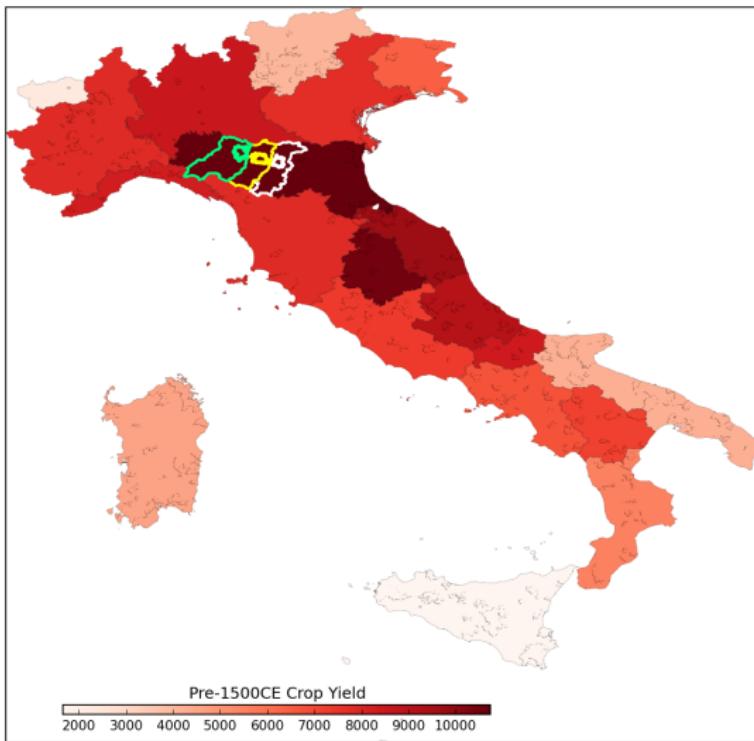
Results are robust to:

- Estimation method [Probit](#)
- Cells that experienced change in crop post-1500 [Table](#)
- Weighted Observations [Table](#)
- Country Fixed Effects [Table](#)

Regional Analysis

Share of Individuals in WVS Region with Long-Term Orientation												
	Whole World								Old World			
	Unweighted				Weighted: Area				Weighted: Area Share			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Crop Yield	0.049*** (0.012)	0.046*** (0.013)	0.053*** (0.017)		0.097*** (0.033)		0.032** (0.012)		0.031** (0.013)		0.039*** (0.015)	0.032** (0.013)
Crop Growth Cycle		-0.010 (0.012)		-0.047** (0.021)		-0.024** (0.010)		-0.036*** (0.009)		-0.027*** (0.009)	-0.027*** (0.008)	-0.036*** (0.008)
Crop Yield (Ancestors)			0.077*** (0.020)		0.133*** (0.032)		0.043** (0.017)		0.041** (0.017)			
Crop Growth Cycle (Anc.)			-0.012 (0.013)		-0.050*** (0.018)		-0.027*** (0.009)		-0.037*** (0.009)			
Continental FE	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No	No
Country FE	No	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Geographical Controls	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Old World Sample	No	No	No	No	No	No	No	No	No	No	Yes	Yes
Weighted by Region Area	No	No	No	No	Yes	Yes	Yes	Yes	No	No	Yes	No
Weighted by Region's Share	No	No	No	No	No	No	No	No	Yes	Yes	No	Yes
Adjusted- <i>R</i> ²	0.22	0.25	0.25	0.28	0.28	0.37	0.72	0.72	0.86	0.86	0.72	0.86
Observations	1356	1356	1356	1356	1356	1356	1356	1356	1356	1356	1143	1143

Crop Yield and the Adoption of Lengthy Production Processes: Aceto Balsamico and Parmigiano Reggiano



Concluding Remarks

- Co-evolution of human traits and the economic environment is central for the understanding of comparative development

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 - ⇒ Saving

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Concluding Remarks

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 - ⇒ Saving
 - ⇒ Smoking
 - ⇒ Technological Adoption

The Agricultural Origins of Time Preference

Oded Galor and Ömer Özak

“Patience is bitter, but its fruit is sweet.”

– Aristotle

Malthusian Framework: Endowment Sector

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- Production function

$$Y_t^E = A_t(L_t^E)^{(1-\alpha)} X^\alpha, \quad \alpha \in (0, 1)$$

Malthusian Framework: Endowment Sector

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- Output endowment sector $\equiv Y_t^E$

Malthusian Framework: Endowment Sector

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- Technological level $\equiv A_t$

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- Boserupian technological progress

$$A_t \equiv A(L_t^E) = R^0(L_t^E)^\alpha$$

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- Boserupian technological progress

$$A_t \equiv A(L_t^E) = R^0(L_t^E)^\alpha$$

- Per capita output

$$\frac{Y_t^E}{L_t^E} = \frac{R^0(L_t^E)^\alpha(L_t^E)^{(1-\alpha)}X^\alpha}{L_t^E} = R^0$$

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Malthusian Framework: Investment Sector

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$$Y_t^{\mathcal{I}} = A_t (L_t^{\mathcal{I}})^{(1-\alpha)} X^{\alpha}, \quad \alpha \in (0, 1)$$

Malthusian Framework: Investment Sector

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Malthusian Framework: Investment Sector

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- Technology level $\equiv A_t$

Malthusian Framework: Investment Sector

- Production function

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- Technology level $\equiv A_t$
- Labor in investment mode $\equiv L_t^{\mathcal{I}}$

Malthusian Framework: Investment Sector

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$$A_t \equiv A(L_t^{\mathcal{I}}) = R^1(L_t^{\mathcal{I}})^{\alpha}$$

Malthusian Framework: Investment Sector

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- Technology level $\equiv A_t$
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- Fixed amount of land $\equiv X = 1$

- Boserupian technological progress

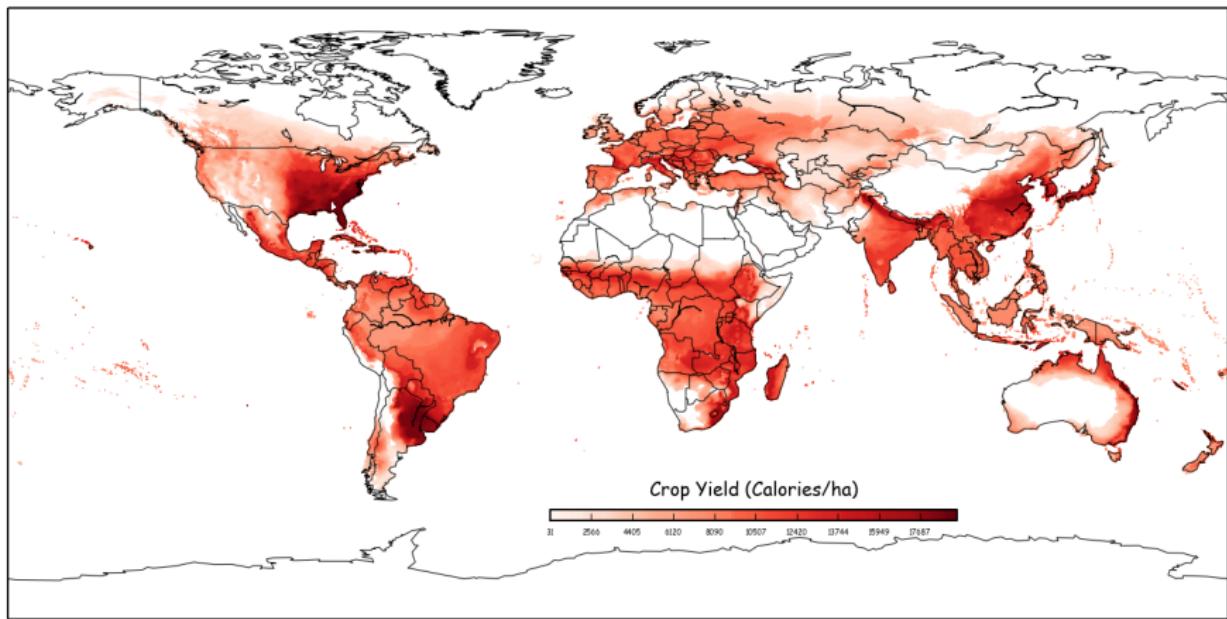
$$A_t \equiv A(L_t^{\mathcal{I}}) = R^1(L_t^{\mathcal{I}})^{\alpha}$$

- Per capita output

$$\frac{Y_t^{\mathcal{I}}}{L_t^{\mathcal{I}}} = \frac{R^1(L_t^{\mathcal{I}})^{\alpha}(L_t^{\mathcal{I}})^{(1-\alpha)}X^{\alpha}}{L_t^{\mathcal{I}}} = R^1$$

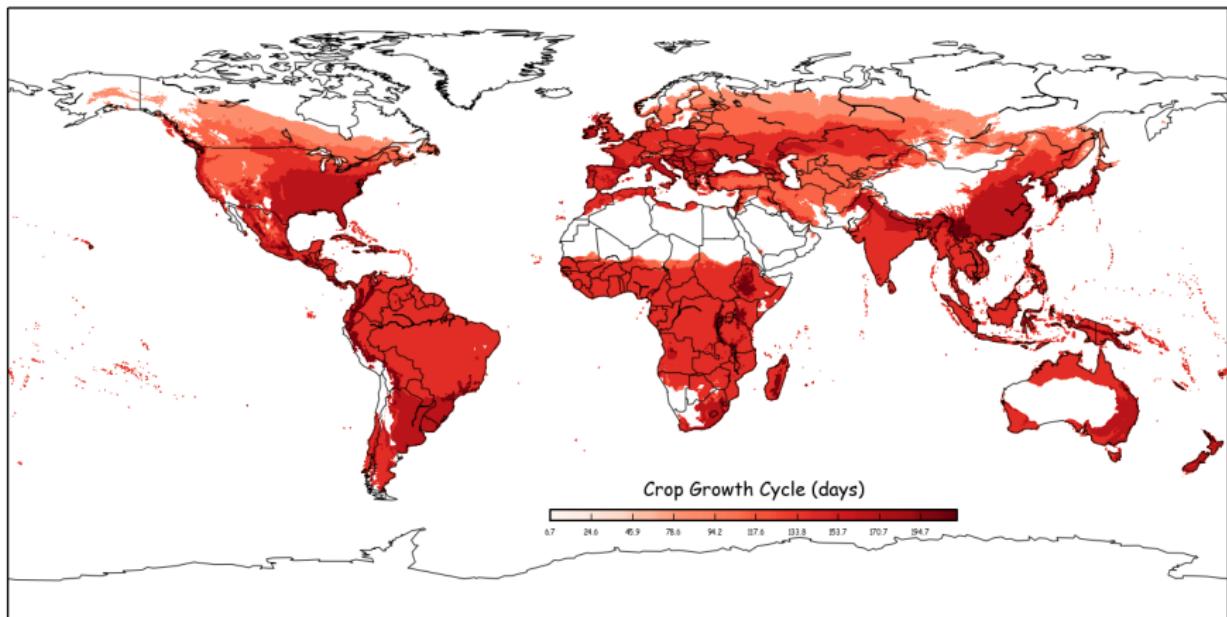
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Potential Crop Yield post-1500CE

[Back](#)

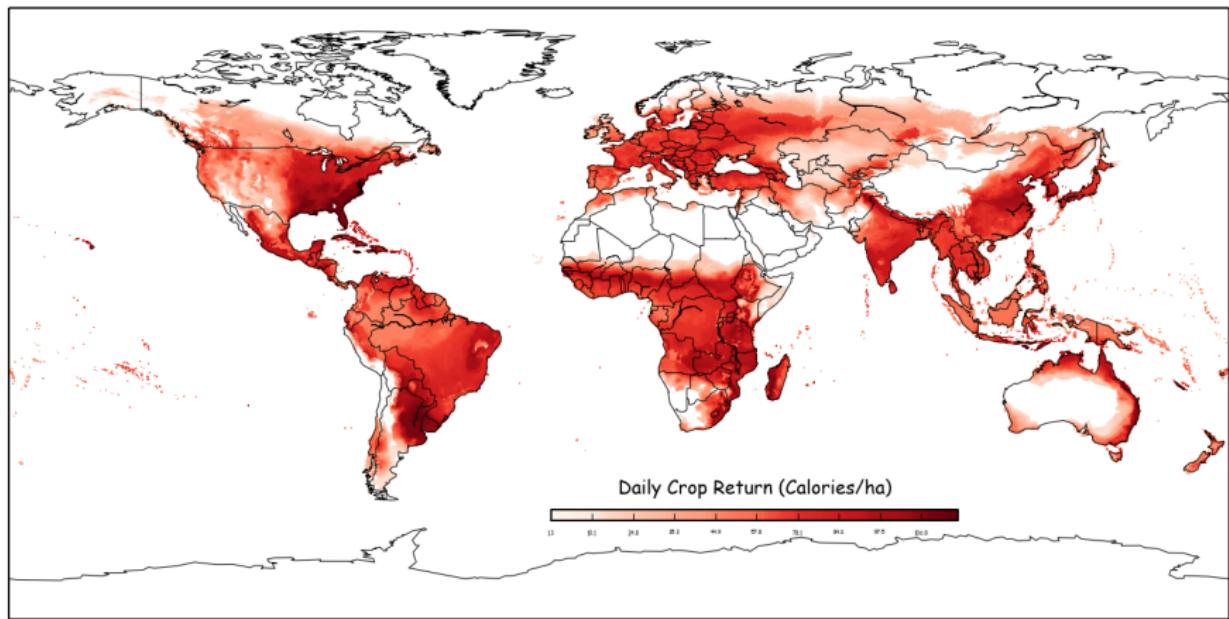
Potential Crop Growth Cycle post-1500CE

Pre-1500CE

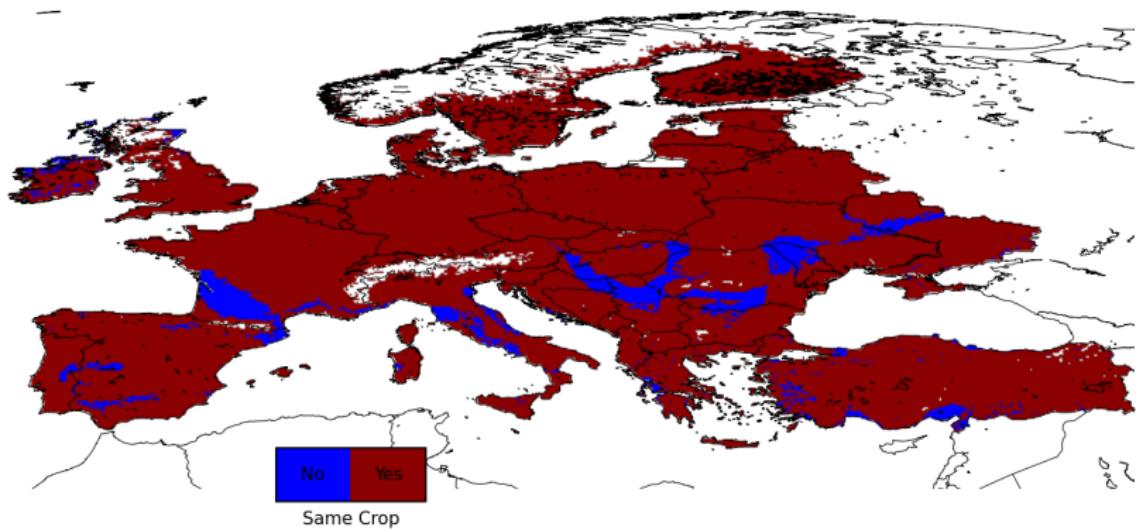


Potential Crop Return post-1500CE

Pre-1500CE

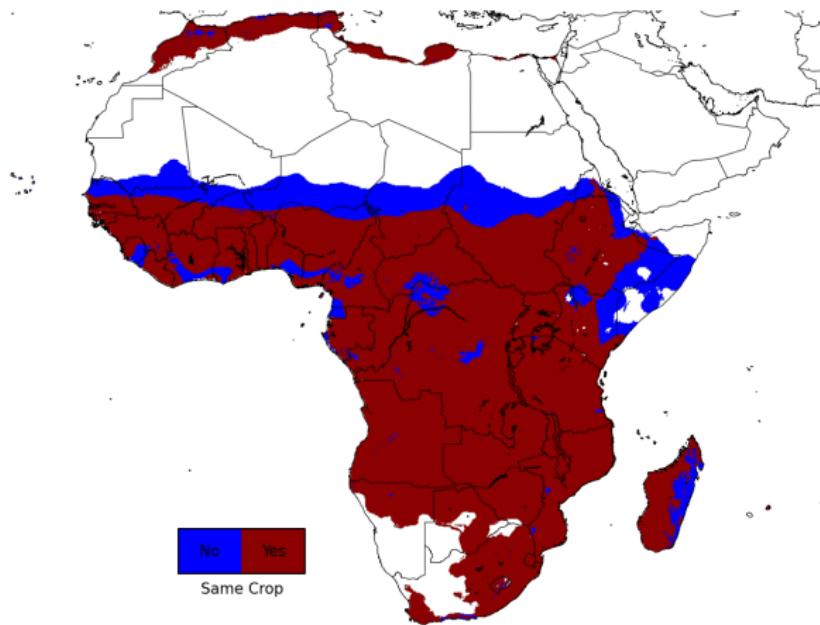


Total vs. Daily Yield



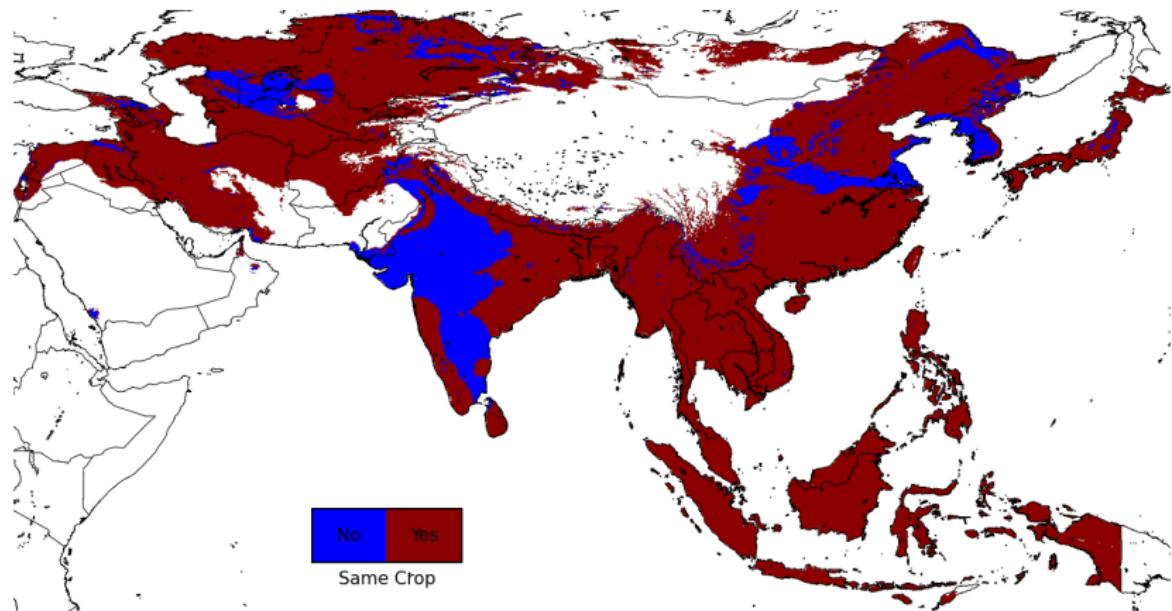
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Total vs. Daily Yield



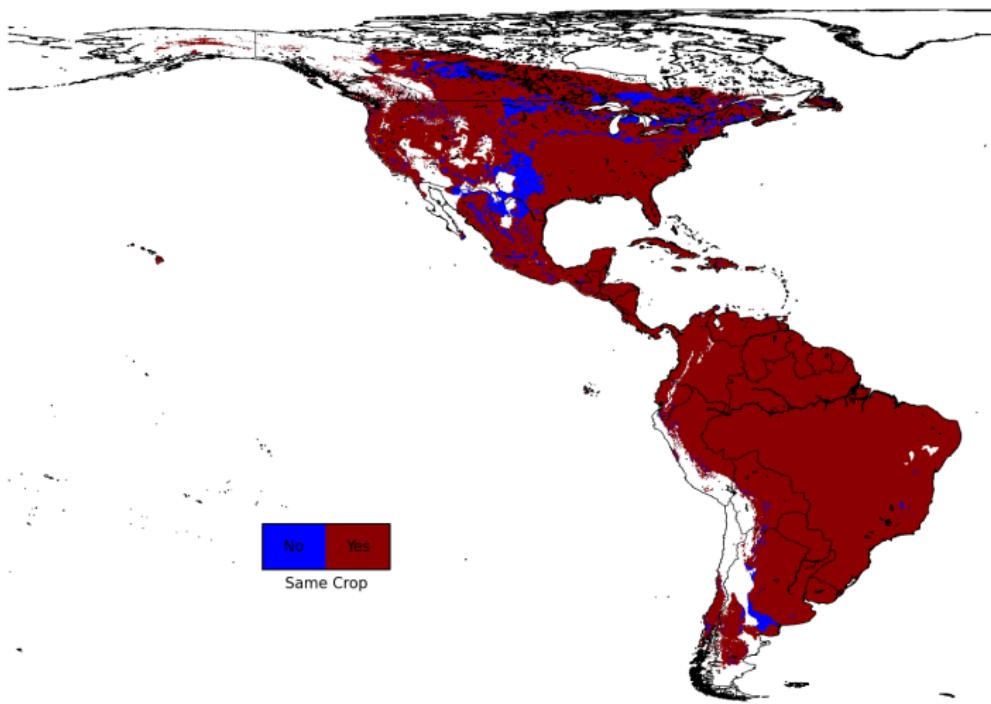
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Total vs. Daily Yield



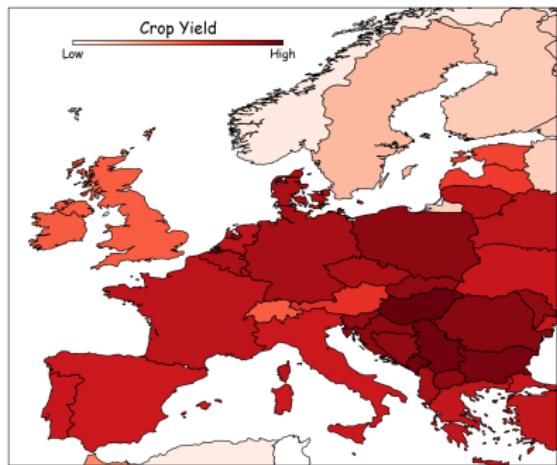
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Total vs. Daily Yield

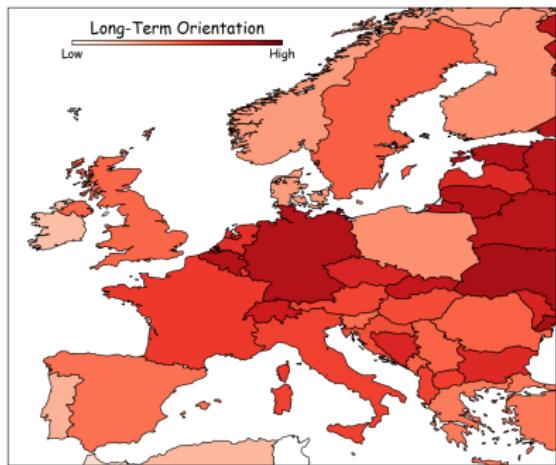


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Potential Crop Yield (Ancestry Adjusted) and LTO



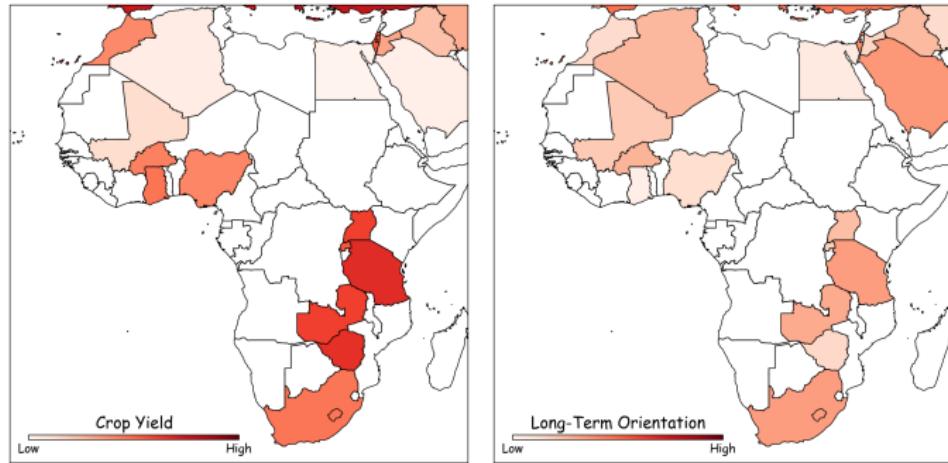
(a) Potential Crop Yield



(b) Long-Term Orientation

Potential Crop Yield (Ancestry Adjusted) and LTO

Unadjusted



(a) Potential Crop Yield

(b) Long-Term Orientation

Continental Distribution of crops (and their variants) pre-1500CE

Back

Crop	Continent	Crop	Continent
Alfalfa	Asia, Europe	Palm Heart	North Africa, Subsahara
Banana	Asia, Oceania, North Africa	Pearl Millet	Asia, North Africa, Subsahara
Barley	Asia, Europe, North Africa	Phaseolus Bean	America
Buckwheat	Asia	Pigeon Pea	Asia, Subsahara
Cabbage	Europe	Rye	Europe
Cacao	America	Sorghum	North Africa, Subsahara
Carrot	Asia, Europe	Soybean	Asia
Cassava	America	Sunflower	America
Chick Pea	Europe	Sweet Potato	America
Citrus	Asia, Europe	Tea	Asia
Coconut	America, Oceania	Tomato	America
Coffee	North Africa	Wetland Rice	Asia, Subsahara
Cotton	America, Asia, Europe, North Africa, Subsahara	Wheat	Asia, Europe, North Africa
Cowpea	Asia, North Africa, Subsahara	Wheat Hard Red Spring	Asia, Europe, North Africa
Dry Pea	Europe, North Africa	Wheat Hard Red Winter	Asia, Europe, North Africa
Flax	Asia, Europe, North Africa	Wheat Hard White	Asia, Europe, North Africa
Foxtail Millet	Asia, Europe, North Africa	Wheat Soft Red Winter	Asia, Europe, North Africa
Greengram	Asia, Subsahara	Wheat Soft White	Asia, Europe, North Africa
Groundnuts	America	White Potato	America
Indigo Rice	Asia, Subsahara	Yams	Asia, Subsahara
Maize	America	Giant Yams	Asia, Subsahara
Oat	Europe, North Africa	Sorghum (Subtropical)	North Africa, Subsahara
Oilpalm	North Africa, Subsahara	Sorghum (Tropical Highland)	North Africa, Subsahara
Olive	Europe, North Africa	Sorghum (Tropical Lowland)	North Africa, Subsahara
Onion	America, Asia, Europe, North Africa, Subsahara, Oceania	White Yams	North Africa, Subsahara

Changes in Crop Yield and Growth Cycle and their Correlates (Anc.)

Back

	Principal Components		
	Component 1	Component 2	Unexplained
Crop Yield (Ancestors, pre-1500)	0.71	0.71	0.00
Crop Growth Cycle (Ancestors, pre-1500)	0.71	-0.71	0.00
Eigenvalues	1.40	0.60	
Proportion Variance	0.70	0.30	
Observations	87		

	Principal Components		
	Component 1	Component 2	Unexplained
Crop Yield Change (post-1500)	0.71	0.71	0.00
Crop Growth Cycle Change (post-1500)	0.71	-0.71	0.00
Eigenvalues	1.12	0.88	
Proportion Variance	0.56	0.44	
Observations	87		

Potential Crop Yield, Growth Cycle, Agricultural Suitability and LTO

Back

	Long-Term Orientation									(10)	
	Whole World										
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)		
PC2 Pre-1500 Crop	17.38*** (2.69)	17.75*** (2.70)		18.53*** (3.10)	12.52*** (2.35)	13.37*** (3.27)	11.79*** (3.22)	10.90*** (3.21)	10.71*** (3.34)		
PC2 Crop Change		0.55 (2.66)		0.77 (2.88)	8.82*** (2.20)	8.74*** (2.46)	8.22*** (2.34)	7.93*** (2.35)	6.39** (2.75)		
PC1 Pre-1500 Crop		1.25 (2.05)		1.10 (2.05)	0.74 (1.57)	0.75 (1.57)	3.08* (1.69)	4.02** (1.89)	2.72 (2.80)	3.11 (2.85)	
PC1 Crop Change				1.30 (3.04)	3.28 (2.49)	8.04*** (2.24)	7.22*** (2.40)	6.95*** (2.12)	6.29*** (2.26)	4.86 (3.01)	
Neolithic Transition Timing (Anc.)							-6.46** (3.02)	-7.05** (3.17)	-9.88** (4.06)		
Land Suitability (Anc.)								2.34 (3.20)	4.28 (3.50)		
Continent FE	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	
Geographical Controls	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	
Old World Sample	No	No	No	No	No	No	No	No	No	Yes	
Adjusted- R^2	0.33	-0.01	0.32	-0.02	0.33	0.62	0.66	0.68	0.68	0.63	
Observations	85	85	85	85	85	85	85	85	85	70	

Pre-1500CE Crop Yield and LTO

Grids that Experienced Change in Crop post-1500

Back

Pre-1500CE Crop Yield and LTO

Natural Experiment in Countries with High Share of Natives

[Back](#)

	Long-Term Orientation			
	Old World			
	(1)	(2)	(3)	(4)
Crop Yield (pre-1500)	8.49** (3.44)	8.58*** (3.05)	13.78*** (3.47)	17.55*** (3.93)
Crop Yield Change (post-1500)		9.62*** (3.53)	9.95*** (3.30)	13.36*** (3.76)
Crop Growth Cycle (pre-1500)				-8.86* (5.01)
Crop Growth Cycle Change (post-1500)				1.03 (2.19)
Neolithic Transition Timing			-2.84 (4.47)	-1.17 (4.38)
Continent FE	Yes	Yes	Yes	Yes
Geography	No	No	Yes	Yes
Adjusted- <i>R</i> ²	0.43	0.52	0.58	0.60
Observations	46	46	46	46

Excluding Other Cultural Channels: Correlations

Back

	Correlation Among Cultural Indices						
	(LTO)	(RVI)	(Trust)	(Ind)	(PDI)	(Coop)	(UAI)
Long-Term Orientation (LTO)	1.00						
Restraint vs. Indulgence (RIV)	0.53***	1.00					
Trust	0.19	-0.07	1.00				
Individualism (Ind)	0.12	-0.18	0.45***	1.00			
Power Distance (PDI)	0.05	0.34**	-0.50***	-0.66***	1.00		
Cooperation	0.01	-0.09	-0.21	0.05	0.16	1.00	
Uncertainty Avoidance (UAI)	-0.04	0.07	-0.50***	-0.23	0.27*	-0.00	1.00

Potential Crop Yield, Growth Cycle, and LTO (Including Grids Not-Suitable for Production)

Back

	Long-Term Orientation							
	Whole World						Old World	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Crop Yield	5.26** (2.43)	9.01*** (2.86)	8.21*** (2.61)	7.11** (3.06)			11.59*** (2.84)	10.79*** (3.51)
Crop Growth Cycle				2.18 (4.00)				1.47 (4.25)
Crop Yield (Ancestors)					9.38*** (2.43)	8.62*** (3.11)		
Crop Growth Cycle (Ancestors)						1.52 (4.23)		
Absolute Latitude	3.56 (4.21)	2.46 (3.94)	3.01 (4.35)	3.66 (3.79)	4.05 (4.16)	4.98 (4.62)	5.37 (5.14)	
Mean Elevation	6.20* (3.26)	7.14** (3.41)	6.63* (3.44)	6.73** (3.35)	6.44* (3.25)	5.86 (3.92)	5.64 (3.84)	
Terrain Roughness	-6.76** (2.68)	-6.16** (2.95)	-6.09** (2.98)	-7.29** (3.00)	-7.24** (3.00)	-6.55** (3.25)	-6.59** (3.28)	
Neolithic Transition Timing			-6.81** (3.05)	-7.21** (3.20)		-5.58* (2.84)	-5.84* (2.94)	
Neolithic Transition Timing (Ancestors)					-5.20** (2.53)	-5.41** (2.63)		
Continent FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Additional Geographical Controls	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Old World Sample	No	No	No	No	No	No	Yes	Yes
Adjusted- R^2	0.50	0.57	0.60	0.59	0.60	0.60	0.56	0.56
Observations	87	87	87	87	87	87	72	72

Potential Daily Crop Return, Crop Growth Cycle, and LTO

[Back](#)

	Long-Term Orientation							
	Whole World						Old World	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Daily Crop Return	5.71** (2.39)	9.40*** (2.57)	8.39*** (2.44)	7.00*** (2.59)			10.83*** (2.69)	9.28*** (2.82)
Crop Growth Cycle				4.04 (3.58)				4.57 (3.85)
Daily Crop Return (Ancestors)					9.00*** (2.41)	7.57*** (2.63)		
Crop Growth Cycle (Ancestors)						4.23 (3.79)		
Absolute latitude	3.07 (4.10)	2.07 (3.82)	3.32 (4.32)	2.58 (3.78)	4.08 (4.24)	3.40 (4.59)	5.22 (5.31)	
Mean elevation	6.44* (3.38)	7.19** (3.47)	6.39* (3.42)	6.78* (3.42)	6.07* (3.26)	5.98 (4.11)	5.32 (3.84)	
Terrain Roughness	-6.66** (2.67)	-6.09** (2.94)	-6.10** (2.95)	-7.05** (3.01)	-7.08** (3.01)	-6.15* (3.31)	-6.46* (3.26)	
Neolithic Transition Timing		-6.13* (3.11)	-6.83** (3.18)			-5.14* (2.93)	-5.78* (2.94)	
Neolithic Transition Timing (Ancestors)					-4.87* (2.62)	-5.41** (2.66)		
Continent FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Additional Geographical Controls	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Old World Sample	No	No	No	No	No	No	Yes	Yes
Adjusted- <i>R</i> ²	0.51	0.58	0.59	0.60	0.59	0.60	0.55	0.56
Observations	87	87	87	87	87	87	72	72

Excluding Trade Channel

[Back](#)

	Long-Term Orientation								
	Suitability		Money			Transportation			Routes
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crop Yield (Ancestors, pre-1500)	9.00*** (2.85)	9.84*** (2.45)	11.48*** (2.73)	12.03*** (3.33)	11.27*** (2.61)	11.61*** (2.67)	12.37*** (3.35)	11.17*** (2.66)	11.73*** (2.76)
Crop Yield Change (post-1500)	10.03*** (2.97)	10.84*** (2.72)	11.08*** (3.16)	11.48*** (3.42)	11.11*** (3.09)	10.98*** (3.16)	11.32*** (3.17)	11.13*** (3.14)	11.81*** (3.42)
Crop Growth Cycle (Ancestors, pre-1500)	-5.35 (4.23)	-7.71* (4.29)	-8.36* (4.28)	-8.96* (4.66)	-8.79** (4.38)	-8.33* (4.30)	-9.28** (4.61)	-8.56* (4.42)	-9.73** (4.51)
Crop Growth Cycle Change (post-1500)	-0.12 (1.70)	0.27 (1.52)	-0.07 (1.82)	-0.02 (1.79)	-0.10 (1.76)	0.02 (1.85)	0.10 (1.77)	-0.34 (1.75)	0.02 (1.83)
Land Suitability (Gini)	-2.11 (2.02)								
Land Suitability (Range)		2.46 (1.65)							
Exchange Medium 1000BCE			0.05 (2.43)						
Exchange Medium 1CE				1.15 (3.12)					
Exchange Medium 1000CE					4.60 (4.32)				
Transportation Medium 1000BCE						0.84 (3.18)			
Transportation Medium 1CE							2.40 (4.36)		
Transportation Medium 1000CE								1.50 (4.39)	
Pre-Industrial Distance to Trade Route									0.16 (5.98)
Continental FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Geography & Neolithic	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted- <i>R</i> ²	0.66	0.67	0.63	0.64	0.63	0.63	0.64	0.62	0.61
Observations	84	84	81	81	81	81	81	81	71

Potential Crop Yield and Development

Back

Crop Yield, Climatic Risk, and LTO

Back

Crop Yield and LTO

[Back](#)

Long-Term Orientation						
	(1)	(2)	(3)	(4)	(5)	(6)
Crop Yield	9.67*** (2.60) [3.03] {2.46}	10.14*** (3.02) [3.38] {2.65}			13.58*** (3.01) [3.01] {2.88}	16.57*** (3.37) [2.57] {2.95}
Crop Growth Cycle	-3.78 (2.47) [2.39] {2.34}	-2.92 (2.95) [2.67] {2.59}			-5.26** (2.61) [2.38] {2.50}	-4.07 (2.90) [2.45] {2.54}
Crop Yield (Ancestors)			11.35*** (2.56) [2.60] {2.43}	14.50*** (2.75) [2.46] {2.41}		
Crop Growth Cycle (Ancestors)			-5.05** (2.41) [2.15] {2.28}	-4.65* (2.59) [2.24] {2.27}		
Continent FE	Yes	Yes	Yes	Yes	Yes	Yes
All Geography & Neolithic	No	Yes	No	Yes	No	Yes
Old World Subsample	No	No	No	No	Yes	Yes
AET		-21.58		-3.00		-5.53
δ		-4.72		-0.35		-0.66
β^*		11.38		22.02		21.67
R^2	0.59	0.70	0.61	0.75	0.56	0.72
Adjusted- R^2	0.55	0.62	0.57	0.68	0.52	0.64
Observations	87	87	87	87	72	72

Changes in Crop Yield & Growth Cycle and LTO (Selection on Unobserv.)

Back

	Long-Term Orientation					
	Whole World				Old World	
	(1)	(2)	(3)	(4)	(5)	(6)
Crop Yield Change (post-1500)	11.28*** (2.92)	9.51*** (2.92)				
Crop Growth Cycle Change (post-1500)	-0.67 (1.84)	-1.51 (1.81)				
Crop Yield Change (Anc., post-1500)			10.20*** (2.50)	8.83*** (2.36)	11.25*** (2.72)	8.39*** (2.88)
Crop Growth Cycle Change (Anc., post-1500)			0.79 (1.75)	-0.73 (1.78)	0.16 (1.87)	-1.45 (1.93)
Crop Yield (Ancestors, pre-1500)	10.03*** (2.31)	10.74*** (2.76)	9.90*** (2.30)	11.31*** (2.70)	10.46*** (2.43)	12.18*** (3.05)
Crop Growth Cycle (Ancestors, pre-1500)	-11.29*** (3.22)	-6.47 (3.90)	-11.59*** (3.23)	-6.85* (3.65)	-12.27*** (3.38)	-5.69 (4.24)
	Change Crop Yield					
AET		5.38		6.43		2.93
δ		2.13		2.51		1.45
β^*		6.21		6.25		3.32
	Change Crop Growth Cycle					
AET		-1.81		-0.48		-0.90
δ		-0.94		-0.25		-0.49
β^*		-3.06		-3.58		-4.29
Continent FE	Yes	Yes	Yes	Yes	Yes	Yes
All Geography & Neolithic	No	Yes	No	Yes	No	Yes
Old World Subsample	No	No	No	No	Yes	Yes
R ²	0.65	0.77	0.67	0.78	0.62	0.76
Adjusted-R ²	0.61	0.70	0.62	0.71	0.58	0.67
Observations	87	87	87	87	72	72

European Social Survey

[Back](#)

Data:

- Third Wave European Social Survey
 - Academically driven cross-national survey that has been conducted every two years across Europe since 2001
 - Survey measures the attitudes, beliefs and behavior patterns of diverse populations in 25 nations
- “Do you generally plan for your future or do you just take each day as it comes?”

Correlations: Long-Term Orientation and Income

	Total Household Income							
	Second Generation Migrants				All Individuals			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Long-Term Orientation	0.33** (0.14)	0.22* (0.12)	0.22** (0.10)	0.23** (0.11)	0.35*** (0.08)	0.45*** (0.04)	0.36*** (0.04)	0.32*** (0.04)
Country FE	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Sex & Age	No	No	Yes	Yes	No	No	Yes	Yes
Pray & Health	No	No	No	Yes	No	No	No	Yes
Adjusted- R^2	0.01	0.40	0.40	0.41	0.01	0.50	0.52	0.53
R^2	0.01	0.43	0.43	0.47	0.01	0.50	0.52	0.53
Observations	383	383	383	383	29323	29323	29323	29323

Crop Yield, Crop Growth Cycle, and LTO in Second Generation Migrants

Graphs

Long-Term Orientation (Ordered Probit)								
	Country of Origin					Parents		
	Mother					(6)	(7)	(8)
	(1)	(2)	(3)	(4)	(5)			
Crop Yield	0.11*** (0.04)	0.11*** (0.04)	0.23*** (0.07)	0.27*** (0.07)		0.23*** (0.09)		0.31*** (0.11)
Crop Growth Cycle				-0.13* (0.07)		-0.09 (0.07)		-0.10 (0.09)
Crop Yield (Ancestors)					0.30*** (0.08)		0.27*** (0.09)	
Crop Growth Cycle (Ancestors)					-0.14* (0.07)		-0.10 (0.08)	
Country FE	Yes							
Sex & Age	Yes							
Other Ind. Chars.	No	Yes						
Geographical & Neolithic	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Old World Sample	No	Yes						
Pseudo- R^2	0.01	0.02	0.03	0.03	0.03	0.03	0.03	0.03
Observations	705	705	705	705	705	566	566	557

Pre-1500 Crop Yield and LTO in Second Generation Migrants

[Back](#)

	Country of Origin						Parents		
	Mother								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crop Yield (pre-1500)	2.96** (1.18)	3.40** (1.32)	6.45*** (2.17)	6.50*** (2.16)	6.65*** (2.15)		5.08** (2.48)	7.62** (2.92)	
Crop Yield Change (post-1500)			0.44 (1.20)	1.37 (1.40)			1.98 (1.63)	2.29 (1.65)	
Crop Growth Cycle (pre-1500)				-1.60 (2.58)			-2.65 (2.37)	-2.36 (2.53)	
Crop Growth Cycle Change (post-1500)					-1.27 (0.92)		-0.07 (1.19)	-0.24 (1.29)	
Crop Yield (Ancestors, pre-1500)						8.10*** (2.03)	6.54** (2.55)		
Crop Yield Change (Anc., post-1500)						1.00 (1.45)	1.87 (1.66)		
Crop Growth Cycle (Ancestors, pre-1500)						-2.42 (2.53)	-3.16 (2.67)		
Crop Growth Cycle Ch. (Anc., post-1500)						-1.03 (0.92)	0.13 (1.17)		
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sex & Age	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other Ind. Chars.	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Geographical Controls & Neolithic	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Old World Sample	No	No	No	No	No	No	No	No	Yes
R ²	0.06	0.11	0.12	0.12	0.12	0.12	0.15	0.15	0.15
Observations	705	705	705	705	705	705	566	566	557

	Country of Origin						Parents		
	Mother								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Crop Yield (pre-1500)	3.71*** (1.19)	3.81*** (1.30)	6.16*** (1.59)	6.09*** (1.63)	6.44*** (1.67)		4.97** (2.42)	4.85* (2.46)	
Crop Yield Change (post-1500)			0.42 (1.58)	-0.25 (1.52)		0.39 (1.45)	0.39 (1.45)	0.94 (1.47)	
Crop Growth Cycle (pre-1500)			0.14 (1.88)		-0.07 (2.28)		0.79 (2.30)		
Crop Growth Cycle Change (post-1500)			1.18 (1.62)		2.06 (1.63)		1.01 (1.37)		
Crop Yield (Ancestors, pre-1500)				6.49*** (1.70)		4.50** (2.23)			
Crop Yield Change (Ancestors, post-1500)				-0.86 (1.49)		0.41 (1.47)			
Crop Growth Cycle (Ancestors, pre-1500)				0.28 (1.86)		0.22 (2.30)			
Crop Growth Cycle Ch. (Anc., post-1500)				1.88 (1.59)		2.24 (1.62)			
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sex & Age	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other Ind. Chars.	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Geographical Controls & Neolithic	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Old World Sample	No	No	No	No	No	No	No	No	Yes
R ²	0.06	0.11	0.12	0.12	0.12	0.12	0.15	0.15	0.15
Observations	705	705	705	705	705	705	566	566	557

Crop Yield and Long-Term Orientation in Second Generation Migrants

Back

World Values Survey

[Back](#)

Data:

- All waves of WVS
 - cross-national survey conducted every 4-5 years
 - 96 countries
 - widely used in social research
- Long-Term Orientation measure based preference for thrift in children

Question

[Back](#)

“Here is a list of qualities that children can be encouraged to learn at home. Which, if any, do you consider to be especially important?”

Question

[Back](#)

“Here is a list of qualities that children can be encouraged to learn at home. Which, if any, do you consider to be especially important?”

Individual has LTO if mentioned “thrift, saving money and things”

Crop Yield and LTO (WVS) [Back](#)

Pre-1500 Crop Yield and LTO (WVS)

Back

Crop Yield and Long-Term Orientation (Weighted)

Back

Long-Term Orientation (OLS)								
	Whole World						Old World	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Crop Yield (pre-1500)	0.023*** (0.002)	0.024*** (0.002)	0.023*** (0.002)	0.025*** (0.002)	0.028*** (0.002)	0.005* (0.003)	0.055*** (0.002)	0.005 (0.004)
Crop Yield Change (post-1500)				0.043*** (0.002)	0.046*** (0.002)	0.006** (0.003)	0.042*** (0.002)	0.007** (0.003)
Crop Growth Cycle (pre-1500)					-0.011*** (0.003)	-0.009** (0.004)	-0.012*** (0.003)	-0.008 (0.005)
Crop Growth Cycle Change (post-1500)					0.002 (0.002)	-0.007*** (0.002)	0.002 (0.002)	-0.007*** (0.003)
Wave & Continent FE	Yes	Yes	Yes	Yes	Yes	No	Yes	No
Individual Chars	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	No	No	No	No	No	Yes	No	Yes
Adjusted- <i>R</i> ²	0.02	0.02	0.04	0.04	0.04	0.08	0.05	0.08
Observations	185659	185659	185659	185659	185659	185659	151299	151299