

The Impact of Language on Economic Behavior

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Phylogenetic Distance and a Linguistic Savings Hypothesis

Sean Roberts, James Winters, and Keith Chen

Language Affects Children's Intertemporal Choices, but not Choices Under Risk

Matthias Sutter, Silvia Angerera, Daniela Glätzle-Rützler
and Philipp Lergetporera

Language Structure and Attention

Psychology of Language Structure and Obligatory Attention

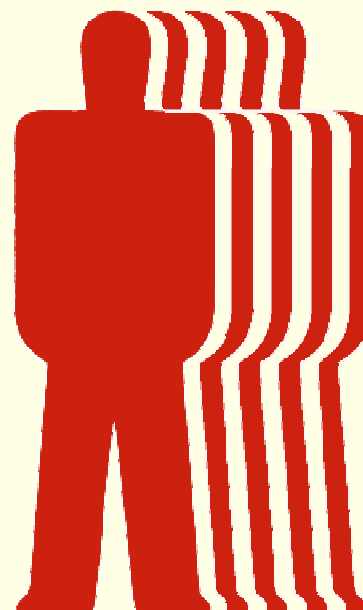
- *Time / Space Mapping*: Tversky et al. (1991), Boroditsky & Gaby (2010)
- *Color*: Brown & Lenneberg (1954), Winawer et al. (2007), Franklin et al. (2008)

Language Structure and Intertemporal Choice in the Cross Section

- *The grammatical distance between the present and future in a language is correlated with:*
 - (Negatively) *Saving, Retirement Wealth, Exercise, Long-Run Health*
 - (Positively) *BMI, Smoking, Risky Sexual Behaviors*
- *Causality appears to run from structure to behavior*
 - *Matched controls (150K families)*
 - *Phylogenetic permutation analyses (192 language features, 122 languages)*
 - *Experiments in Meran, South Tyrol, all children in grades 1-5.*
- *These effects interact with early language acquisition*



Uncle



伯父
叔父
舅舅
姑丈
姨丈



It ***rained***
yesterday



It ***is raining***
now



It ***will rain***
tomorrow



昨天下雨
Zuótiān ***xià yǔ.***



现在下雨
Xiànzài ***xià yǔ.***



明天下雨
Míngtiān ***xià yǔ.***

Weak and Strong FTR

Distinction: *“The obligatory use in (main clause) prediction-based contexts as a main criterion for grammaticalization”.*

English Weather Forecast (from a British newspaper):

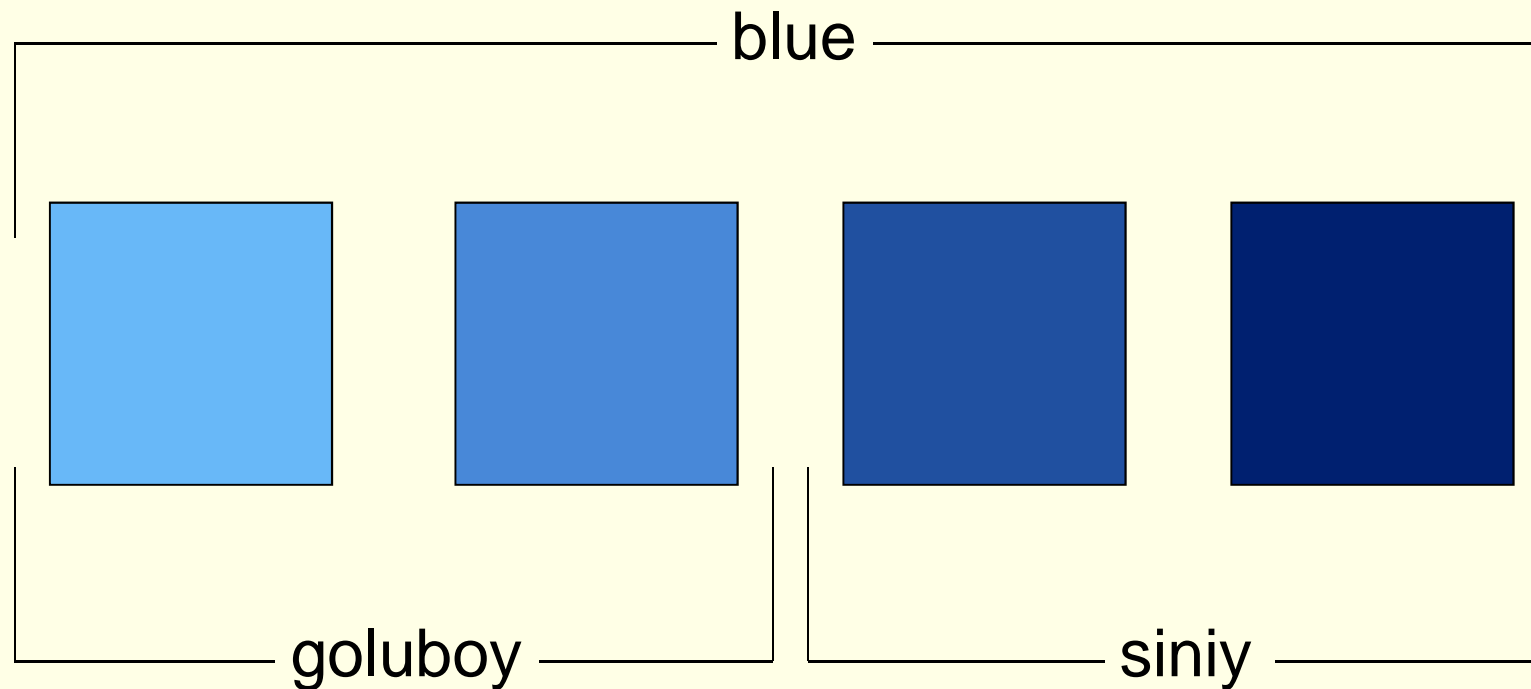
Outbreaks of rain *will clear* on Monday to leave a mix of sunshine and showers across the country. Longer periods of rain are likely midweek, especially in the west. It *will be* mostly cool and windy. Cool and unsettled conditions over much of Scandinavia *will extend* into central and western Europe during Tuesday and Wednesday. Mediterranean coasts *will remain* sunny and very warm.

Finnish Weather Forecast:

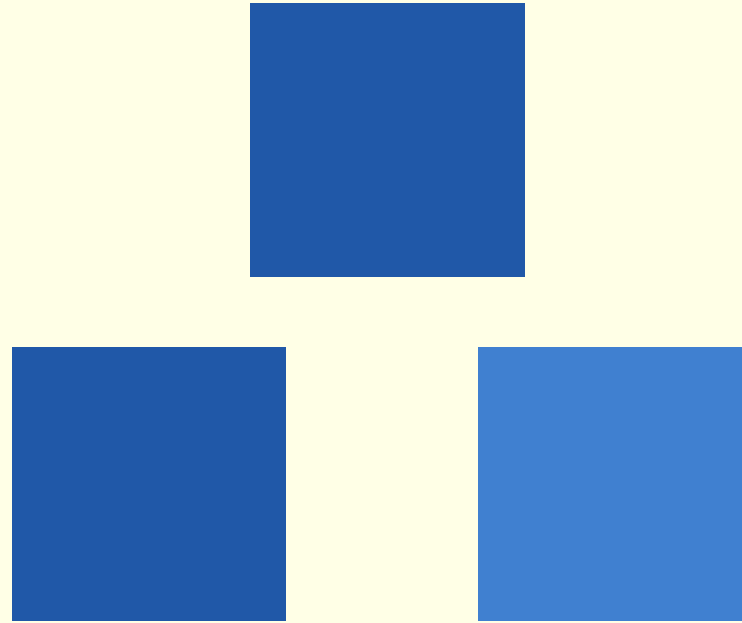
Sää kylmenee, mutta keskiviikkona tuulee idästä ja pyryttää lunta. Lämpötila kohoaa tilapäisesti nollaan tai jopa vähän suojan puolelle. Torstain tienoilla voi olla jopa kymmenisen pakkasastetta. Viikonlopulla taas lauhtuu, pilvistyy ja alkaa sataa lunta.

Literal translation: The weather becomes cooler, but on Wednesday it blows from the east and there is drifting snow. The temperature rises temporarily to zero or even a little higher. By Thursday it may already be around ten degrees below zero. During the weekend it again becomes milder, overcast and begins to snow.

Linguistic Distinctions and Color Perception

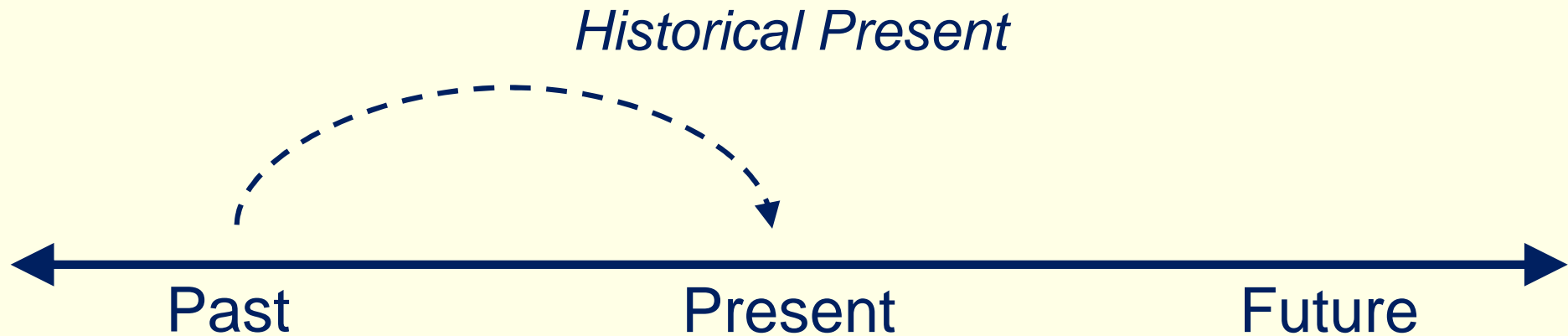


Linguistic Distinctions and Color Perception



Which is the match?

Tense Shifting Strategies in Language



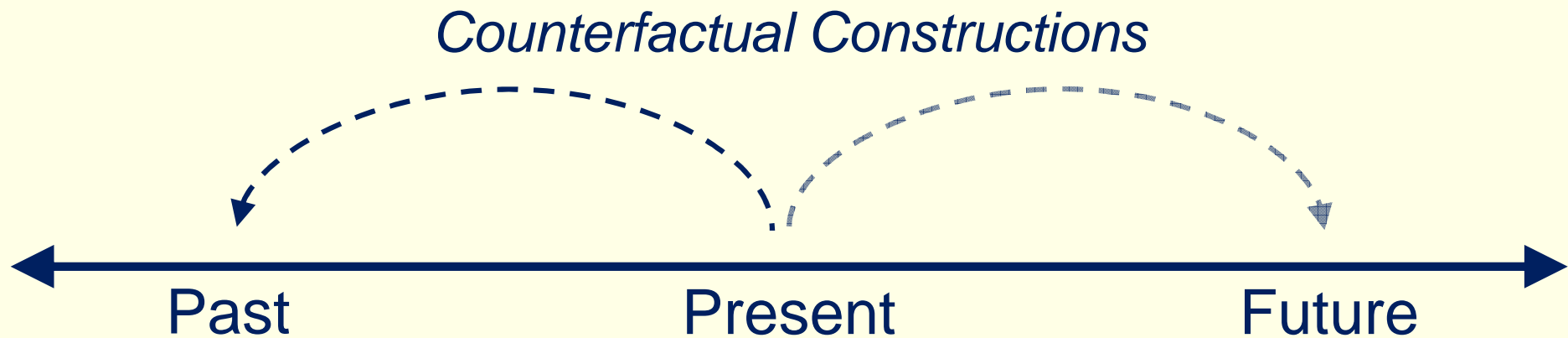
“If you introduce things which are past as present and now taking place, you will make your story no longer a narration, but an actuality.”

(Longinus, *On the Sublime*, first-century AD)

“There is a famous story of President Abraham Lincoln, taking a vote in a cabinet meeting on whether to sign the Emancipation Proclamation. All his cabinet secretaries **vote** nay, whereupon Lincoln **raises** his right hand and **declares**: ‘The ayes have it.’”

(Rodman, *Presidential Command*, 2009).

Tense Shifting Strategies in Language



“I wish I **owned** a car (right now).”

“If I **had** a car (I would give you a ride)”

“If I **was** rich...”

“If he **ran** the school...”

Data: Language and FTR

Dahl 2000 / Thieroff 2000: *Tense and Aspect in the Languages of Europe*

- Leads to a binary classification, between “weak-FTR” languages (Chinese, Finnish, German, Japanese) and “strong-FTR” languages (English, Greek, Italian, Russian).

European Language Typology Project: the EUROTYP Data

Context: The boy is expecting a sum of money.	
Text to be Translated: If the boy GET the money, he BUY a present for the girl.	Translation: If the boy GETS the money, he WILL BUY a present for the girl.

Extending this characterization to non-European languages:

- Dahl and Kós-Dienes (1984)
- WALS (World Atlas of Language Structures)
- Awobuluyi (1982), Bybee, Perkins & Pagliuca (1994), Carrell (1970), Newman (2000), Nurse (2008), Thompson (1965)

Western Europe

Eastern Europe

Africa + Middle East

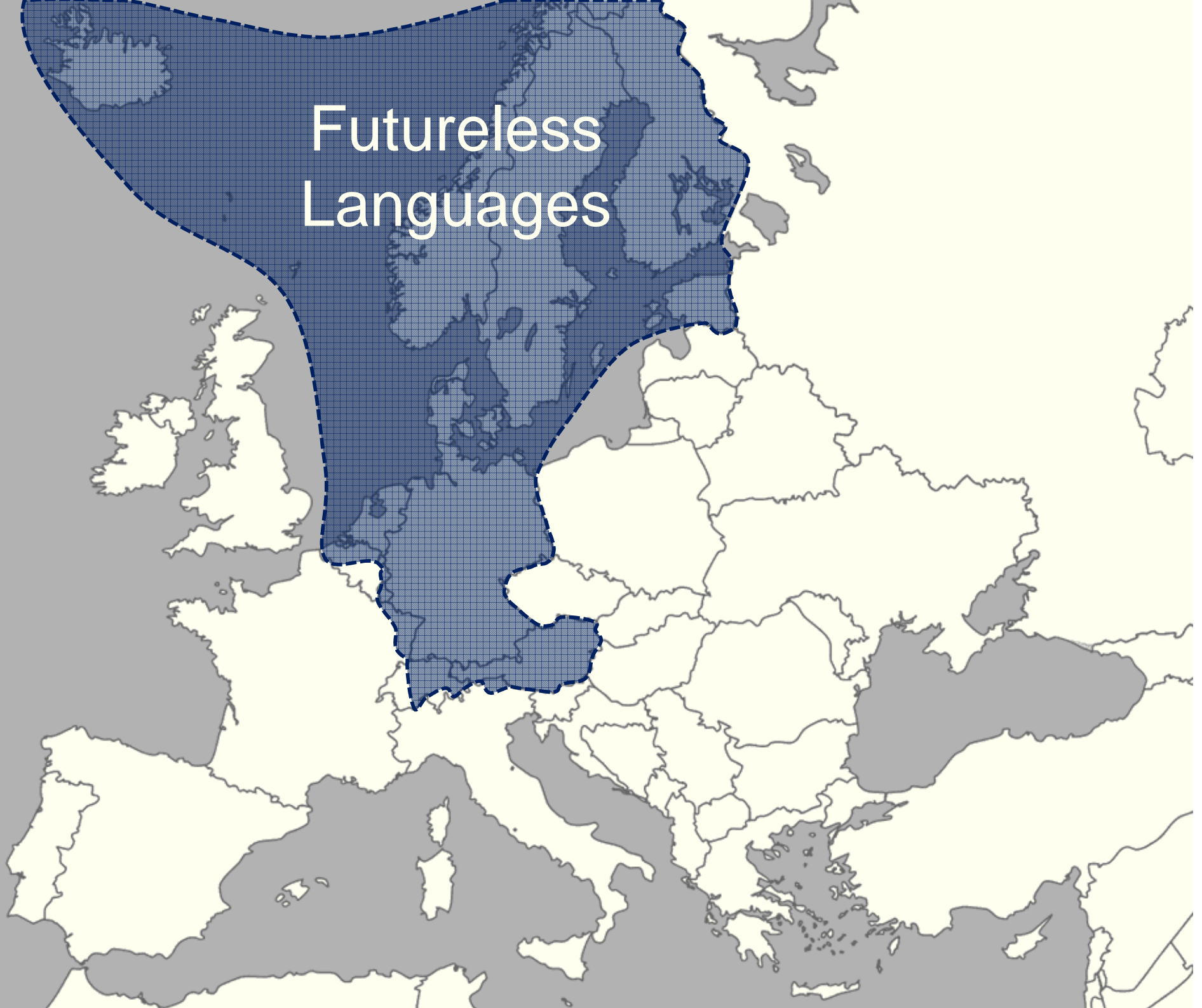
Australia + Asia

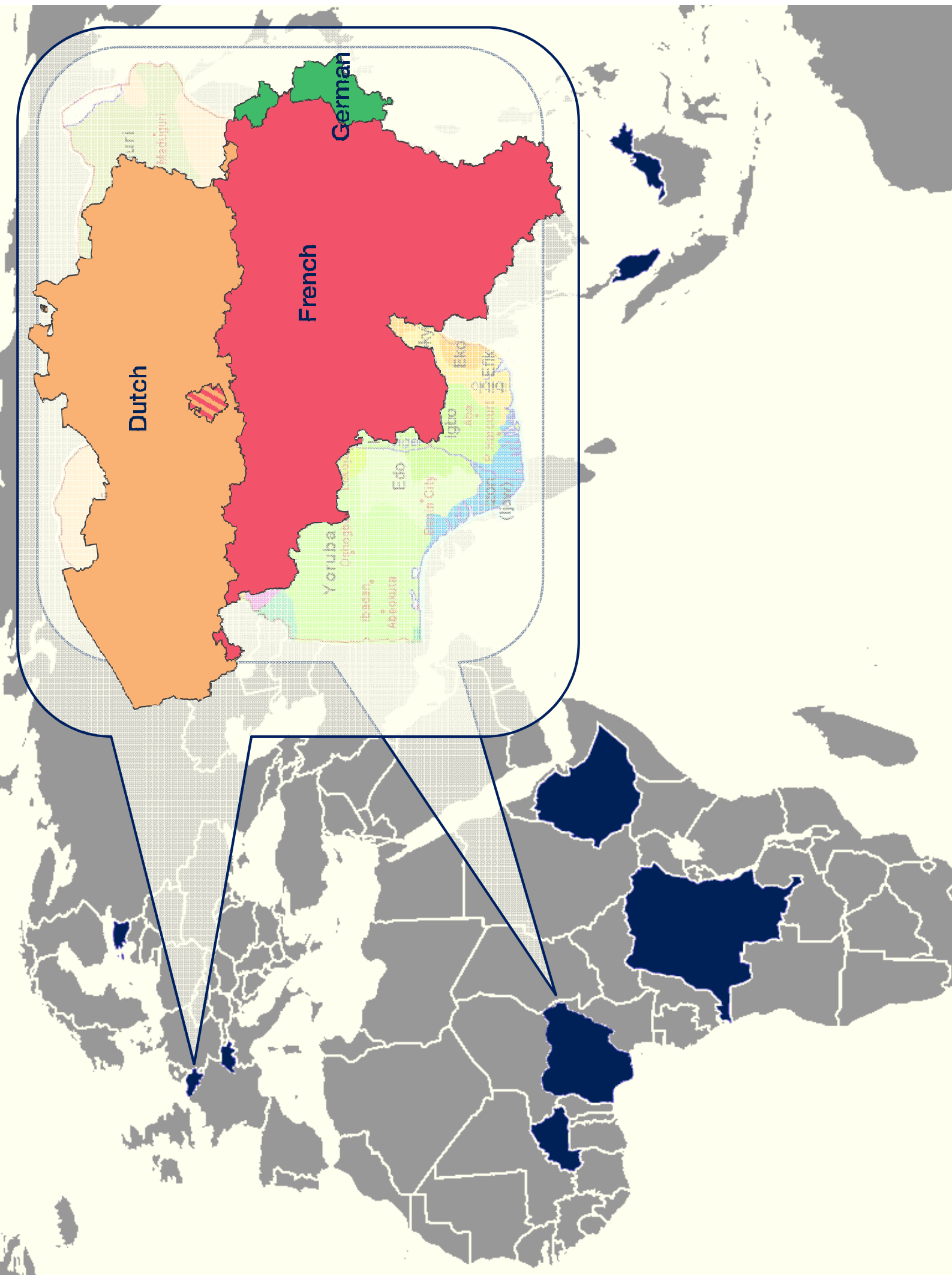
Basque, Greek, Irish	Azerbaijani, Macedonian, Montenegrin, Turkish, Ukrainian, Uzbek	Akan, Ewe, Ga, Hausa, Igbo, Kurdish	Alawa, Bandjalang, Kammu, Korean, Tagalog, Thai
Catalan, French, Galician, Italian, Romansh, Spanish, Portuguese	Romanian, Moldavian	Arabic, Hebrew, Tigrinya	Kannada, Tamil, Telugu
	Georgian		
	Latvian, Lithuanian	Dagbani, Tenyer (Karaboro)	Bengali, Gujarati, Hindi, Kashmiri, Panjabi, Urdu
	Serbo-Croatian, Belorussian, Bulgarian, Czech, Polish, Russian, Slovak, Slovene	Bemba, Chichewa, Lozi, Sotho, Sesotho, Swahili, Tsonga, Tswana, Xhosa, Zulu	
Afrikaans, English	Albanian, Armenian	Isekiri	
Danish, Dutch, Flemish, German, Icelandic, Norwegian, Swedish	Hungarian	Yoruba	Cebuano, Indonesian, Japanese, Javanese, Malay, Maori, Sudanese, Vietnamese
	Estonian, Morvin	Amharic	
Finnish		Kikuyu	
Maltese		Beja, Bambara, Oromo, Persian, Wolof	Cantonese, Hakka, Mandarin

Futured

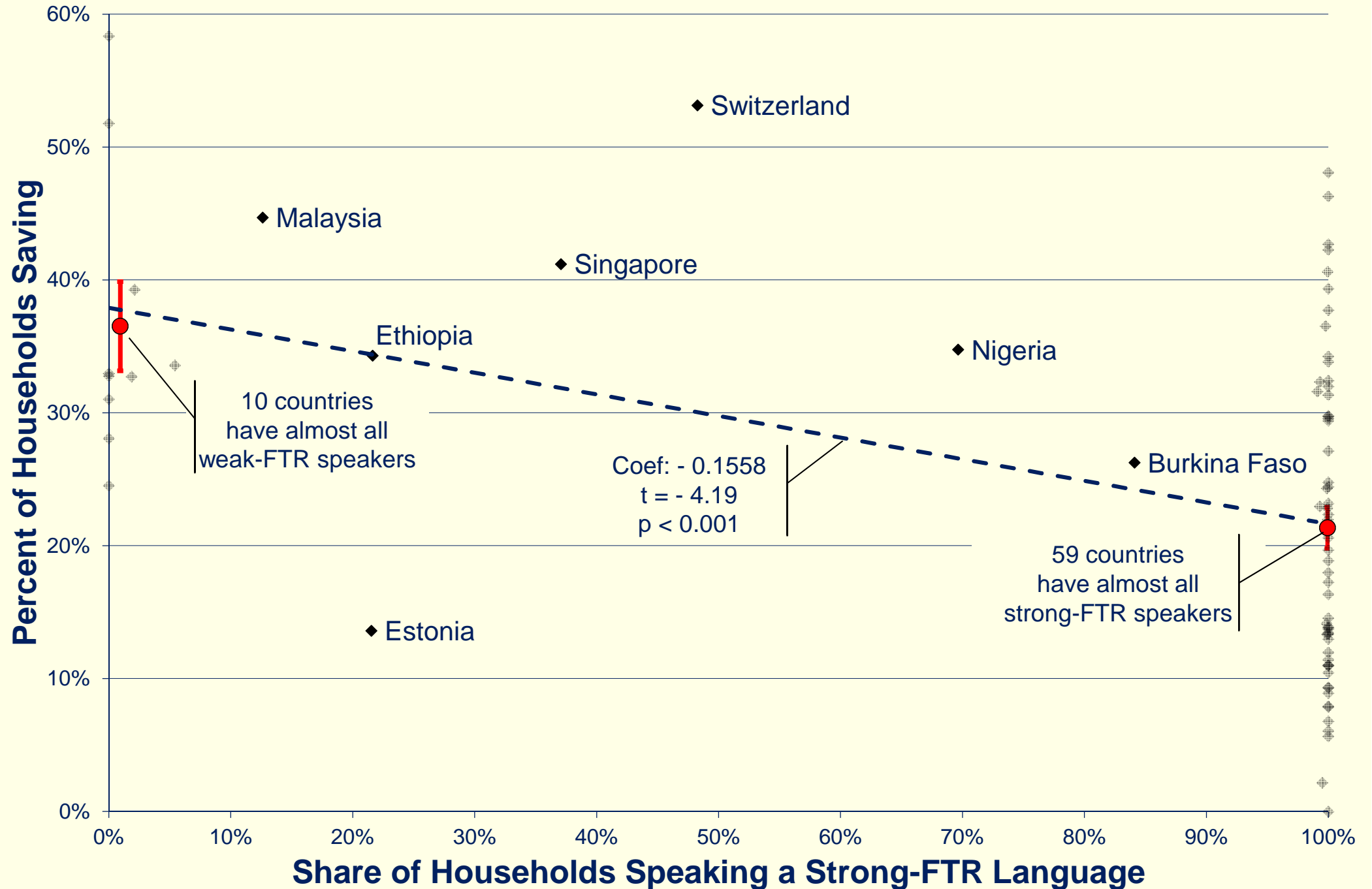
Futureless

Futureless Languages





Savings in the World Values Survey



First Regressions: World Values Survey

FAMSAVED: During the past year, did your family (*read out and code one answer*):

- Save money (23%)
- Just get by (51%)
- Spent some savings and borrowed money (14%)
- Spent savings and borrowed money (12%)

TRUST: Generally speaking, would you say that most people can be trusted or that you need to be very careful in dealing with people? (*Code one answer*):

- Most people can be trusted. (26%)
- Need to be very careful. (74%)

FAMILY: indicate how important it is in your life. Would you say it is:

- Very important (91%)
- Rather important (8%)
- Not very important (1%)
- Not at all important (0.2%)

CHILDSAVE: 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? (Code five at maximum):

Independence

Feeling of responsibility

Tolerance and respect for other people

Determination, perseverance

Unselfishness

Hard work

Imagination

Thrift, saving money and things (37%)

Religious faith

Obedience

WVS Cross-Country Regressions	(1) Saved	(2) Saved	(3) Saved	(4) Saved	(5) Saved	(6) Saved
Strong FTR	0.460 [0.069]**	0.441 [0.071]**	0.443 [0.072]**	0.449 [0.073]**	0.456 [0.074]**	0.471 [0.073]**
Legal Origin (FR)		0.473 [0.065]**	0.579 [0.110]**	0.595 [0.129]*	0.579 [0.128]*	0.590 [0.128]*
Legal Origin (GE)		0.406 [0.084]**	0.441 [0.096]**	0.451 [0.134]**	0.435 [0.147]*	0.449 [0.150]*
Legal Origin (SC)		0.616 [0.192]	0.665 [0.215]	0.670 [0.324]	0.643 [0.355]	0.683 [0.371]
Log Per-Capita GDP _t		1.164 [0.057]**	1.154 [0.057]**	1.171 [0.093]*	1.169 [0.098]	1.168 [0.100]
PCGDP _{t-1} / PCGDP _t			0.597 [0.672]	0.588 [0.676]	0.600 [0.675]	0.580 [0.655]
Unemployed			0.677 [0.031]**	0.694 [0.044]**	0.688 [0.044]**	0.689 [0.044]**
Real Interest Rate _t			0.996 [0.003]	0.997 [0.003]	0.996 [0.003]	0.997 [0.003]
WDI Legal Rights Index			1.045 [0.035]	1.044 [0.044]	1.042 [0.048]	1.038 [0.049]
Trust _t					1.229 [0.041]**	1.229 [0.041]**
Family is Important _t					0.886 [0.024]**	0.886 [0.024]**
Language Share						0.911 [0.149]
FTR Share						0.775 [0.339]
Fixed Effects:						
Age X Sex	Yes	Yes	Yes	Yes	Yes	Yes
Continent	No	No	No	Yes	Yes	Yes
Observations	152,056	149,350	140,498	140,498	134,535	134,535

WVS Cross-Country Analysis by Continent and PCGDP

					Strong FTR		
Regression restricted by Continent:					Coef.	SE	N
Africa					0.596	[0.095]**	28,262
Asia					0.519	[0.104]**	30,198
Europe					0.581	[0.135]*	45,502
Americas					0.713	[0.148]	26,854
Regression restricted by PCGDP:							
		PCGDP	≤	1,000	0.285	[0.093]**	38,271
1,000	<	PCGDP	≤	5,000	0.743	[0.172]	56,403
5,000	<	PCGDP	≤	25,000	0.680	[0.163]	29,732
		PCGDP	>	25,000	0.422	[0.018]**	10,123

Coefficients (reported as odds ratios) are from logistic regressions with the same specification as regression 6 in the last table (the regression with the most controls), but restricted by continent or level of per-capita GDP. Robust standard errors are reported in brackets; all regressions are clustered at the country level.

* significant at 5%; ** significant at 1%.

An Individual Saved (WVS, Within-Country)

	(1) Saved	(2) Saved	(3) Saved	(4) Saved	(5) Saved	(6) Saved
Strong FTR	0.460 [0.069]**	0.718 [0.113]*	0.722 [0.115]*	0.700 [0.103]*	0.691 [0.090]**	0.693 [0.092]**
Unemployed			0.677 [0.031]**	0.694 [0.044]**	0.688 [0.044]**	0.689 [0.044]**
Trust					1.083 [0.045]	1.084 [0.045]
Family is Important					0.952 [0.057]	0.953 [0.057]
Savings is imp. to teach child						1.111 [0.044]**
Fixed Effects:						
Age × Sex	Yes	Yes	Yes	Yes	Yes	Yes
Country × Wave	No	Yes	Yes	Yes	Yes	Yes
Income × Edu	No	Yes	Yes	Yes	Yes	Yes
Married × Num Chil	No	No	No	Yes	Yes	Yes
All FEs Interacted	Yes	Yes	Yes	Yes	Yes	Yes
Observations	152,056	64,017	64,017	24,933	23,615	23,615

Regressions are fixed-effect (or conditional) logistic regressions with coefficients reported as odds ratios. Immigrants are excluded from all regressions. Robust standard errors are reported in brackets; all regressions are clustered at the country level.

* significant at 5%; ** significant at 1%

Within-Country FTR Differences in the WVS

Country	Weak FTR	%	Strong FTR	%	Coef. and SE	N
					On Strong FTR	
Burkina Faso	Dyula	16	Fula, French, Moore	84	0.687, [0.386]	137
Estonia	Estonian	78	Russian	22	0.000, [0.000]	31
Ethiopia	Amharic, Oromo, Sidamo	78	Chaha, Gamo, Tigrinya	22	0.837, [0.366]	208
Malaysia	Malay, Mandarin	87	English, Tamil	13	0.745, [0.232]	449
Nigeria	Yoruba	30	English, Hausa, Igbo	70	0.758, [0.354]	121
Singapore	Malay, Mandarin	63	English, Tamil	37	0.813, [0.149]	664
Switzerland	German	52	French, Italian	48	0.360, [0.133]	171

Coefficients (reported as odds ratios) are from fixed-effect (or conditional) logistic regressions with the same specification as regression 6 in Table 3, but restricted to individual countries with significant within-country variation in FTR strength. Listed languages are the most common weak and strong-FTR languages in that country; percents are the share of that country's WVS sample that speak weak and strong FTR languages. Immigrants are excluded from all regressions. The coefficient in Estonia is 0 because no Estonian-speaker in the regression reported not saving this year.

Household Retirement Assets (SHARE)

	(1)	(2)	(3)	(4)	(5)
	IHS(RA _{it} / INC _{ct})	IHS(RA _{it} / INC _{ct})	IHS(RA _{it} / INC _{ct})	IHS(RA _{it} / INC _{ct})	IHS(RA _{it} / INC _{ct})
Strong FTR	-0.390 [0.017]**	-0.370 [0.024]**	-0.444 [0.028]**	-0.386 [0.047]**	-0.356 [0.075]**
Fixed Effects					
Age	Yes	Yes	Yes	Yes	Yes
Country × Wave	Yes	Yes	Yes	Yes	Yes
Income	No	Yes	Yes	Yes	Yes
Education	No	No	Yes	Yes	Yes
Married × Num Chil	No	No	No	Yes	Yes
All FEs Interacted	Yes	Yes	Yes	Yes	Yes
Countries	All	All	All	All	BE & CH
Observations	39,665	39,665	39,665	39,350	5,937
F stat of model:	529.55	234.93	255.48	68.90	22.77

Regressions are fixed-effect OLS regressions where the dependent variable is the inverse-hyperbolic sine of net household retirement assets divided by average national disposable income. Immigrant households are excluded from all regressions. Robust standard errors are reported in brackets; all regressions are clustered at the country level except regression 5, which is clustered at the household level.

* significant at 5%; ** significant at 1%.

$$IHS\left(\frac{ra_{it}}{inc_{ct}}\right) = \alpha + \beta_1 StrongFTR + \beta_2 (F_{it}^{ex} \times F_{it}^{en} \times F_t^c) + \varepsilon_{it}$$

$$IHS(x) = \log\left(x + (x^2 + 1)^{\frac{1}{2}}\right)$$

Household Retirement Assets (SHARE, BE & CH)

	(1)	(2)	(3)	(4)	(5)	(6)
	IHS(RA / INC)	IHS(RA / INC)	IHS(RA / INC)	IHS(RA / INC)	IHS(RA / INC)	IHS(RA / INC)
Strong FTR	-0.459 [0.052]**	-1.637 [0.515]**	-0.374 [0.132]**	-0.440 [0.194]*	-1.621 [0.457]**	-1.571 [2.749]
Fixed Effects						
Age	Yes	Yes	Yes	Yes	Yes	Yes
Wave	Yes	Yes	Yes	Yes	Yes	Yes
Income	Yes	Yes	Yes	Yes	No	Yes
Education	Yes	Yes	Yes	Yes	No	Yes
All FEs Interacted	Yes	Yes	Yes	Yes	Yes	Yes
Sub-Region FEs	1	11	1	7	1	1
Sample	BE	BE	CH	CH	Brussels	Brussels
Observations	4,410	4,409	1,553	1,553	148	148
F stat of model:	78.53	11.36	7.99	1.99	12.56	0.33

Regressions are fixed-effect OLS regressions where the dependent variable is the inverse-hyperbolic sine of net household retirement assets divided by average national disposable income. Immigrant households are excluded from all regressions. Robust standard errors are reported in brackets; all regressions are clustered at the household level.

* significant at 5%; ** significant at 1%.

$$IHS\left(\frac{ra_{it}}{inc_{ct}}\right) = \alpha + \beta_1 StrongFTR + \beta_2 (F_{it}^{ex} \times F_{it}^{en} \times F_t^c) + \varepsilon_{it}$$

$$IHS(x) = \log\left(x + (x^2 + 1)^{\frac{1}{2}}\right)$$

Health Behaviors and Long-Run Health (SHARE)

	(1) Smoking	(2) Phy. Activ.	(3) Obesity	(4) Walk Speed	(5) Grip Strength	(6) Peak Flow
Strong FTR	1.241 [0.042]**	0.709 [0.025]**	1.131 [0.007]**	-0.028 [0.101]	-0.899 [0.049]**	-16.083 [2.806]**
Full set of FEs	Yes	Yes	Yes	Yes	Yes	Yes
All FEs Interacted	Yes	Yes	Yes	Yes	Yes	Yes
Observations	15,750	9,135	11,958	6,038	51,571	26,836
R-squared:				0.85	0.84	0.73

Regressions 1, 2 and 3 are fixed-effect (or conditional) logistic regressions with coefficients reported as odds ratios. The dependant variables are having ever smoked daily for a year or more, engaging in regular physical activity, and being medically obese. Regressions 4, 5 and 6 are fixed-effect OLS regressions for measures of old-age health; walking speed, grip strength, and peak expiratory flow. Immigrants are excluded from the sample. Robust standard errors are reported in brackets; all regressions are clustered at the country level. * significant at 5%; ** significant at 1%

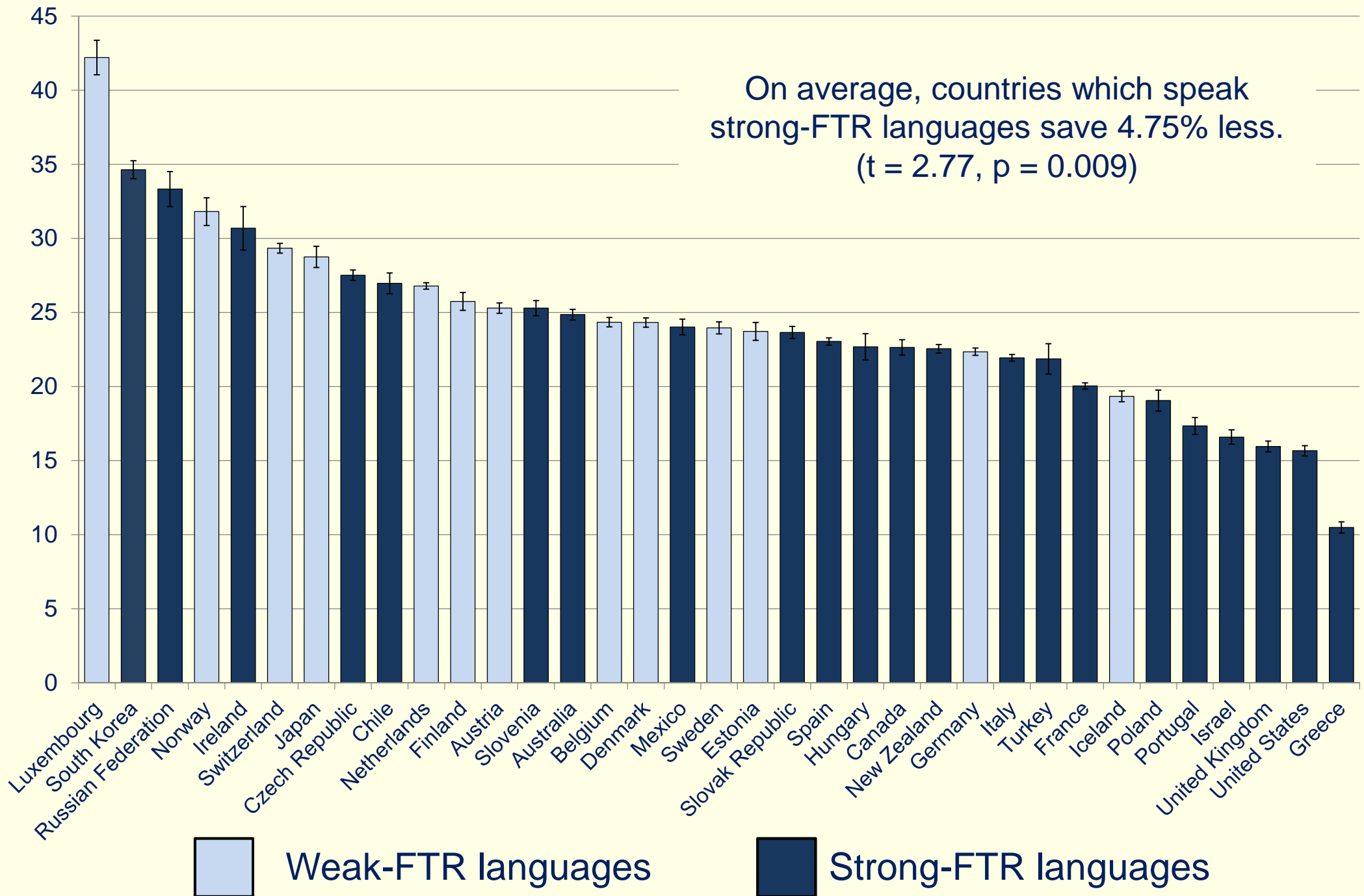
Health Behaviors in Developing Countries (DHS)

	(1) Smoking	(2) Obesity	(3) Cntcpt	(4) Cntcpt	(5) Condom	(6) Condom
Strong FTR	1.199 [0.104]*	1.169 [0.058]**	0.533 [0.025]**	0.575 [0.029]**	0.810 [0.052]**	0.838 [0.069]*
				0.726 [0.088]**		0.926 [0.122]
Full set of FEs	Yes	Yes	Yes	Yes	Yes	Yes
Religion FEs	Yes	Yes	Yes	Yes	Yes	Yes
All FEs Interacted	Yes	Yes	Yes	Yes	Yes	Yes
Observations	13,252	27,706	32,064	32,064	11,201	11,201

Regressions are fixed-effect (or conditional) logistic regressions with coefficients reported as odds ratios. The dependent variables are currently smokes, being medically obese, uses any form of contraception, and used a condom during last intercourse. Robust standard errors are reported in brackets.

* significant at 5%; ** significant at 1%.

Average Savings Rate (% GDP), OECD: 1985-2010



<i>GDSR in the OECD</i>	(1)	(2)	(3)	(4)	(5)	(6)
	GDSR _t	GDSR _t	GDSR _t	GDSR _t	GDSR _t	GDSR _t
Strong FTR	-5.272	-5.212	-5.245	-6.397	-5.821	-5.924
	[1.798]**	[1.769]**	[1.948]*	[1.774]**	[2.378]*	[2.457]*
PCGDP _{t-1} / PCGDP _t	-32.504	-35.035	-45.985	-41.852	-41.285	-32.396
	[7.908]**	[8.930]**	[14.742]**	[13.215]**	[12.065]**	[10.819]**
CAGR	-0.045	-0.009	0.141	0.154	0.169	0.159
	[0.128]	[0.169]	[0.284]	[0.265]	[0.255]	[0.228]
Unemp _t (%)	-0.411	-0.367	-0.226	-0.190	-0.170	-0.171
	[0.141]**	[0.133]**	[0.142]	[0.130]	[0.125]	[0.118]
Old _t (%)	-1.342	-1.382	-1.386	-1.240	-1.100	-1.165
	[0.284]**	[0.298]**	[0.318]**	[0.319]**	[0.283]**	[0.299]**
Young _t (%)	-0.711	-0.663	-0.618	-0.367	-0.205	-0.155
	[0.162]**	[0.184]**	[0.239]*	[0.212]	[0.302]	[0.351]
1 / PCGDP _t		-28.119	-66.266	-109.761	-130.260	-133.831
		[49.798]	[65.211]	[57.808]	[71.601]	[68.227]
Soc Sec _t			-1.942	-1.909	-1.622	-5.457
(%GDP / Old)			[2.252]	[2.040]	[2.153]	[3.395]
Protestant				-4.102	-4.229	-5.501
				[1.427]**	[1.850]*	[1.196]**
Legal Origin (FR)					-0.424	0.358
					[2.425]	[3.401]
Legal Origin (GE)					1.542	2.197
					[3.316]	[4.283]
Legal Origin (SC)					0.395	0.503
					[3.508]	[3.343]
Distance from Equator						1.371
						[3.106]
Continent FEs	No	No	No	No	No	Yes
Observations	904	904	614	614	614	614
R-squared	0.40	0.40	0.43	0.51	0.52	0.59

GDSR in the OECD by Decade

	(1)	(2)	(3)	(4)	(5)
	GDSR _t	GDSR _t	GDSR _t	GDSR _t	GDSR _t
Strong FTR	-5.212 [1.769]**	-4.194 [1.750]*	-5.458 [1.805]**	-5.142 [2.043]*	-6.975 [2.667]*
PCGDP _{t-1} / PCGDP _t	-35.035 [8.930]**	-46.258 [12.536]**	-64.147 [15.494]**	-49.460 [19.760]*	-18.060 [8.391]*
CAGR	-0.009 [0.169]	0.397 [0.571]	0.313 [0.329]	0.121 [0.371]	-0.056 [0.158]
Unemp _t (%)	-0.367 [0.133]**	-0.544 [0.307]	-0.360 [0.189]	-0.229 [0.192]	-0.321 [0.153]*
Old _t (%)	-1.382 [0.298]**	-1.298 [0.552]*	-1.178 [0.321]**	-1.803 [0.382]**	-2.019 [0.513]**
Young _t (%)	-0.663 [0.184]**	-0.624 [0.464]	-0.213 [0.320]	-0.810 [0.257]**	-1.237 [0.230]**
1 / PCGDP _t	-28.119 [49.798]	112.425 [78.480]	-23.892 [29.367]	-49.676 [53.792]	-66.561 [85.171]
Years	All	1970-1979	1980-1989	1990-1999	2000-2009
Observations	904	103	185	290	326
R-squared	0.40	0.69	0.64	0.45	0.39

Regressions are OLS regressions where the dependent variable is (Y-C)/Y in year t . Robust standard errors are reported in brackets; all regressions are clustered at the country level.

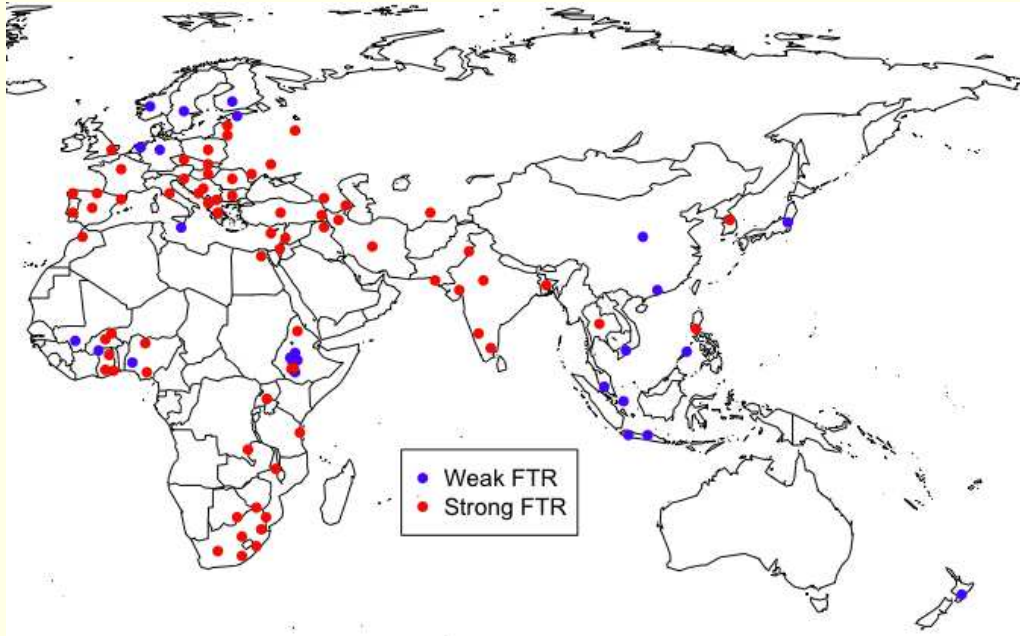
* significant at 5%; ** at 1%

<i>GDSR in the WVS</i>	(1)	(2)	(3)	(4)	(5)	(6)
	GDSR _t	GDSR _t	GDSR _t	GDSR _t	GDSR _t	GDSR _t
Strong FTR	-13.848	-15.545	-12.253	-11.328	-8.442	-11.002
	[3.303]**	[4.814]**	[3.337]**	[3.320]**	[2.980]**	[3.611]**
PCGDP _{t-1} / PCGDP _t	47.570	19.905	15.108	15.616	13.488	11.032
	[35.330]	[28.120]	[25.197]	[23.366]	[21.735]	[19.177]
Old _t (%)	-2.363	-1.718	-1.916	-2.112	-1.144	-1.064
	[0.685]**	[0.839]*	[0.730]*	[0.687]**	[0.774]	[1.312]
Young _t (%)	-1.274	-0.736	-0.813	-0.891	-0.617	-0.523
	[0.409]**	[0.498]	[0.501]	[0.512]	[0.475]	[0.693]
Legal Origin (FR)		-7.676	-3.302	-7.578	-4.191	-2.189
		[2.843]**	[2.828]	[4.887]	[4.831]	[6.080]
Legal Origin (GE)		-9.937	-6.735	-11.716	-6.883	-6.450
		[6.790]	[4.980]	[4.828]*	[5.204]	[8.180]
Legal Origin (SC)		-7.430	-3.196	-6.432	1.139	omitted
		[7.248]	[5.326]	[5.355]	[5.580]	
1 / PCGDP _t		-4.455	-4.819	-5.102	-5.477	-4.811
		[1.726]*	[1.781]**	[1.766]**	[1.954]**	[2.318]*
Unemp _t (%)			-0.724	-0.587	-0.455	-0.252
			[0.193]**	[0.225]*	[0.207]*	[0.250]
Real Interest Rate _t			-0.199	-0.219	-0.217	-0.213
			[0.108]	[0.092]*	[0.076]**	[0.081]*
Legal Rights Index				-0.899	-0.084	0.236
				[0.999]	[1.059]	[1.280]
Trust _t				2.947	-0.787	-5.474
				[9.244]	[8.738]	[11.585]
Family is Important _t				47.163	42.008	49.974
				[15.877]**	[13.648]**	[17.618]**
Continent FEs	No	No	No	No	No	Yes
Observations	904	904	614	614	614	614
R-squared	0.40	0.40	0.43	0.51	0.52	0.59

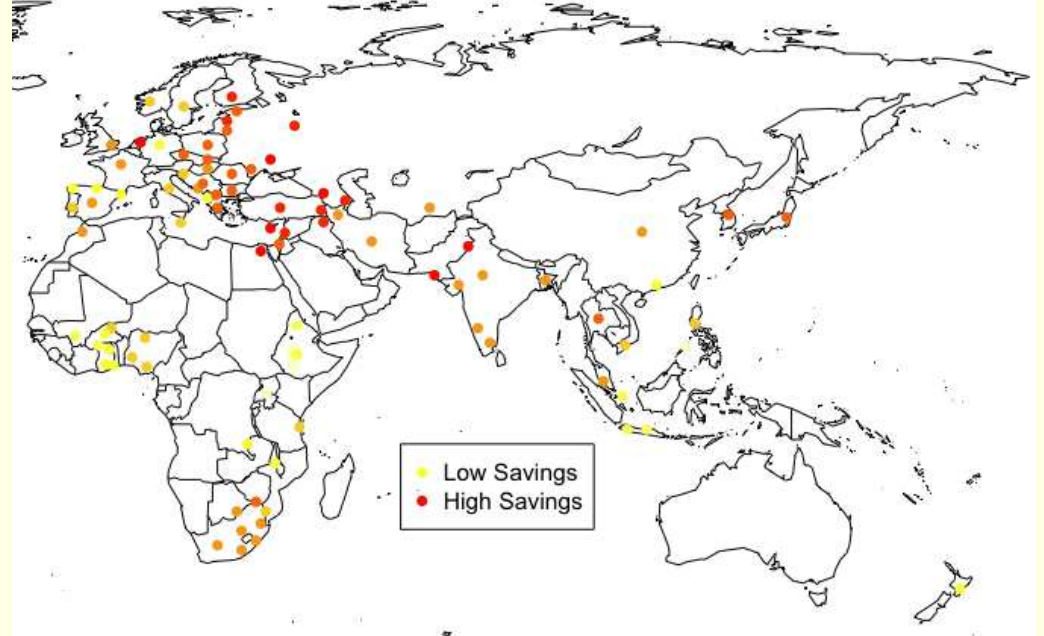
Online Language FTR Coding

Language	Verb Ratio	Sentence Ratio	Strong FTR	Language	Verb Ratio	Sentence Ratio	Strong FTR
Azerbaijani	100.0%	100.0%	1	Portuguese (EU)	85.0%	81.3%	1
Basque	98.4%	100.0%	1	Russian	72.2%	80.8%	1
Catalan	100.0%	100.0%	1	Croatian	78.6%	80.0%	1
Greek	97.4%	100.0%	1	Spanish	71.6%	74.1%	1
Hebrew	100.0%	100.0%	1	Turkish	55.8%	66.7%	1
Irish	100.0%	100.0%	1	Vietnamese	59.6%	66.7%	1
Korean	82.2%	100.0%	1	Latvian	58.3%	55.2%	1
French	95.8%	97.6%	1	Czech	46.4%	54.5%	1
Albanian	98.4%	97.5%	1	Arabic	41.7%	52.9%	1
Lithuanian	93.2%	97.2%	1	Polish	28.2%	34.4%	1
Belarusian	93.5%	96.4%	1	Hungarian	25.0%	32.3%	1
Bulgarian	93.8%	95.5%	1	Norwegian	15.3%	20.9%	0
Romanian	96.1%	95.1%	1	Danish	10.0%	12.5%	0
Slovenian	81.5%	94.4%	1	Swedish	4.9%	6.3%	0
English (UK)	88.1%	92.9%	1	Chinese	0.0%	0.0%	0
Italian	90.0%	92.9%	1	Dutch	0.0%	0.0%	0
English (US)	76.9%	87.5%	1	Estonian	0.0%	0.0%	0
Maltese	86.4%	82.4%	1	Finnish	0.0%	0.0%	0
				German	0.0%	0.0%	0
				Japanese	0.0%	0.0%	0
				Portuguese (BR)	0.0%	0.0%	0

Phylogenetic Techniques

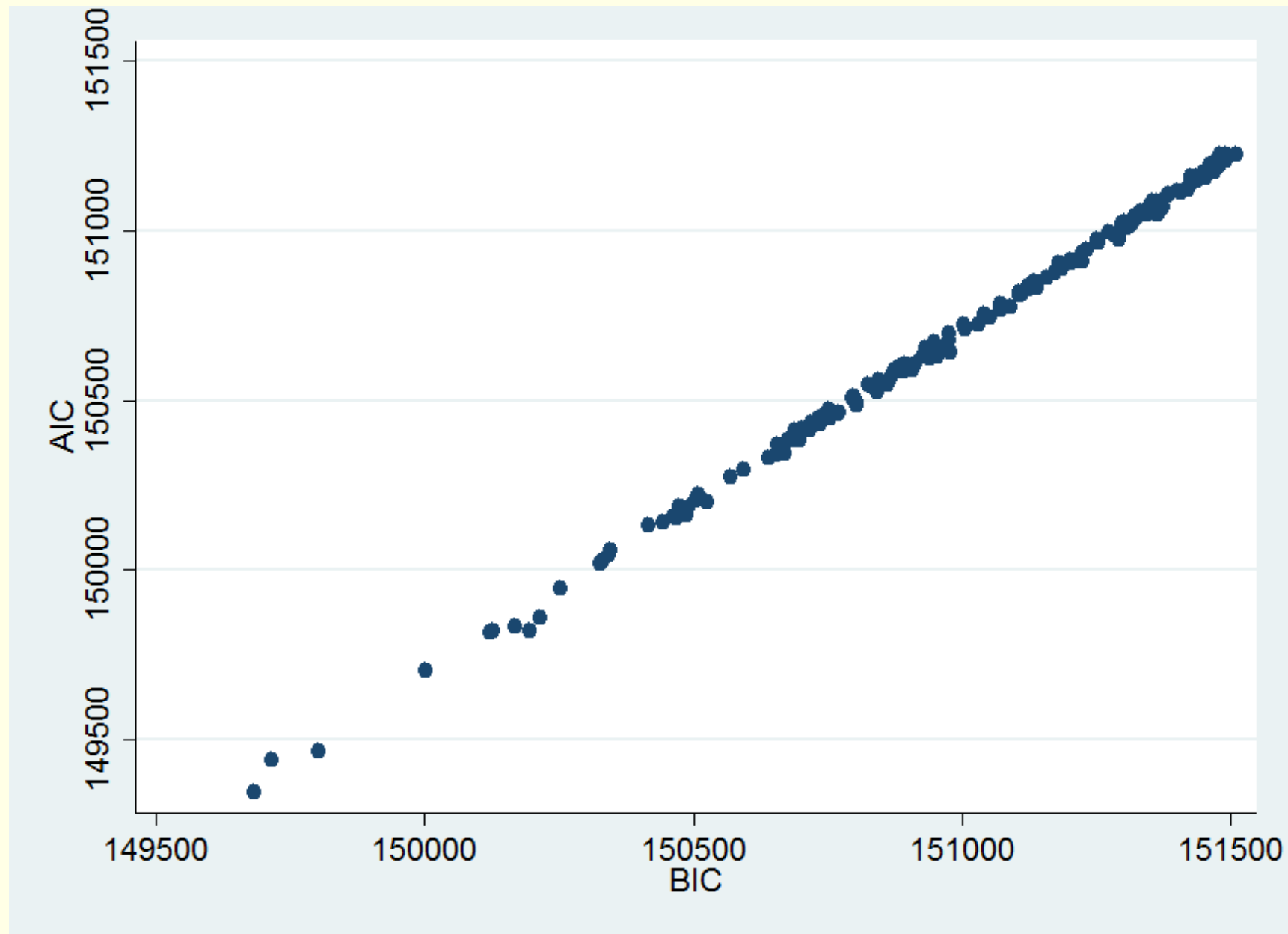


Geographic distribution of
the FTR variable



Geographic distribution of
savings residuals

Fit of 192 WALS Language Features



Frequency of Use of Tenses (%) by English (E) and German (G) Children and Adults (Mothers)

	Present Tense		Past Tense		Future Tense	
Age	E	G	E	G	E	G
2.5	90.6	93.9	8.9	5.1	.4	.8
3.0	78.6	76.2	15.0	16.4	6.3	7.4
3.5	59.4	65.5	29.9	23.2	10.8	11.2
4.0	50.7	51.5	34.5	30.8	14.6	17.5
4.5	34.7	39.3	39.2	36.9	25.8	23.6
Adult	41.7	43.2	43.9	47.1	14.4	9.5

On the Frequency of Use of Tenses
English and German Children's Spontaneous Speech; Table 1, Szagun, 1978

Future Research

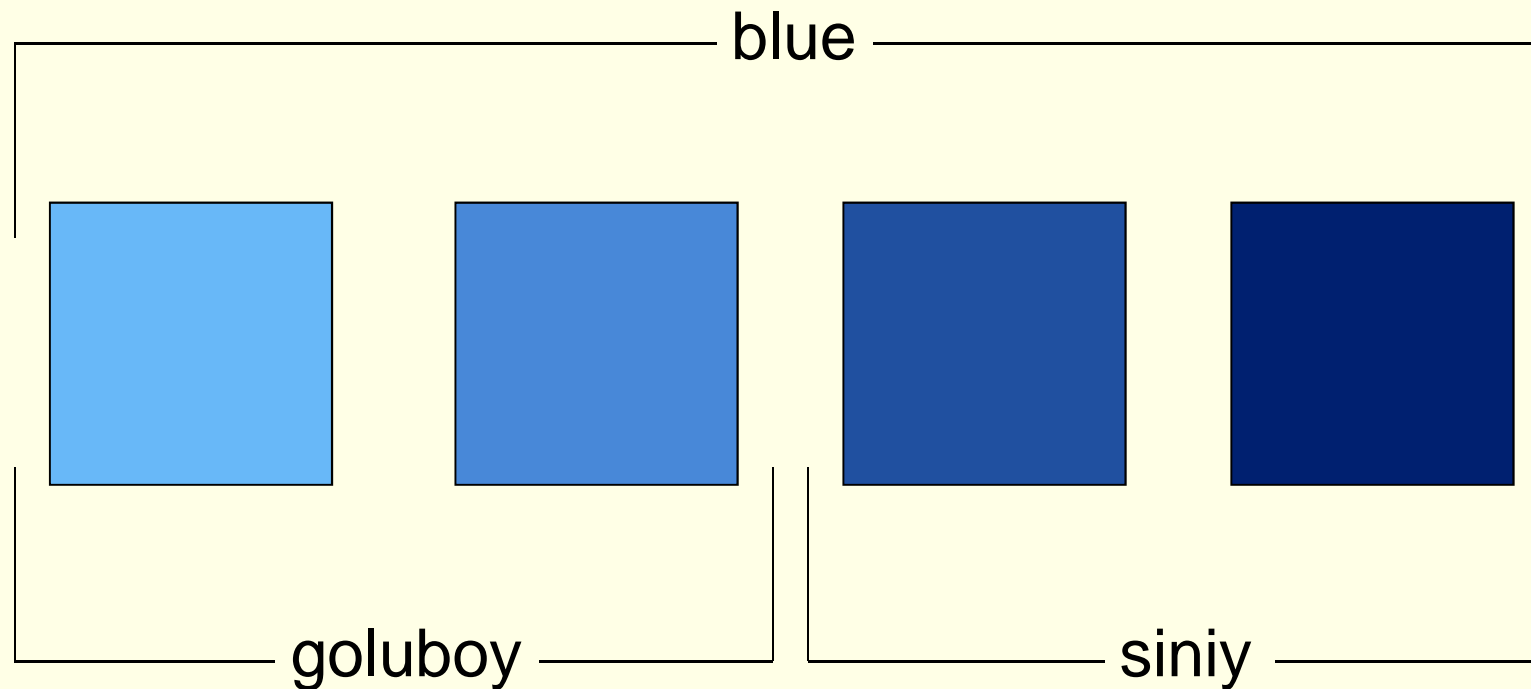
Other aspects of linguistic structure:

- Evidentiality
- Gender
- Counterfactuality

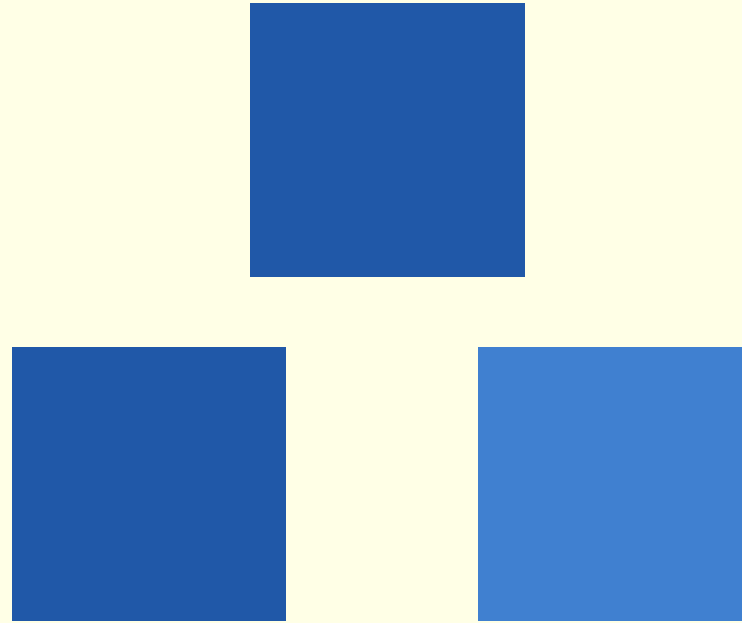
Individual differences in usage and differences in behavior

- language use in negotiations and future-orientation
- search behavior and online purchasing

Linguistic Distinctions and Color Perception



Linguistic Distinctions and Color Perception



Which is the match?

Weak and Strong FTR

Distinction: *“The obligatory use in (main clause) prediction-based contexts as a main criterion for grammaticalization”.*

English Weather Forecast (from a British newspaper):

Outbreaks of rain *will clear* on Monday to leave a mix of sunshine and showers across the country. Longer periods of rain *are likely* midweek, especially in the west. It *will be* mostly cool and windy. Cool and unsettled conditions over much of Scandinavia *will extend* into central and western Europe during Tuesday and Wednesday. Mediterranean coasts *will remain* sunny and very warm.

Finnish Weather Forecast:

Sää kylmenee, mutta keskiviikkona tuulee idästä ja pyryttää lunta. Lämpötila kohoaa tilapäisesti nollaan tai jopa vähän suojan puolelle. Torstain tienoilla *voi* olla jopa kymmenisen pakkasastetta. Viikonlopulla taas lauhtuu, pilvistyy ja alkaa sataa lunta.

Literal translation: The weather becomes cooler, but on Wednesday it blows from the east and there is drifting snow. The temperature rises temporarily to zero or even a little higher. By Thursday it *may* already be around ten degrees below zero. During the weekend it again becomes milder, overcast and begins to snow.

Evolution of FTR in Languages

Bybee and Pagliuca 1987,
Bybee, Pagliuca and Perkins 1991
Bybee and Dahl, 1989

Futures disappear (example, ancient Greek inflectional future)

“Evolve from a fairly restricted range of lexical sources:”

- Movement verbs (ex: going),
- Markers of obligation (ex: shall, earlier meant ‘owe’),
- Desire and ability (ex: will, earlier meant ‘desire’)

Follow relatively regular paths:

- Desire > Willingness > Intention > Prediction
- Possession (ex: have) > Obligation > Intention > Future



It *rained*
yesterday



It *is raining*
now



It *will rain*
tomorrow



昨天下雨
Zuótiān *xià yǔ*.



现在下雨
Xiànzài *xià yǔ*.



明天下雨
Míngtiān *xià yǔ*.



It ***rained***
yesterday



It ***is raining***
now



It ***will rain***
tomorrow



Gestern
regnete es



Jetzt
regnet es



Morgen
regnet es



It *rained*
yesterday



It *is raining*
now



It *will rain*
tomorrow



昨天下雨
Yesterday
Zuótiān xià yǔ.



现在下雨
Jetzt
Xiànzài xià yǔ.



明天下雨
Morgen
Míngtiān xià yǔ.

Literature: Determinants of Time Preference

Economic Models of Discounting:

DU Model: Fisher (1930), Samuelson (1937)

Endogenous time-preference:

Becker (1976), Becker, Barrow (1988), Becker, Mulligan (1997)

- Discounting can depend on fertility, mortality, education

Rogers (1994)

- Evolutionarily stable discount rate $\ln(2)$ per generation

Lowenstein (1988), Read, Frederick et.al. (2005)

- Framing Effects on discounting

Language Effects on Cognition:

Whorf (1940), Fuhrman, Boroditsky (2009)

