The Effect of Language on Economic Behavior: Evidence from Savings Rates, Health Behaviors, and Retirement Assets

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Abstract

Languages differ widely in the ways they encode time. I test the hypothesis that languages that grammatically associate the future and the present, foster future-oriented behavior. This prediction arises naturally when well-documented effects of language structure are merged with models of intertemporal choice. Empirically, I find that speakers of such languages: save more, retire with more wealth, smoke less, practice safer sex, and are less obese. This holds both across countries and within countries when comparing demographically similar native households. The evidence does not support the most obvious forms of common causation. I discuss implications for theories of intertemporal choice.

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1 Introduction

Languages differ in whether or not they require speakers to grammatically mark future events. For example, a German speaker predicting rain can naturally do so in the present tense, saying: *Morgen regnet es* which translates to 'It *rains* tomorrow'. In contrast, English would require the use of a future marker like 'will' or 'is going to', as in: 'It *will rain* tomorrow'.[1] In this way, English requires speakers to encode a distinction between present and future events, while German does not.[2] Could this characteristic of language influence speakers' intertemporal choices?

In this paper I test a linguistic-savings hypothesis: that being required to speak in a distinct way about future events leads speakers to take fewer future-oriented actions. This hypothesis arises naturally if grammatically separating the future and the present leads speakers to disassociate the future from the present. This would make the future feel more distant, and since saving involves current costs for future rewards, would make saving harder. On the other hand, some languages grammatically equate the present and future. Those speakers would be more willing to save for a future which appears closer. Put another way, I ask whether a habit of speech which disassociates the future from the present, can cause people to devalue future rewards.

The bulk of this paper investigates whether this prediction is borne out in savings behavior. To do so, I first review the literature on what linguists call future-time reference (FTR), which studies both when and how languages require speakers to mark the timing of events. From this literature I adopt a future-time criterion from typological linguistics, which separates languages into two broad categories: *weak* and *strong FTR*. This criterion separates those languages that require future events to be grammatically marked when making predictions (strong-FTR languages, like English), from those that do not (weak-FTR languages, like German).[3] By analyzing text samples extracted from the web, I confirm that this linguistic distinction captures a central tendency of how languages mark future events, and that this distinction can be both generated and verified in automatically collected data.

I then examine how these linguistic differences correlate with future-oriented behaviors such as saving, exercising, abstaining from smoking, condom use, retirement savings, and long-run health. I also attempt to determine if differences in language *cause* these differences in behavior, or if non-linguistic traits that are coincident with language explain these correlations. For example, most (but not all)[4] Germanic languages are weak-FTR: could there also be a "Germanic" savings value that is widely held by Germanic-language speakers but not caused by language? While not conclusive, the evidence does not support the most obvious forms of common causation.

[1] These are what linguists call *periphrastic* constructions, in which future events are marked by the addition of auxiliary words.

[2] In English future reference is possible without future markers in certain contexts: specifically with scheduled events or events resulting from law-like properties of the world. See Copley (2009) for details. In my analysis, I set aside these cases because as shown in Dahl (1985) and Dahl (2000), "in many if not most languages, this kind of sentence is treated in a way that does not mark it grammatically as having non-present time reference... even for languages where future-time reference is otherwise highly grammaticalized." In other words, how scheduled events are treated does not reflect a language's overall treatment of future reference.

[3] Specifically, I adopt a criteria which distinguishes between languages which Dahl (2000) calls "futureless", and those which are not. Dahl defines "futureless" languages as those which do not require "the obligatory use [of grammaticalized future-time reference] in (main clause) prediction-based contexts". In this framework, a *prediction* is a statement about the future that has no *intentional* component. Predicting the weather would be a canonical example. See Dahl (2000) and Thieroff (2000) for a discussion of the basis and areal properties of this distinction. In the text of this paper, I adopt Thieroff's more neutral language of "weak-FTR" for "futureless" languages, and denote non-weak-FTR languages as "strong-FTR". See section 4.1 for details on the EUROTYP criteria developed by Dahl (2000), Appendix B for a discussion of how I apply this criteria to languages not covered by EUROTYP, and the online Appendix for a complete list of coded languages.

[4] Interestingly, English is a notable outlier among Germanic languages. I discuss this at length in section 2.

Cross-country regressions show a strong correlation between weak-FTR languages and future-oriented behavior, which do not attenuate with the inclusion of numerous geographic, cultural, and institutional controls. Switching to within-country regressions, I compare individuals with identical income, education, family structure, and countries of birth, but who speak different languages. These regressions rely for identification on a set of nine multi-lingual countries with both weak and strong-FTR populations.[5] In these regressions, speakers of weak-FTR languages (with little to no grammatical distinction between the present and future) appear more future-oriented in numerous monetary and non-monetary behaviors. Weak-FTR speakers are 31% more likely to have saved in any given year, have accumulated 39% more wealth by retirement, are 24% less likely to smoke, are 29% more likely to be physically active, and are 13% less likely to be medically obese.

Similar to my cross-country regressions, the effect of language is not attenuated by controls for cultural traits and values in these within-country regressions. Most notably, several waves of the World Values Survey (WVS) asked respondents the degree to which "savings and thrift is an important value". I find that both future-time reference and the degree to which a person reports valuing savings, predict savings behavior. However, these effects are completely independent. This suggests that the language effects I identify operate through a channel which is independent of cultural attitudes towards savings.

Finally, I examine the effect that this differential propensity to save has on national savings rates, both among the developed-country members of the Organization for Economic Cooperation and Development (OECD), and among the larger set of WVS countries. Several interesting patterns emerge. First, a country's language has a significant effect on that country's aggregate savings rate. Countries which speak weak-FTR languages save on average 6% more of their GDP per year. This result is unaffected by the addition of life-cycle-savings controls, holds in every major region of the world, and appears stable across time. Parallel regressions using world-bank savings data show this same result among developing nations, even with numerous controls for culture, values, institutions, and legal origins.

The paper proceeds as follows. Section 2 reviews the linguistics literature on future-time reference and details the ways it differs across languages. Section 3 lays out my hypothesis and potential mechanisms, and discusses linguistics and psychological studies that bear on these mechanisms. Section 4 details my empirical methods and the data I use for estimation. Section 5 presents conditional correlations between a language's FTR and its speakers future-oriented behaviors. More detailed regressions investigate the degree to which these correlations can be taken as evidence of causation. A final set of regressions investigates the relationship between language and national savings rates. Section 6 discusses several related literatures on the effect of language on thought, as well as the implications of my findings for work in economics. Section 7 discusses issues surrounding the interpretation of my results before concluding.

[5] These countries are Belgium, Burkina Faso, Ethiopia, Estonia, The Democratic Republic of the Congo, Nigeria, Malaysia, Singapore and Switzerland.

2 Language and Future-Time Reference

Languages differ widely in both *how* and *when* they require speakers to signal that they are talking about the future. For example, English primarily marks the future with either 'will' or forms of 'be going to'.[6] In contrast, some languages mark future events using a much larger and diverse set of constructions. For example, Bittner (2005) documents that Kalaallisut (West Greenlandic), has at least 28 distinct constructions which mark future time:

> "...nineteen verb-extending suffixes (sixteen transitivity preserving..., three transitive-deriving...), four verbal roots (one complex predicate forming...), one noun-extending suffix..., one de-nominal verb-forming suffix... and three mood inflections".

More subtly, languages also differ in *when* they require speakers to specify the timing of events, or when timing can be left unsaid. The linguist Roman Jakobson explained this difference as: "Languages differ essentially in what they *must* convey and not in what they *may* convey" (Jakobson, 1956).

For example, if I wanted to explain to an English-speaking colleague why I can't attend a meeting later today, I could not say 'I *go* to a seminar'. English grammar would oblige me to say 'I (*will go, am going, have to go*) to a seminar'. If on the other hand I were speaking Mandarin, it would be quite natural for me to omit any marker of future time and say *Wǒ qù tīng jiǎngzuò* (I *go* listen seminar):

Wǒ	*qù*	*tīng*	*jiǎngzuò*
I	go.PRS	listen	seminar

'I am going to listen to a seminar' (1)

with no reference to future time, since the context leaves little room for misunderstanding.[7]

In this way, English forces its speakers to habitually divide time between the present and future in a way that Mandarin (which has no tenses) does not. Of course, this does not mean that Mandarin speakers are unable (or even less able) to understand the difference between the present and future, only that they are not required to attend to it every time they speak. This difference, in the *obligatory marking of future events* is a central characteristic of the weak vs strong FTR classification (Thieroff 2000), and is the difference between languages I exploit in my study of savings behaviors.

These differences between languages are surprisingly widespread, and occur not only between neighboring countries in the same region, but sometimes occur *within* multi-lingual countries. For example, European languages range from a tendency to rarely distinguish present and future time (like Finnish) to languages like French, which have separate and obligatory "future" forms of verbs.[8]

[6] The English 'will' is what linguists call a de-volitive future construction which descended from the Proto-Germanic *willan*, or 'want'. While 'will' was already used for future-time reference in Old English, the modern German equivalent *wollen*, is not used for future-time reference in German. The English 'be going to' is a de-andative construction that developed in the 17th century, and is found in English, Dutch, French, Spanish, and Portuguese, but not in German. In English neither construction is purely a tense marker, but instead mark different temporal and modal properties which give rise to future-time reference in certain contexts ('going to' is prospective aspect, while 'will' can be a modal auxiliary).

[7] In this and all subsequent examples I follow the Leipzig glossing rules, where FUT and PRS indicate future and present morphemes. See Croft (2003) for details.

[8] Languages where verbs have distinct future forms are said to have an "inflectional" future. In Europe, this includes the romance languages (except Romanian), and most Slavic and Semitic languages. See Dahl (1985) for source data on inflectional futures in Europe, and Dahl & Velupillai (2011) for a broad survey of inflectional futures around the world.

A Finnish speaker for example, would say both *Tänään on kylmää* (today *is* cold) and *Huomenna on kylmää* (tomorrow *is* cold) using the unmarked verb *on*:

	Tänään	*on*	*kylmää*	
a.	Today	be.PRS	cold	
	'It is cold today'			
				(2)
	Huomenna	*on*	*kylmää*	
b.	Tomorrow	be.PRS	cold	
	'It will be cold tomorrow'			

while French speakers would switch from *Il fait froid aujourd'hui* (it *is* cold today), to *Il fera froid demain* (it *will-be* cold tomorrow):

	Il	*fait*	*froid*	*aujourd'hui*	
a.	It	do/make.PRS	cold	today	
	'It is cold today'				
					(3)
	Il	*fera*	*froid*	*demain*	
b.	It	do/make.FUT	cold	tomorrow	
	'It will be cold tomorrow'				

English is a notable outlier in Europe; in all other Germanic languages grammatical future-time reference is optional when making predictions that have no intentional component.[9] That is, while a German speaker predicting rain or forecasting a freeze could say *Morgen regnet es,* or *Morgen ist es kalt* (both in the present tense):

	Morgen	*regnet*	*es*		
a.	Tomorrow	rain.PRS	it		
	'It will rain tomorrow'				
					(4)
	Morgen	*ist*	*es*	*kalt*	
b.	Tomorrow	is.PRS	it	cold	
	'It will be cold tomorrow'				

an English speaker would have to grammatically mark future time (it *will rain* tomorrow, and it *will be* cold tomorrow).[10] Later, I will exploit the fact that weak and strong-FTR languages often coexist within the native languages of the same country, helping me isolate linguistic effects from confounds that vary on the country level (such as taxes, institutions, or capital markets).

[9] This observation that German and English differ dramatically in obligatory GFTM is not new: Comrie (1985) cites English and German as exemplars of strong and weak FTR languages. For a detailed analysis of this difference between English and German see Copley (2009). Copley demonstrates that in English, "futurates" (sentences about future events with no FTR) can only be used to convey information about planned / scheduled / habitual events, or events which arise from law-like properties of the world. This restriction is not present in German, and futurates are common in German speech and writing.

[10] Thieroff (2000) documents what Dahl (2000) calls a "futureless area" in Northern and Central Europe, including most Finno-Ugric and all Germanic languages except English.

3 A Linguistic-Savings Hypothesis

My linguist-savings hypothesis stems naturally from two different types of mechanisms, one concerning a linguisticly-induced bias in time perception, and one concerning the precision of beliefs about time. To illustrate these mechanisms, consider a simple savings problem. Suppose a decision maker is deciding whether or not to pay cost C now, in exchange for reward $R > C$ at some time in the future. Suppose she is uncertain about *when* reward R will materialize, and holds beliefs with distribution $F(t)$. If the decision maker discounts future rewards at rate δ, then she will prefer to save / invest if and only if:

$$C < \int e^{-\delta t} R dF(t). \tag{5}$$

3.1 Mechanism One: Obligatory distinctions bias beliefs.

The first way that language may affect future choices is by changing how distant future events feel. For example, it seems plausible that speaking about future events as if they were happening now (in the present tense), would lead weak-FTR speakers to perceive future events as less distant. Indeed, several literary and rhetorical techniques appear to depend on this for their effectiveness.

For example, speakers often narrate past events in the present tense, with the goal of making those events feel more vivid and immediate (linguists call this the *historical present*). Writers have consciously used this tense-shifting strategy since at least the first century, when in what is often considered the first treatise on writing style, Longinus wrote:

> "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)

For example, the historian Peter Rodman writes:

> "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.'" (*italics mine.* Rodman, *Presidential Command*, 2009).

Common across languages and used in both writing and conversation, linguists have traditionally thought that narrating the past in the present make a story more vivid and immediate by "moving past events out of their original time frame and into the moment of speaking" (Schiffrin, 1981).

Indeed, this technique is widespread enough to elicit scorn from critics who consider it manipulative. The Man Booker Prize judge Philip Hensher attributes the routine use of the present tense to: "a thousand low-level creative writing tutors, clinging to the belief that you can 'make your writing more vivid' by turning to the present tense". Author and critic Philip Pullman (while acknowledging skillful use by Brontë and Dickens), agrees, complaining: "if every sound you emit is a scream, a scream has no expressive value... I feel claustrophobic, always pressed up against the immediate".

Similarly, jokes are almost always told in the present tense, as in 'a man *walks (not walked)* into a bar'. This is often attributed to a need for immediacy and surprise in successful humor. If talking about temporally distant events in the present tense makes them seem more immediate, languages which force this way of speaking may make future events seem closer.

A similar linguist construction flips this logic to arrive at the same effect. In what some linguists call *distancing*, distant (past or future) tenses are used instead of the present tense to convey that a current event is distant in some other way (Dancygier & Sweetser, 2009).[11] For example, something that is distant from current reality (unlikely or impossible), is often spoken about in the past tense, as in:

> "I wish I *had* a car (right now)."

which conveys that the person does not have a car at present. Note that the past-tense 'had' is not meant to describe a past state, which would require an auxiliary 'had':

> "I wish I *had had* a car (when I was a student)."

Iatridou (2000) notes that this use of the past tense to convey distance from reality occurs in both wishes (like above) and also in if-clauses:

> "If I *had* a car (I would give you a ride)", "If he *ran* the school...".

These non-past uses of past tenses are widespread across languages (James 1982), and while less common, future tenses are also used (Mezhevich, 2008). If speaking about current events in a distant tense makes them seem distant, languages which oblige speakers to use a future (distant) tense may make future events seem more distant.

In the context of my simple model, this could be represented either through the discount rate, or through beliefs. That is, we could imagine that weak and strong-FTR languages lead speakers hold rates $\delta_W < \delta_S$, which would immediately translate into different willingness to save:

$$\text{if } \delta_W < \delta_S, \text{ then } \int e^{-\delta_W t} R dF(t) > \int e^{-\delta_S t} R dF(t). \tag{6}$$

Alternatively, we could represent such an effect as shifting the beliefs $F_W(t)$ and $F_S(t)$ that weak and strong-FTR speakers hold. If weak-FTR speakers perceive that the future as closer, then $F_S(t)$ would first-order stochastically dominate $F_W(t)$. It is easy to see how this would affect the decision to save:

$$\text{if } \forall t, F_W(t) \geq F_S(t), \text{ then } \int e^{-\delta t} R dF_W(t) \geq \int e^{-\delta t} R dF_S(t). \tag{7}$$

3.2 Mechanism Two: Linguistic distinctions lead to more precise beliefs.

The second way that language may affect future choices is by leading speakers to have more or less *precise beliefs* about the timing of future rewards. Languages with more grammatical time marking would lead speakers to hold more precise beliefs about the timing of events if either: marking time requires increased attention to time, or if these markers are encoded in memory. While no studies (to my knowledge) have directly examined the effects of how a language treats time, a large literature has found that language with more precise "basic color terms"[12] cause their speakers to hold more precise color beliefs.

Summarizing this literature, MacLaury (1992) notes that languages around the wold possess anywhere from 2 to 11 basic color terms. So for example, while almost all languages distinguish

[11] This use of the simple past to convey epistemic distance is closely related to several well-studied linguistic phenomena, including hypotheticals (see James 1982), counterfactuals (see Iatridou 2000), conditionals (see Dancygier & Sweetser 2005), and most broadly, the irrealis and subjunctive moods.

[12] MacLaury (1992) defines 'basic color terms' as: "the simplest forms of broadest meaning that most speakers of a language will routinely apply to colors in any context".

between black, white, and red, several languages name all of yellow, green, and blue with one basic color term, and many languages do not have a basic word for purple, pink, orange, or grey. In one of the first studies examining the cognitive correlates of these differences, Brown and Lenneberg (1954) find that Zuñi speakers (who lack a lexical distinction between orange and yellow) have trouble remembering nuanced differences between orange/yellow colors.[13]

More recent studies have confirmed the direct role of language in these findings. Russian makes an obligatory distinction between light blue (*goluboy*) and dark blue (*siniy*). Winawer et al. (2007) finds that Russian speakers do better than English speakers in distinguishing blues when the two colors span the *goluboy/siniy* border (but not when then do not), and that these differences are eliminated when subjects must simultaneously perform a verbal (but not a spatial) distractor task. Further implicating language in this differential precision, Franklin et al. (2008) finds that this difference holds for adults, but not for pre-linguistic infants.

If this linguistic-precision effect is also true for time perception, then strong-FTR speakers will be less willing to save. To see this, assume strong-FTR speakers (who must separate the future and present) hold more precise beliefs about the timing of reward R than speakers of weak-FTR languages. More concretely, if $F_W(t)$ and $F_S(t)$ are the beliefs of weak-FTR and strong-FTR language speakers, then we might expect $F_W(t)$ to be a mean-preserving spread of $F_S(t)$. Proposition 1 establishes that a decision maker with beliefs $F_W(t)$ will value future rewards more than one who holds beliefs $F_S(t)$.

Proposition 1 *If $F_W(t)$ is a mean-preserving spread of $F_S(t)$, then $\int e^{-\delta t} R dF_W(t) > \int e^{-\delta t} R dF_S(t)$.*

Proof. Note that if $F_W(t)$ is a mean-preserving spread of $F_S(t)$, then $F_S(t)$ second-order stochastically dominates $F_W(t)$. Also note that for any discount rate $\delta > 0$, $e^{-\delta t}$ is a strictly-convex function. Therefore $\int e^{-\delta t} R dF_W(t) > \int e^{-\delta t} R dF_S(t)$. ■

In other words, if more finely partitioning events in time leads to more precise beliefs, weak-FTR speakers will be more willing to save than their strong-FTR counterparts. Intuitively, since discounting implies that the value of future rewards is a strictly-convex function of time, uncertainty about the timing of future payoffs makes saving *more* attractive. Experimentally, Redelmeier and Heller (1993) find this risk-seeking response to timing uncertainty, which is also commonly observed in animal studies (see Kacelnik & Bateson, 1996). Note that the exponential discount function I specified in equation 5 is not critical: every widely studied theory of discounting is strictly convex, and would produce the same result.[14]

This would have the same effect on savings as mechanism one: people who speak weak-FTR languages (who speak the future and present identically) would save, exercise, and plan more, and spend, smoke, and over-consume less. I will now present a set of empirical findings which test this hypothesis, then return to a more general discussion of language and cognition.

4 Data and Methods

4.1 Coding Languages

In all of the regressions to follow the independent variable of main interest is Strong FTR (strong future-time reference), a criterion I did not develop but adopt from the European Science Founda-

[13] The Zuñi (one of the Pueblo peoples), are a Native-American tribe that live primarily in western New Mexico.

[14] See Frederick, Lowenstein, and O'Donoghue (2002) for a review of both models and evidence on discounting behavior.

tion's Typology of Languages in Europe (EUROTYP) project.[15] Summarizing the findings of the EUROTYP project, Dahl (2000) describes a set of languages he calls "futureless" as those which do not require "obligatory [FTR] use in (main clause) prediction-based contexts". In this paper, I adopt the more neutral language of "weak-FTR" for "futureless" languages, and call non-weak-FTR languages "strong-FTR". That is, English is a strong-FTR language because marking future-time is obligatory in all but a small set of circumstances, even when making predictions that have no intentional component (e.g., 'tomorrow it *will be* warm', which the speaker is not promising to cause).

This distinction between intentions we may have about things under our control, vs mere predictions is a central distinction in the typology of FTR. Thieroff (2000) notes that at least in Europe, this distinction maps more generally onto whether future events can be left unmarked (i.e. discussed in the present tense). That is, in weak-FTR languages in general, "future time reference can be referred to with unmarked form (the present), in other words, in general the future is not obligatory". Dahl also finds that weak-FTR corresponds strongly with a language's general tendency to require FTR, and that "whether FTR is overtly and obligatorily marked in prediction-based sentences can be used as one of the major criteria for whether it is grammaticalized in a language or not" (Dahl 2000). These analyses motivate my decision to use weak-FTR as a proxy for the general treatment of future time in a language.

Most regressions in this paper cover languages directly analyzed by the EUROTYP Theme Group. In those regressions, strong-FTR languages are the exact complement of what Dahl calls "futureless" and Thieroff (2000) calls "weakly-grammaticalized future" languages. Some regressions analyze the World-Values Survey, whose participants speak many non-European languages not analyzed by either Dahl or Thieroff. To extend their characterization to this broader set, I rely on several other cross-linguistic analyses, (most notably Bybee et al. 1994, Cyffer et al. 2009, Dahl 1985, Dahl & Kós-Dienes 1984, and Nurse 2008), and on individual grammars for languages that are extensively spoken in the WVS but not covered by these broader analyses. A more detailed discussion of coding languages in found in the appendix, and a large table of all languages included in this study and their coding is included in the online appendix.

4.2 Alternative Codings

While in this paper I focus for simplicity on weak vs strong FTR languages, there are several related criteria that may be important. A weaker criterion might be the presence of *any grammatical marking* of future events in a language, even if infrequently used. This would include both *inflectional* markers (like the future-indicating suffixes in Romance languages) or *periphrastic* markers (like the English auxiliary 'will'). Mandarin, Finnish, and Estonian are examples of languages that lack either type of future markers.[16] A stronger criterion might be the presence of an inflectional future tense, which would include most Romance languages, but exclude English. These alternative

[15] Future-time reference was a focal area of the EUROTYP Theme Group on Tense and Aspect, which studied the typological and areal distribution of grammaticalized future-time reference. The idea for EUROTYP was developed at a European Science Foundation conference (Rome, January 1988). At those meetings, it was established that a cross-linguistic study of the tense and aspect systems of European Languages would form one of EUROTYP's nine focus areas. The resulting working group summarized their findings in an 846 page volume on Tense and Aspect, edited by Östen Dahl (2000).

[16] Dahl (2000) writes that Finnish and Estonian stand out in Europe as "extreme examples of languages with no systematic marking of future time reference (although this does not imply a total absence of devices that show future time reference)".

criterion would satisfy:

$$AnyGrFTR \supset WeakFTR \supset StrongFTR \overset{?}{\supset} InflectionalFTR, \tag{8}$$

with the first and second inclusions being logically necessary, and the third representing a typological regularity for which I do not have a counterexample.[17]

For simplicity and transparency, in this paper I have adopted the main criterion advocated by the EUROTYP working group for "futureless" languages, which corresponds to the second inclusion. An additional reason for this choice is that, as both Dahl and Thieroff note, in the EUROTYP data weak-FTR languages are those in which "the future is not obligatory in sentences with future-time reference". Since this is the characteristic of languages (a more or less granular obligatory discretization of future time) that is central to the mechanism I propose, differences between weak and strong FTR languages seem the most direct test of my hypothesis.[18]

4.2.1 Online-Text Based Codings

To my knowledge, the EUROTYP project is the most extensive typological research program to study the cross-linguistic grammaticalization of FTR.[19] Nevertheless, it may be important to assess whether the linguistic distinction I adopt from them can be validated independent of expert judgement. To do this, I attempt to form a measure of FTR strength based on word-frequency analysis of text retrieved from the web, and investigate how much this a measure correlates with weak vs strong FTR.

As a basis for an online measure, I scrape the web for full-sentence weather forecasts. Using weather forecasts has the advantage of comparing relatively controlled sets of texts about future events.[20] An important limitation of this approach is its restriction to languages which are widespread on the internet. As of the writing of this paper, this results in a set of 39 coded languages.

Details and the results of this exercise are summarized in the Appendix, which reports two measures of how frequently a language grammatically marks future time. "Verb ratio" counts the number of verbs which are grammatically future-marked, divided by the total number of future-referring verbs. In other words, in online weather forecasts in a language, what share of verbs about future weather are marked as future-referring? Similarly, "sentence ratio" asks: what share of sentences regarding future weather contain a grammatical future marker?[21]

[17] More specifically, the languages which satisfy these criteria are nested sets. That is: $\{X \mid X$ has any grammatical FTR $\} \supset \{X \mid X$ has at least weak FTR $\} \supset \{X \mid X$ has strong FTR $\} \supset \{X \mid X$ has inflectional FTR $\}$.

[18] As a robustness check, it is possible to include all three inclusions as nested effects in the broader cross-country savings regressions in this paper. While these regressions do not have enough statistical power to disentangle all three effects, results suggest increasingly strong effects as you move from weaker to stronger criteria, with joint statistical significance similar to that of the binary weak-vs-strong distinction. Please see Online Appendix Table 4 for the results of these regressions.

[19] Sponsored by the European Science Foundation, EUROTYP involved about a hundred linguists over five years (1990-94), and its report on Tense and Aspect runs over 800 pages.

[20] Another advantage is that weather forecasts are likely to reliably be restricted to prediction-based FTR markers, since weather forecasters do not generally believe they can affect the weather. This restriction comes with the disadvantage that for many languages, prediction-based FTR is a small share of overall FTR strategies. However, focussing on a consistent source of future-time predictions eliminates the worry that the relative proportions of FTR strategies represented online may vary by language. In addition, using prediction-based FTR as a proxy for general FTR tendencies is supported by Thieroff (2000) observation that (at least in the EUROTYP data), the tendency to mark FTR in prediction-based contexts maps more generally onto the obligatory FTR marking.

[21] In some languages (Arabic, for example), a sentence with multiple verbs will often mark only the first as future-regarding. Grammatical differences across languages like these produce variation between verb and sentence ratios.

Unsurprisingly, across languages these measures are highly correlated (0.992). Both are also highly rank-correlated with the EUROTYP criterion (1.000). While I cannot know how well these results would extend to languages which are not well represented online, in general these results suggest that the EUROTYP criterion measures an objective central tendency of a language's FTR strength. For simplicity then, all results presented in this paper report the average effect of moving from a weak to strong-FTR language.[22]

4.3 Savings Regressions in the WVS

My first set of regressions are run on individuals in the World-Values Survey (WVS), a global survey of world cultures and values (World-Values Survey 2009). Although five waves of the WVS are available, I study only the last three, which ran from 1994 to 2007. In these (but not earlier) waves, participants were asked what language they normally speak at home, which I use as a proxy for the language most likely to structure their thought. This allows me to study individuals across a set of 76 countries for which language data are available. For my purposes, this sample has the nice feature that not only does it permit a broad set of countries with which to do cross-country comparisons, it also includes a number of countries with sufficient within-country linguistic diversity to permit within-country comparisons.

I estimate fixed-effect Logit models of an individual's propensity to save (versus not save) in the current year, regressed on the FTR strength of that individual's language and a rich set of fixed-effects for country and individual characteristics.[23] These fixed effects control for a person's: country of residence, income decile within that country, marital status (with 6 different classifications), sex, education (with 8 different classifications), age (in ten-year bins), number of children, survey wave, and religion (from a set of 74) all interacted (for a total of 1.4 billion categories). Effectively, this analysis matches an individual with others who are identical on every dimension listed above, but who speak a different language. It then asks within these groups of otherwise identical individuals, do those who speak strong-FTR languages behave differently than those who speak weak-FTR languages? In addition, immigrants are excluded from this analysis so as to avoid conflating differences in a household's primary language with differences between natives and immigrants.

The WVS also allows me to study the interaction between the effect of language on savings behavior, and several beliefs and values questions asked of participants. This allows me to examine to what degree the measured effect of language on savings behavior is attenuated by such things as how much a person reports trusting other people, or how much they report that saving is an important cultural value. To a limited extent, this allows me to investigate whether language acts as a marker of deep cultural values that drive savings, or whether language itself has a direct effect on savings behavior.

[22] While the set of languages I can code this way is limited to those which are well represented on the searchable internet (39 as of the writing of this paper), it is extensive enough that both the OECD and SHARE results I report can be run using either ratio instead of the binary strong-vs-weak FTR criteria. Both ratios produce results that are nearly identical to the results I report, both quantitatively and statistically. Please see Online Appendix Tables 1, 2, and 3 for the results of these regressions.

[23] I use Chamberlain's (1980) fixed-effect (or conditional) logit model to estimate these regressions, since I have very few observations within each group defined by my fixed effects. The Chamberlain model solves the resulting incidental-parameters problem.

4.4 Retirement Assets in the SHARE

The WVS focusses on *current* savings behavior and beliefs. The second dataset I analyze is the SHARE, the Survey of Health, Ageing, and Retirement in Europe, which is a panel survey that measures the socioeconomic status and health of retired households in 13 European countries (Börsch-Supan & Jürges 2005). This allows me to complement my earlier analysis of the WVS with an analysis of *past* savings behavior (as reflected in accumulated wealth).

Using the SHARE, I estimate several OLS models of total net household retirement assets regressed on a household's language.[24] The SHARE attempts a comprehensive measure all assets a household has, including income, private and public benefit payments, and all forms of assets (stocks, bonds, housing, etc.) The richest of these regressions includes fixed effects for a household's: country of residence (13), income decile within that country, marital status (with 6 different classifications), sex, education (with 8 different classifications), age, number of children, and survey wave (2004 and 2006), all interacted for a total of 2.7 million categories. Like my regressions in the WVS, my analysis of the SHARE allows me to control for many confounds by focussing on the effects of within-country language variation.

4.5 Health Behaviors in the SHARE and DHS

In addition to retirement assets, the SHARE also collects data on *health* behaviors such as smoking and exercise, as well as multiple measures of long-run physical-health: body-mass-index, walking speed (as measured by a walking test), grip strength (as measured by a dynamometer), and respiratory health (peak expiratory air flow). This allows me to run similar fixed-effect regressions as my savings results, but with a broader set of future-regarding behaviors.

Complementing these results, I run similar health regressions in data from the MEASURE DHS project, which conducts demographic and health surveys in developing countries on behalf of USAID. These surveys collect nationally representative data on fertility, family planning, and health behaviors in a large sample of developing countries. Together, these results allow me to investigate whether the savings behavior results I study extend to health behaviors such as exercise, smoking, family planning, and condom use, both in developed and developing countries.

4.6 National Savings Rates

Finally, I study the relationship between language and savings in a cross-country framework, using national accounts data from both the OECD (1970 to present) and world-bank data merged with the WVS. The OECD data are collected and harmonized across all 34 member countries as well as for the Russian Federation.[25] Details on the exact construction of each measure can be found in the Data Appendix. While harmonized world-bank and WVS data do not go back as far as those from the OECD, those data allow me to complement my OECD analysis with regressions over a much broader set of countries at different levels of development, and which include country-level controls for culture, attitudes and beliefs.

These regressions ask whether the FTR structure of a country's language appears to affect national savings. The form of the national savings equation is a simple linear relation that follows closely from life-cycle savings theory (see Modigliani 1986 for a review). Essentially, I regress

[24] Unfortunately, the SHARE does not record what language households speak at home. Instead, I exploit the fact that the survey instrument is offered in multiple languages; households can choose to take the survey in any of the national languages of their country. I use this choice as a proxy for their primary language.

[25] I include the Russian Federation in this analysis because as of the writing of this paper they were in the process of joining the OECD, and were included in the harmonized OECD data.

national-savings rates on the level and growth rate of GDP as well as a number of other country demographics. To this regression I add a weighted measure of the FTR strength of that country's languages. This is simply the FTR strength of each of that country's major languages, weighted by the percent of the country's population reports speaking those languages.[26] This language measure does not vary by year: these regressions test if the unexplained components of national savings vary cross-sectionally with a country's language, and do not try to identify off of demographic shifts within a country across time.

5 Results

The results that follow use data from five main sources of data: the WVS, the WDI, the SHARE, the DHS, and the OECD. Please see the data appendix for a detailed description of each data set, as well methodologies, definitions, means, and standard deviations of all variables of interest.

5.1 Language and Savings in the World Values Survey

My first set of regressions examines the savings behavior of individuals. I examine this behavior using cross-country regressions where the dependant variable $save_{it}$ is an individual reporting having net saved this year.[27] I estimate the equation:

$$\Pr(save_{it}) = \frac{\exp(z_{it})}{1+\exp(z_{it})}, \tag{9}$$

where:

$$z_{it} = \beta_0 + \beta_1 StrongFTR + \beta_2 X_{it} + \beta_3 X_t + \beta_4 F_{it}^{ex} + \beta_5 F_t^c.$$

In equation 9, the main variable of interest $StrongFTR$ is a binary-coded characteristic of the language that the individual speaks at home. X_{it} are characteristics of individual i at time t, such as their employment status or self-reported beliefs about trust and savings. X_t are characteristics of a country at time t, such as their legal system, economy, and country-level averages of variables like trust. F_{it}^{ex} is a set of fixed effects that can be taken as exogenous, these are non-choice variables such as age and sex. F_t^c is a set of continent fixed effects. Empirical estimates of equation 9 are presented in Tables 1 and 2; all coefficients are reported as odds ratios, where the null effect is 1.

[26] These relative language shares were obtained for each country from their national census taken closest to the year 2000.

[27] See the data appendix for the exact wording of this and other questions in the WVS.

Table 1: An Individual Saved This Year (WVS, Cross-Country Analysis)

	(1)	(2)	(3)	(4)	(5)	(6)
	Saved	Saved	Saved	Saved	Saved	Saved
Strong FTR	0.460	0.441	0.443	0.449	0.456	0.471
	[0.069]**	[0.071]**	[0.072]**	[0.073]**	[0.074]**	[0.073]**
French Legal Origin†		0.473	0.579	0.595	0.579	0.59
		[0.065]**	[0.110]**	[0.129]*	[0.128]*	[0.128]*
German Legal Origin†		0.406	0.441	0.451	0.435	0.449
		[0.084]**	[0.096]**	[0.134]**	[0.147]*	[0.150]*
Scandinavian Lgl Or†		0.616	0.665	0.670	0.643	0.683
		[0.192]	[0.215]	[0.324]	[0.355]	[0.371]
Log Per-Capita GDP†		1.164	1.154	1.171	1.169	1.168
		[0.057]**	[0.057]**	[0.093]*	[0.098]	[0.100]
PCGDP_{t-1} / $\text{PCGDP}_t^\dagger$			0.597	0.588	0.600	0.580
			[0.672]	[0.676]	[0.675]	[0.655]
Unemployed			0.532	0.529	0.529	0.529
			[0.035]**	[0.038]**	[0.036]**	[0.036]**
Real Interest Rate†			0.996	0.997	0.996	0.997
			[0.003]	[0.003]	[0.003]	[0.003]
WDI Legal-Rights Index†			1.045	1.044	1.042	1.038
			[0.035]	[0.044]	[0.048]	[0.049]
Trust					1.229	1.229
					[0.041]**	[0.041]**
Family is Important					0.886	0.886
					[0.024]**	[0.024]**
Trust†					0.906	0.953
(country average)					[0.493]	[0.535]
Family is Important†					1.602	1.629
(country average)					[1.500]	[1.557]
Language Share						0.911
						[0.149]
FTR Share						0.775
						[0.339]
Fixed Effects:						
Age × 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

Regressions are logistic regressions with coefficients reported as odds ratios. Immigrants are excluded from all regressions. Variables with a (†) following their name vary only at the country level. Robust standard errors are reported in brackets; all regressions are clustered at the country level. * significant at 5%; ** significant at 1%.

Regression 1 controls only for F_{it}^{ex}, (non-choice variables age and sex), so as to summarize the average difference in the propensity to save between strong and weak-FTR individuals. The coefficient of 0.460 can be interpreted as strong-FTR families saving only 46% as often as weak-FTR families.

Regressions 2 adds the origin of a country's legal system and the log of its PCGDP, mirroring the cross-country regressions La Porta et al. use to study the effect of legal origins (see La Porta, Lopez-De-Silanes & Shleifer 2008). Regression 3 adds a richer set of controls than typically included in those regressions, including the growth rate of PCGDP, unemployment, real interest rates, and the WDI legal-rights index. Regression 4 goes further, adding continent fixed effects. If anything, the inclusion of these controls increases the measured effect of language.

Regression 5 adds the two most studied variables in the large literature on social capital as additional controls, both at the household level, and as their country-level averages. "Trust" measures whether an individual thinks "most people can be trusted". This measure has a large and marginally significant effect on the propensity of an individual to save; individuals who think others are generally trustworthy are on average 23% more likely to have saved this year. "Family" measures how important a respondent says that family is to them (with 1 being 'very' and 4 being 'not at all'). People who report valuing family save significantly more than those who do not. Both of these effects appears to be largely independent of the effect of language.

Regressions 6 adds controls for the share of a country which speaks a household's language, and what share speak a language with the same FTR level. These results demonstrates that the effect of language is not driven by speaking either minority languages or FTR structures. Table 2 presents the coefficient on strong FTR when this final regression (regression 6) is run separately by continent and level of development.

Table 2: 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:			
$\text{PCGDP} \leq 1{,}000$	0.285	[0.093]**	38,271
$1{,}000 < \text{PCGDP} \leq 5{,}000$	0.743	[0.172]	56,403
$5{,}000 < \text{PCGDP} \leq 25{,}000$	0.680	[0.163]	29,732
$\text{PCGDP} > 25{,}000$	0.422	[0.018]**	10,123

Coefficients (reported as odds ratios) are from logistic regressions with the same specification as regression 6 in Table 1, 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%.

These regressions display coefficients less than 1 in every major region of the world and at every level of PCGDP, consistent with my main findings.

Estimates from these first set of regressions suggest that a language's FTR is an important predictor of savings behavior. This effect is large (larger than that of other widely-studied variables), does not attenuate despite the inclusion of an aggressive set of controls, and appears to hold across both geographical regions and levels of development. Nevertheless, these regressions are fundamentally cross-country, and may omit important differences between countries not captured by standard controls

To attempt to account for this possibility, my next set of regressions include both country fixed effects and comprehensive household-level controls, comparing demographically similar households born and living in the same country. These within-country regressions rely on the fact that many countries are multi-lingual, and contain sets of extremely similar native families who live in close geographic proximity, but who speak different languages.

These regressions are carried out using fixed-effect (or conditional) logistic analysis, where the dependant variable $save_{it}$ is an individual reporting having saved in net this year.[28] I estimate the equation:

$$\Pr(save_{it}) = \frac{\exp(z_{it})}{1+\exp(z_{it})}, \tag{10}$$

where:

$$z_{it} = \beta_1 StrongFTR + \beta_2 X_{it} + \beta_3 F_{it}^{ex} \times F_{it}^{en} \times F_t^c.$$

In equation 10, the F variables are sets of fixed effects that are jointly interacted to form groups for the basis of analysis: the conditional-likelihood function is calculated relative to these groups. That is, individuals are compared only with others who are identical on every F variable. F_{it}^{ex} is a set of fixed effects that can be taken as exogenous, these are non-choice variables such as age and sex. F_{it}^{en} is a set of fixed effects that are likely endogenous to an individual's discount rate, such as income, education and family structure. F_t^c is a set of country-wave fixed effects. In using these extensive fixed effects to compare like families, this estimation strategy mirrors that of Poterba, Venti, & Wise (1995) and the international comparisons of household savings in Poterba (1994). Empirical estimates of equation 10 are presented in Tables 3, 4 and 5; all coefficients are reported as odds ratios.

Table 3: An Individual Saved This Year (WVS, Within-Country Analysis)

	(1)	(2)	(3)	(4)	(5)	(6)
	Saved	Saved	Saved	Saved	Saved	Saved
Strong FTR	0.460	0.718	0.722	0.700	0.691	0.693
	[0.069]**	[0.113]*	[0.115]*	[0.103]*	[0.090]**	[0.092]**
Unemployed			0.677	0.694	0.688	0.689
			[0.031]**	[0.044]**	[0.044]**	[0.044]**
Trust					1.083	1.084
					[0.045]	[0.045]
Family is Important					0.952	0.953
					[0.057]	[0.057]
Saving is Important						1.111
(to teach children)						[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%.

Included again for the sake of comparison, regression 1 controls only for F_{it}^{ex}, (non-choice variables age and sex), so as to summarize the average difference in the propensity to save between

[28] See Chamberlain (1980) for details on conditional-logistic analysis, and the data appendix for the exact wording of this and other questions in the WVS.

strong and weak-FTR individuals. Regressions 2 and 3 add fully-interacted fixed effects for country, time, income, and education. On top of these, regressions 4 through 6 include controls for family structure. Regression 4 can be interpreted as demonstrating that even when comparing only individuals that are identical on every dimension discussed above, individuals who speak a language with strong FTR are roughly 30% less likely to report having saved this year. This effect is nearly as large as being unemployed (31%).

As before, regression 5 adds "Trust", which has a marginally significant effect on the propensity of an individual to save. Individuals who think others are generally trustworthy are on average 8% more likely to have saved this year. "Family" measures how important a respondent says that family is to them (with 1 being 'very' and 4 being 'not at all'). People who report valuing family save significantly more than those who do not. Both of these effects appears to be largely independent of the effect of language. Indeed, by comparing regressions 4 and 5 we see that the inclusion of "Trust" and "Family", if anything, increases the measured effect of language.

Regression 6 adds a variable intended to measure saving as an important cultural value. Specifically, this question asks whether "thrift and saving money" is a value which is important to teach children.[29] Unsurprisingly, individuals who report that saving money is important are more likely to save. However, this effect is both smaller than the effect of language (11% versus 30%), and does not meaningfully attenuate the effect of language on savings behavior. This can be seen by comparing the coefficients on Strong FTR between regressions 5 and 6. Indeed, across individuals the belief that saving is an important value is almost completely uncorrelated with the FTR of their language ($corr = -0.07$).

Parameter estimates from this first set of regressions indicate that a language's FTR is an important predictor of savings behavior. This effect is both large (larger than that of other widely-studied variables) and survives an extremely aggressive set of controls. Interestingly, this correlation is statistically independent of what was designed to be a good marker of saving and thrift as a cultural value. This suggests that the channel through which language affects the propensity to save is largely independent of the saving as a self-reported value. Later, I will discuss what this non-attenuation result suggests about the causal link between language and savings behavior.

Next, I look at which countries in the WVS have numerous native speakers of both weak and strong-FTR languages. Figure 1 shows the percent of households who reported savings for countries in the WVS, organized by what percent of the country's survey respondents report speaking a strong-FTR language at home.

[29] See the data appendix for the full wording of these questions in the WVS.

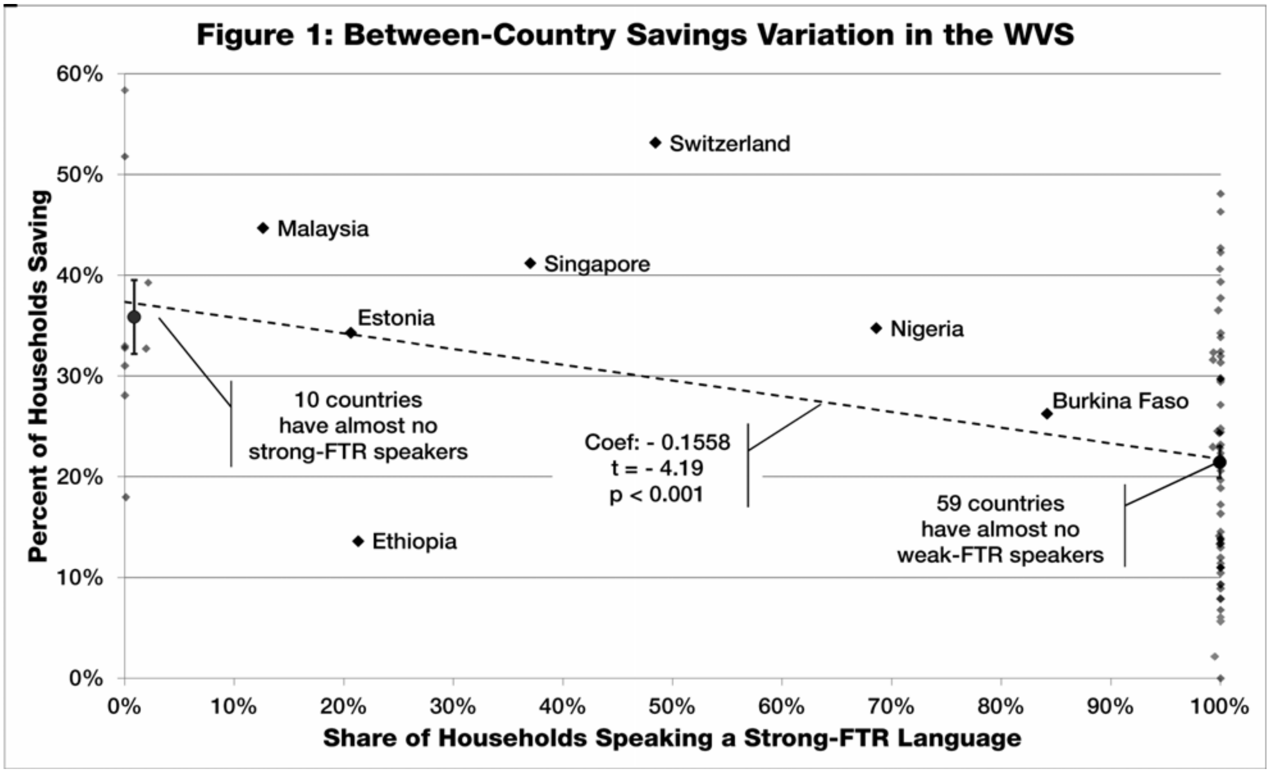

Figure 1 plots the least-squares regression of the percent of a country which reports saving on the percent of that country which speaks a strong-FTR language at home. The large number of countries with extreme strong-FTR percentages ($< 5\%$ and $> 95\%$), are summarized by their means and standard errors.

As Figure 1 shows, the between-country relationship between savings and language is both clear and highly significant in the WVS. However, the vast majority of countries (69 of 76) have basically no intra-country variation in FTR strength. This is because in most countries one language dominates, and in many multi-lingual countries, those languages share a common FTR structure. For example, though Canada has both English and French speaking populations, French and English are both strong-FTR languages.

In 7 of 76 WVS countries however, both weak and strong FTR speakers are a significant shares of natives. These 7 countries provide the majority of identification for my within-country regressions. Table 4 enumerates these countries, and reports the coefficient on Strong FTR when regression 6 from Table 3 is estimated in that country. I also report the percents of each country's sample that speak strong and weak-FTR languages, the most common languages they speak, and the sample size of each country-specific regression.

Table 4: WVS Countries with Large Within-Country FTR Differences

Country	Weak-FTR Languages	%	Strong-FTR Languages	%	Strong FTR Coef.	SE	N
Burkina Faso	Dyula	16	French, Fula, 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. * significant at 5%; ** significant at 1%.

Remember that these coefficients represent the odds ratio of savings, for strong over weak-FTR families. Though small samples reduce statistical significance, consistent with my overall effect, all 7 regressions display coefficients less than 1, (strong-FTR families save less often than their weak-FTR counterparts). The coefficient in Estonia is 0 because in the sample of matched Estonian families, no Russian speakers reported saving. Other than this outlier, (which is driven by that regression's small sample size) the estimated effect is remarkably stable across this set of countries, which span multiple continents, regions, and sets of languages.

To confirm this and to explore the robustness of my initial results to additional controls, I estimate an additional set of regressions summarized in Table 5. First, estimate the regression with a full set of controls (regression 6 in Table 3) separately in the 69 countries with little, and the 7 countries with sizable within-country FTR variation (columns 1 and 2 in Table 5, respectively). I also examine whether these results are explained by the share of a country speaking a language or languages of a particular FTR level. Finally, I add fixed-effects for self-reported religious denomination (74 in total), interacted with all of my previous fixed effects.

Table 5: Additional Within-Country Control Regressions in the WVS

	(1)	(2)	(3)	(4)	(5)
	Saved	Saved	Saved	Saved	Saved
Strong FTR	0.857	0.676	0.669	0.537	0.539
	[0.297]	[0.096]**	[0.098]**	[0.111]**	[0.111]**
Unemployed	0.693	0.632	0.689	0.750	0.749
	[0.046]**	[0.156]	[0.044]**	[0.068]**	[0.067]**
Trust	1.072	1.277	1.084	1.066	1.067
	[0.047]	[0.139]*	[0.045]	[0.050]	[0.050]
Family is Important	0.963	0.792	0.953	0.991	0.990
	[0.060]	[0.128]	[0.057]	[0.069]	[0.069]
Saving is Important	1.124	0.978	1.110	1.056	
(to teach children)	[0.047]**	[0.080]	[0.044]**	[0.060]	
Language Share			0.769	0.700	0.699
			[0.120]	[0.129]	[0.129]
FTR Share			1.016	0.475	0.469
			[0.184]	[0.190]	[0.188]
Full set of FEs from reg 5 in table 3	Yes	Yes	Yes	Yes	Yes
Religion FEs	No	No	No	Yes	Yes
All FEs Interacted	Yes	Yes	Yes	Yes	Yes
Country's FTR Variation	$< 5\%$ (69)	$> 5\%$ (7)	All	All	All
Observations	21,834	1,781	23,615	13,245	13,245

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%.

Regressions 1 and 2 confirm that the majority of the identification for my within-country regressions come from the seven countries enumerated in Table 4. The coefficient of 0.676 in regression 2 is statistically indistinguishable from the coefficient of 0.691 I measure when that regression is run on the whole sample.

Returning to the whole sample: as an additional control, regressions 3, 4 and 5 adds controls for the share of a country that speaks a household's language, and what share speak a language with the same FTR level. Neither of these attenuate the effect of language. Regressions 4 and 5 include fixed effects for religious denomination (74 in total), interacted with all of my previous fixed effects. While the addition of religion significantly reduces the usable sample, its inclusion does not attenuate the effect of language; comparing regression 3 to 4, the measured effect actually grows by 11%. Comparing regression 4 to 5 replicates my earlier non-attenuation finding: the addition saving as a self-reported value does not affect the effect of language.

5.2 Language and Retirement Assets in Europe

If individuals who speak strong-FTR languages save less in any given year, then we would expect them to accumulate less savings over time. My next set of regressions examines the cumulative retirement assets of individuals in the retired households in the SHARE.

Table 6 summarizes regressions that estimate the equation:

$$IHS\left(\frac{ra_{it}}{inc_{ct}}\right) = \alpha + \beta_1 StrongFTR + \beta_2(F_{it}^{ex} \times F_{it}^{en} \times F_t^c) + \varepsilon_{it}, \tag{11}$$

where:

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

In equation 11 the dependant variable is $IHS\left(\frac{ra_{it}}{inc_{ct}}\right)$. The numerator ra_{it} is the estimated value of a retired household's net worth, including all real assets (homes, businesses and cars), and financial assets (money, stocks, bonds, and life insurance), minus any debt. In order to make this comparable across families living in different countries, I divide ra_{it} by inc_{ct}, that country's average disposable income.[30] Finally, in order to assure that these regressions are not being driven by outliers, I apply $IHS(x)$, an inverse-hyperbolic-sine transformation. Except for small values of x, this transformation approximately equals $\log(2x)$, or $\log(2) + \log(x)$, and so coefficients can be interpreted in exactly the same way as with a standard log transformation. Unlike the log transformation though, $IHS(x)$ is defined for both zero and negative values of x, which are common in wealth data.[31]

Unfortunately, unlike the WVS, the SHARE does not ask households what language they speak at home. Therefore, the main variable of interest Strong FTR is coded using the language that the head of household asked to take the survey in (the SHARE attempts to offer the survey in any of a country's national languages).

Mirroring my earlier regressions in the WVS, the F variables are sets of fixed effects that are jointly interacted to form groups similar to those in my analysis of the WVS. That is, households are compared only with others who are identical on every F variable, but who asked to take the survey in a different language. Empirical estimates of equation 11 are presented in Table 6; all coefficients can be interpreted as percent changes in retirement savings.[32]

[30] Average disposable income is per head, with PPP and in 2005 Euros, as collected by the OECD.

[31] I am indebted to Frances Woolley, who suggested I use the inverse-hyperbolic-sine transformation, and pointed me to her work on the transformation and its use with wealth data. See Woolley 2011 and Burbidge, Magee and Robb 1988 for a discussion of the relative advantages of various transformations. All of the regressions I report using this transformation provide qualitatively and statistically similar results when run without any transformation, either as a ratio to disposable income or simply in levels.

[32] Details on variable construction: Age is coded in ten-year bins, Income is coded as an intra-country decile, and Education falls within one of 8 categories provided in the SHARE. For more details on the construction of variables and the measuring of household net-worth in the SHARE, see Börsch-Supan and Jürges (2005).

Table 6: Household Retirement Assets (SHARE)

	(1) $IHS\left(\frac{RA}{DI}\right)$	(2) $IHS\left(\frac{RA}{DI}\right)$	(3) $IHS\left(\frac{RA}{DI}\right)$	(4) $IHS\left(\frac{RA}{DI}\right)$	(5) $IHS\left(\frac{RA}{DI}\right)$
Strong FTR	-0.390	-0.370	-0.444	-0.386	-0.356
	[0.017]**	[0.024]**	[0.028]**	[0.047]**	[0.075]**
Fixed Effects:					
Age	Yes	Yes	Yes	Yes	Yes
Country × Wave	Yes	Yes	Yes	Yes	Wave
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	529.55	234.93	255.48	68.90	23.95

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%.

Regressions 1 through 5 show my predicted effect; retired households that speak strong-FTR languages have around 39% less by the time they retire. These regressions are identified by the fact that Belgium has large Flemish (weak-FTR) and French (strong-FTR) speaking populations, and Switzerland has large German (weak-FTR), and French, Italian, and Romansh (strong-FTR) speaking populations. Comparing regressions 4 and 5, we see that the differences overall effect appear to be roughly the same size as the differences between different FTR groups within Belgium and Switzerland.

Table 7 summarizes regressions that increase the level of spatial control by including fixed effects for intra-country regions. This allows us to examine whether language may be proxying (even within country) for unobserved differences between regions, counties or even cities. If for example, families tend to segregate across regions by language, then I may be attributing institutional differences between regions to language.

Table 7: Household Retirement Assets (SHARE, BE and CH)

	(1)	(2)	(3)	(4)	(5)	(6)
	$IHS\left(\frac{RA}{DI}\right)$	$IHS\left(\frac{RA}{DI}\right)$	$IHS\left(\frac{RA}{DI}\right)$	$IHS\left(\frac{RA}{DI}\right)$	$IHS\left(\frac{RA}{DI}\right)$	$IHS\left(\frac{RA}{DI}\right)$
Strong FTR	-0.459	-1.637	-0.374	-0.440	-1.621	-1.571
	[0.052]**	[0.515]**	[0.132]**	[0.194]*	[0.457]**	[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
FEs Interacted	Yes	Yes	Yes	Yes	Yes	Yes
Sub-Reg 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	78.53	11.36	7.99	1.99	12.56	0.33

Regressions are fixed-effect OLS regressions where the dependent variable is net household retirement assets divided by average national disposable income, with a inverse-hyperbolic-sine transformation. 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%.

Comparing regressions 1 and 2 (in Belgium) and regressions 3 and 4 (in Switzerland) shows that the addition of finer spatial controls (in the form of 11 Belgian and 7 Swiss region dummies) do not appear to attenuate the effect of language on retirement savings. For example, Brussels has both a large Dutch speaking (weak-FTR) and a large French speaking (strong-FTR) population. Regressions 5 and 6 show that even when comparing demographically similar families living in Brussels, language appears to have a strong effect on retirement savings. Together, these regressions suggest that the language effects I find are not due to spatial differences, at least not at the level that can be measured in the SHARE.

5.3 Language and Health in the SHARE

In addition to measuring household wealth, the SHARE also asks about health behaviors and records several measures of physical health. If languages affect their speakers' intertemporal beliefs, this would also affect health behavior and long-run health. More specifically, if obligatory FTR reduces the psychological importance of the future, we would predict that it would lead to more smoking, less exercise, and worse long-run health.

To investigate this, Table 8 summarizes regressions investigating the effect of FTR on health variables found in the SHARE. Some of these measures are binary, such as ever having smoked heavily, remaining physically active, and being medically obese. For these regressions I estimate fixed-effect logit model similar to equation 10. The other measures I examine, walking speed, grip strength, and peak expiratory flow, are commonly studied measures of long-run health. These measure the speed at which a person comfortably walks, the maximum amount of force they can apply while squeezing a dynometer, and their maximum exhalatory air flow (lung strength). For these regressions I estimate fixed-effect OLS regressions.

Table 8: Health Behaviors and Measures of Health (SHARE)

	(1)	(2)	(3)	(4)	(5)	(6)
	Smoked	Phy Act	Obesity	Walk Sp	Grip Str.	Peak Flow
Strong FTR	1.241	0.709	1.131	-0.028	-0.899	-16.083
	[0.042]**	[0.025]**	[0.007]**	[0.101]	[0.049]**	[2.806]**
Full set of FEs from reg 4 table 6	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 dependent variables are: having smoked daily for a year or more, engaging in regular physical activity, and medically obesity. Regressions 4, 5, and 6 are fixed-effect OLS regressions for measures of old-age health; walking speed (m/sec), grip strength (kg), and peak expiratory flow(L/min). 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%.

Regression 1 indicates that a strongly grammaticalized FTR leads to a 24% higher probability of having ever smoked (daily for a year or more). This is consistent with my findings on savings if the decision to smoke trades off immediate benefits versus future health costs. Similarly, regression 2 indicates that a strong-FTR language leads to a 29% lower probability of being physically active. Regressions 3, 4, 5, and 6 examine the effect of strong FTR on long-run measures of health. While there appears to be no effect on walking speed, speaking a strong-FTR language is associated with a 13% higher probability of being medically obese, a reduction in grip strength of almost a kilogram, and a reduction in peak expiratory flow of 16 liters per minute.

5.4 Language and Health in the DHS

The detailed health measures found in the SHARE allow me to investigate both health behaviors, and long-run markers of health. These comparisons however, are limited to retired citizens of developed Western-European countries, and in the presence of country fixed effects are identified almost entirely by retired households from Belgium and Switzerland.

To investigate whether these results generalize, I run similar health regressions in data from the MEASURE DHS project. Of the countries covered by the DHS, four countries contain significant ($> 5\%$) native within-country FTR variation. These countries are Burkina Faso, the Democratic Republic of the Congo, Ethiopia, and Nigeria.[33] I use the DHS surveys for these countries in logistic health regressions similar to those run in the SHARE. Table 9 reports the results of these regressions on smoking, obesity, contraception, and condom use. If speaking a strong-FTR language reduces a person's concern for the future, we should expect it to increase smoking and obesity, and decrease family planning and safe-sex behavior.

[33] In order to match as closely as possible the health regressions I run in the SHARE, I use the DHS survey that falls between 2004 and 2006 for each country, with two changes in specification. Age in the DHS data comes coded in 5-year bins, and I maintain that greater level of specificity than I used in the SHARE (10-year bins). Also, I include fixed effects for self-reported religion, which was not measured in the SHARE (but is in the WVS, and was included in those regressions).

Table 9: Health Behaviors in Developing Countries (DHS)

	(1) Smokes	(2) Obesity	(3) Cntcpt	(4) Cntcpt	(5) Condom	(6) Condom
Strong FTR	1.199	1.169	0.533	0.575	0.810	0.838
	[0.104]*	[0.058]**	[0.025]**	[0.029]**	[0.052]**	[0.069]*
FTR × Sex				0.726		0.926
				[0.088]**		[0.122]
Full set of FEs from reg 4 table 6	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%.

Regressions 1 through 6 are consistent with my general hypothesis, and quantitatively similar to the results I obtain in the SHARE. Speaking a strong-FTR language is associated with a 20% greater likelihood of smoking, and a 17% greater likelihood of being obese. In regressions 3 through 6 I examine sexual health behaviors that have a strong future-component, reporting using contraception for family planning, and reporting having used a condom during your last sexual intercourse. Speaking a strong-FTR language significantly depresses both behaviors. Also, this effect appears stronger for men than for women, consistent with a large literature in development that finds men may have greater decision-making authority over these behaviors.

5.5 Linguistic Effects on National Savings Rates in the OECD

The evidence on both individual and household behavior we have presented so far supports the hypotheses that strong-FTR languages induce less future-oriented choices by its speakers. If my hypothesis about language and willingness to save is true however, it would also have implications for aggregate behavior. It seems natural to expect that countries in which strong-FTR languages are spoken would have both lower equilibrium household savings, and (to the degree governments aggregate individual preferences) government savings.[34] Figure 2, which graphs the relationship between language and savings rates for OECD countries (without any controls), suggests that the results we find among households also seem to hold for national savings rates.

[34] This prediction does not immediately follow from theory, however. Samuelson (1937) showed that when the duration of a potential project is fixed, the value of that project may not be even weakly decreasing in the interest rate. Arrow and Levhari (1969) established that if an agent controls when a project terminates, then in deterministic settings the natural monotonic relationship must hold; the value of investment in projects must be monotonically decreasing in the interest rate. In Hicks' book *Capital and Time* (1973), this is referred to as the *Fundamental Theorem of Capital*. Under the conditions for which this relationship holds then, it is natural to predict that countries with strong FTR languages will, on average, save less.

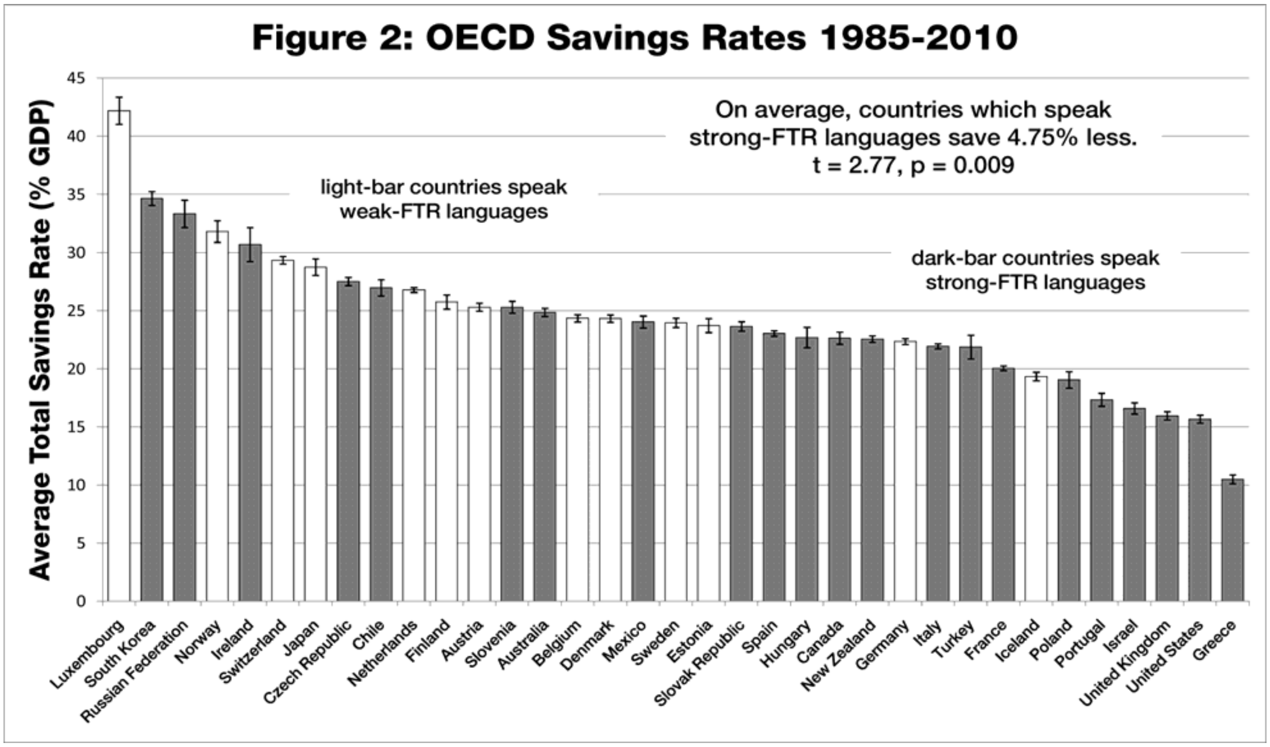

Figure 2 shows average total savings rates, accounting for both private and government consumption. Both Switzerland and Belgium have significant within-country FTR variation; for simplicity they are shaded according to their majority-FTR status. Difference in means are computed using a OLS regression where observations are clustered at the country level.

To see whether this trend survives a basic set of controls, table 10 summarizes a first set of regressions that comprise a more careful test of this prediction. These regressions closely follow Barrow and McDonald (1979), who run similar regressions on the same OECD national savings data that we investigate here. The basic functional form of these regressions is:

$$((Y-C)/Y)_{it} = \alpha_0 + \alpha_1(StrongFTR)_i + \alpha_2(1/Y)_{it} + \alpha_3(Y_{t-1}/Y_t)_{it} + \alpha_4(CAGR)_i + \varepsilon_{it}, \quad (12)$$

where annual observations for each country in the OECD are indexed by country $i = 1, ..., 35$ and year $t = 1970, ..., 2009$.[35] Most importantly: C is total consumption (including government expenditure) while Y is GDP, $CAGR$ is the average growth rate of the country from 1993 to 2009 (the earliest date for which data is available for all countries), and $StrongFTR$ is weighted by the percent of the country's population reports speaking each of their major languages.[36]

This form of this savings equation is a simple linear relation motivated by the Life-Cycle Hypothesis (LCH) of savings (see Modigliani 1986 for a review of the LCH). Notice that as equation 12 is written, all terms in the savings equation except $(1/Y)_{it}$ imply that a savings function that is homogeneous of degree 0, which is to say that the savings rate is independent of the level or unit of income. This assumption has theoretical support in the LCH model, and allows for a specification in which units of measurement do not need to be comparable across countries. It may be violated if, as Feldstein (1980) points out, higher incomes lead to a increase in the share of life spent in retirement. This leads to the presence of the $1/Y_{it}$ term, which can test for such effects as measured

[35] Details on the construction of each variable can be found in the data Appendix.

[36] Multi-lingual countries' FTR values need to be weighted by the shares of their populations speaking each language. I used the Ethnologue database to do this, see Lewis (2009) for details.

by a positive α_2. Essentially this term allows the marginal propensity to consume out of income to differ by the level of development of a country. In addition, OECD data allows for the inclusion of a number of important demographic controls:

$$\alpha_5(Unemployment)_{it} + \alpha_6(Old)_{it} + \alpha_7(Young)_{it} + \alpha_8(SocSec)_{it}.$$

These control for the unemployment rate, the fraction of the population that are over 65, the fraction under 15, and the per-capita fraction of GDP spent on social security payments (defined as % GDP spent on disability, old age, and survivors benefits divided by the fraction of the population that are over 65).

Another possible concern with cross-country regressions may be that the FTR strength of countries is spatially correlated. In Western Europe for example, most strong-FTR countries are in the northern half of the continent. This leads to the possibility that (at least in Western Europe), the effects I attribute to strong FTR could actually be due to correlated spatial factors (like climate or distance from Mediterranean trade routes) Similar stories might also invalidate my results on other continents. The inclusion of continent fixed effects and a country's Latitude allow me to investigate whether effects like these are biasing my results.

Empirical estimates of equation 12 are presented in Table 10.

Table 10: Gross Domestic Savings Rates in the OECD

	(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]
Unemployment$_t$ (%)	-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$_t$ (%GDP / Old)			-1.942	-1.909	-1.622	-5.457
			[2.252]	[2.040]	[2.153]	[3.395]
Protestant				-4.102	-4.229	-5.501
				[1.427]**	[1.850]*	[1.196]**
French Legal Origin					-0.424	0.358
					[2.425]	[3.401]
German Legal Origin					1.542	2.197
					[3.316]	[4.283]
Scandanavian Lgl Or					0.395	0.503
					[3.508]	[3.343]
Dist 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

Regressions are OLS regressions where the dependent variable is a country's Gross Domestic Savings Rate in year t. Observations are for OECD countries from 1970 to 2009. Protestant is a binary variable that measures if the country is majority protestant or not. Robust standard errors are reported in brackets and clustered at the country level. * significant at 5%; ** significant at 1%.

Regression 1 estimates a version of equation 12 that is fully homogeneous of degree 0, while regressions 2 through 6 add $1/PCGDP_t$, which allows savings rates to vary with the size of the economy. These regressions suggests that countries with a strong-FTR language save on average around five percentage points less per year than do countries with weak-FTR language, a result consistent with my earlier results on household savings and health measures. Regressions 5 and 6 add controls commonly found in the literature on economic growth: Protestantism and a country's legal origin.[37] Regression 6 adds two measures to help control for spatial correlation, continent fixed

[37] A large literature has argued that common-law countries provide stronger protection of outside investors from

effects, and the distance from a country's capital to the equator in thousands of miles. Overall, the measured effect of FTR on national savings rates is stable to the inclusion of these controls. Weak-FTR countries appear to save on average 6% more of their GDP per year than their strong-FTR counterparts.

5.6 Language and Savings in the OECD: Robustness Checks

To get a sense of the stability of my measured effect over time, I re-estimate equation 12 separately for each decade that OECD data is available. These estimates are reported in Table 11.

Table 11: Gross Domestic Savings Rates in the OECD by Decade

	(1)	(2)	(3)	(4)	(5)
	$GDSR_t$	$GDSR_t$	$GDSR_t$	$GDSR_t$	$GDSR_t$
Strong FTR	-5.212	-4.194	-5.458	-5.142	-6.975
	[1.769]**	[1.750]*	[1.805]**	[2.043]*	[2.667]*
$PCGDP_{t-1}$ / $PCGDP_t$	-35.035	-46.258	-64.147	-49.460	-18.060
	[8.930]**	[12.536]**	[15.494]**	[19.760]*	[8.391]*
CAGR	-0.009	0.397	0.313	0.121	-0.056
	[0.169]	[0.571]	[0.329]	[0.371]	[0.158]
$Unemployment_t$ (%)	-0.367	-0.544	-0.360	-0.229	-0.321
	[0.133]**	[0.307]	[0.189]	[0.192]	[0.153]*
Old_t (%)	-1.382	-1.298	-1.178	-1.803	-2.019
	[0.298]**	[0.552]*	[0.321]**	[0.382]**	[0.513]**
$Young_t$ (%)	-0.663	-0.624	-0.213	-0.810	-1.237
	[0.184]**	[0.464]	[0.320]	[0.257]**	[0.230]**
1 / $PCGDP_t$	-28.119	112.425	-23.892	-49.676	-66.561
	[49.798]	[78.480]	[29.367]	[53.792]	[85.171]
Years:	All	1970-79	1980-89	1990-99	2000-09
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 a country's Gross Domestic Savings Rates in year t. Robust standard errors are reported in brackets and clustered at the country level. * significant at 5%; ** significant at 1%.

While statistical power becomes an issue when subdividing these data, the effect of language on savings appears stable across time, and is significant in every decade. Earlier regressions have fewer observations due to OECD expansion in the 1980's and early 1990's. Increasing membership in the OECD also makes it hard to compare coefficients across time periods; however in a pooled regression the interactions between language and decade dummies are insignificant.

These OECD regressions have the benefit of comparing relatively similar countries: the member nations of the OECD are developed economies dedicated to open markets and free trade. By merging world-bank national savings data with the WVS however, we can investigate whether these cross-country national savings results extend to less-developed countries. In addition, this

expropriation by corporate insiders, and that this and other features of a legal system are largely determined by a country's legal origin; see La Porta 2008 for an excellent survey.

allows us to examine whether these cross-country regressions survive the types of culture and values controls that are present in the WVS. Table 12 reports the results of these regressions.

Table 12: Gross Domestic Savings Rates in the WVS

	(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]
French Legal Origin		-7.676	-3.302	-7.578	-4.191	-2.189
		[2.843]**	[2.828]	[4.887]	[4.831]	[6.080]
German Legal Origin		-9.937	-6.735	-11.716	-6.883	-6.450
		[6.790]	[4.980]	[4.828]*	[5.204]	[8.180]
Scandanavian Lgl Or		-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]*
$Unemployment_t$ (%)			-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	Yes	Yes
PCGDP	All	All	All	All	All	$< 5,000$
Observations	120	120	113	113	113	73
R-squared	0.20	0.32	0.51	0.55	0.62	0.65

Regressions are OLS regressions where the dependent variable is a country's Gross Domestic Savings Rates in year t. Observations are for the countries in the WVS countries over three waves, from 1994 to 2008. Robust standard errors are reported in brackets and clustered at the country level. * significant at 5%; ** significant at 1%.

The results of these regressions suggest that the national savings results I find are not limited to the developed nations of the OECD, and also survive the cultural controls that are found in the WVS. Overall, if anything the effect of language on national savings appears stronger (in percentage points) among developing than developed nations, and are not significantly attenuated by the inclusion of culture and values controls.

6 Discussion

6.1 Language, Thought, and Behavior

The idea that language can impact the way people think and act has a rich history in linguistics, philosophy, and psychology. Saussure, the founder of both structural linguistics and semiotics, characterized reality as an unstructured phenomena that is discretized and organized by language, writing: "if words stood for pre-existing entities they would all have exact equivalents in meaning from one language to the next, but this is not true" (Saussure 1916). In his *Tractatus Logico-Philosophicus* (1922), Wittgenstein formulates a theory of language as the means by which people both picture and reason about reality, famously concluding: "*Wovon man nich sprechen kann, darüber muss man schweigen*" (Whereof one cannot speak, thereof one must be silent). The idea that language can influence thought has become know as the Sapir-Whorf hypothesis (SWH, Whorf 1956), and has generated several interesting lines of research in linguistics and psychology.[38] My hypothesis can be thought of as an instance of the SWH, and is to my knowledge, the first to connect language structure and decision making.

6.1.1 Skepticism of the Weak Sapir-Whorf Hypothesis

While many studies support at least a weak form of the SWH, there are a number of scholars who argue that on balance, the idea that cognition is shaped by language is misguided. Most prominently, in his seminal work *Syntactic Structures* (1957), Chomsky argues that humans have an innate set of mechanisms for learning language, and that this constrains all human languages to conform with a "universal grammar".

Taken in strong form, a universal grammar would largely eliminate the scope for language to affect cognition. In *The Language Instinct* (1994), Pinker argues exactly this: that humans do not think in the language we speak in, but rather in an innate "mentalese" which precedes natural language. He concludes that: "there is no scientific evidence that languages *dramatically* shape their speakers' ways of thinking" (emphasis mine).While a rich literature since 1994 has disputed this claim, support for the SWH remains an hotly debated topic.

6.1.2 Language Acquisition and Future-Time Reference

Important for evaluating my hypothesis, several studies have looked at differences between children learning weak and strong-FTR languages. Harner (1981) finds that among English-speaking children, the use of the future tense begins by age 3 and is relatively developed by age 5. Szagun (1978) finds that the time-path of this development is identical in matched pairs of English and German children, with these pairs of children showing no discernible difference in the rate at which they acquire and use FTR. Differences between English (strong-FTR) and German (weak-FTR) were reflected in Szagun's study, but only among adults: the German-speaking parents of the children Szagun studied used FTR much less often than their English-speaking counterparts. These similar development paths suggest that the differences that I find between weak and strong-FTR language speakers do not reflect innate cognitive nor early cultural differences between speakers of different languages, at least as reflected in the development of children through age five.

[38] See Scholz et al 2011 for a review of Sapir-Whorf hypotheses.

6.1.3 Work on Language in Economics

Work on language in economics has primarily focused on whether language, either by evolution or design, maximizes some objective function. The earliest example of this is Marschak (1965) which asks both which traits will be selected as languages evolve, and what objectives policy makers should have in mind when shaping a language, either directly (as in the case of the *Académie française)*[39] or through educational policy. Closest in objective to this paper, Rubinstein (2000) studies a model in which decision makers use language to both perceive and verbalize decisions. It follows that: "interesting restrictions on the richness of a language can yield interesting restrictions on the set of an economic decision maker's admissible preferences". This "expressibility effect" is essentially a much stronger form of what I test for here: the ability of language to affect beliefs and behavior.

6.1.4 Work on Development and Growth

There is also a broad and ongoing debate as to why similarly-situated nations and societies can differ so greatly in their economic development and wealth. Jared Diamond is probably best associated with the geographer / biologist's view that these differences are mainly due to geography, climate, and the ecology of animal domestication (Diamond 2005). Historian David Landes argues that deep seated cultural factors affect the ability of societies to exploit science, technology, and markets (Landes 1999). Finally, social scientists such as Acemoglu, Robinson, and Shleifer have argued for the central role of institutions in providing the right incentives for innovation and good government (Acemoglu & Robinson 2012, La Porta et al 2008). All of these theories were developed by comparing similarly situated nations and societies that have experienced divergent economic outcomes. While my findings are not a theory of development, they do suggest that language structure is an important factor to account for when making such comparisons.

7 Conclusion

Overall, my findings are largely consistent with the hypothesis that languages with obligatory future-time reference lead their speakers to engage in less future-oriented behavior. On savings, the evidence is consistent on multiple levels: at an individual's propensity to save, to long-run effects on retirement wealth, and in national savings rates. These findings extend to health behaviors ranging from smoking to condom use, as well as to measures of long-run health. All of these results survive after comparing only individuals who are identical in numerous ways and were born and raised in the same country.

One important issue in interpreting these results is the possibility that language is not *causing* but rather *reflecting* deeper differences that drive savings behavior. These available data provide preliminary evidence that much of the measured effects I find are causal, for several reasons that I have outlined in the paper. Mainly, self-reported measures of savings as a cultural value appear to drive savings behavior, yet are completely uncorrelated with the effect of language on savings. That is to say, while both language and cultural values appear to drive savings behavior, these measured effects do not appear to interact with each other in a way you would expect if they were both markers of some common causal factor.

[39] The *Académie francaise* is made up of 40 members (*immortels*) who are elected to life terms. The *Académie* is France's official authority on the vocabulary and grammar of the French language, and publishes the *Dictionnaire de l'Académie française*, the official dictionary of the French language.

In addition, differences in the use of FTR do not seem to correspond to cognitive or developmental differences in the acquisition of language. This suggests that the effect of language that I measure occurs through a channel that is independent of either cultural or cognitive differences between linguistic groups.

Nevertheless, the possibility that language acts only as a powerful marker of some deeper driver of intertemporal preferences cannot be completely ruled out. This possibility is intriguing in itself, as the variation in future-time reference that identifies my regressions is very old. In Europe for example, most Germanic and Finno-Ugric languages have been futureless for hundreds of years. Indeed, Dahl (2000) suggests that proto-Germanic was futureless at least two thousand years ago.

8 Appendix A: Data

8.1 Data Statements

This paper uses data from SHARE release 2.3.1, as of July 29th 2010. SHARE data collection in 2004-2007 was primarily funded by the European Commission through its 5th and 6th framework programmes (project numbers QLK6-CT-2001- 00360; RII-CT- 2006-062193; CIT5-CT-2005-028857). Additional funding by the US National Institute on Aging (grant numbers U01 AG09740-13S2; P01 AG005842; P01 AG08291; P30 AG12815; Y1-AG-4553-01; OGHA 04-064; R21 AG025169) as well as by various national sources is gratefully acknowledged (see http://www.share-project.org for a full list of funding institutions).

8.2 Wording of Questions in the WVS (Household Level Variables)

FAMSAVED: During the past year, did your family (read out and code one answer):
1: Save money (23%)
2: Just get by (51%)
3: Spent some savings and borrowed money (14%)
4: Spent savings and borrowed money (12%)

For the regressions in this paper, this variable is coded as 1 if the family reported saving money, and 0 otherwise.

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):
1: Most people can be trusted. (26%)
2: Need to be very careful. (74%)

FAMILY: indicate how important it is in your life. Would you say it is
1: 'Very important' (91%)
2: 'Rather important' (8%)
3: 'Not very important' (1%)
4: '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? Please choose up to five! (Code five mentions at the maximum):

Independence	Hard work
Feeling of responsibility	Imagination
Tolerance and respect for other people	Thrift, saving money and things (37%)
Determination, perseverance	Religious faith
Unselfishness	Obedience

UNEMPLOYED: Respondents are asked to chose one of three options:
1: Employed (52%)
2: Not in Labor Force (38%)
3: Unemployed (10%)

8.3 World Bank, World Development Indicators (WDI)

LEGAL ORIGIN VARIABLES: Following La Porta et al 1997, many cross-country analyses have included fixed effects for the origin of a country's legal system. These controls account for the fact that legal rules protecting investors appear to vary systematically among legal traditions, with La Porta et al arguing that the laws of common law countries (originating in English law) are more protective of outside investors than civil law countries (originating in Roman law). They argue that these protections limit the extent of expropriation of outside investors by corporate insiders, and thereby promotes financial development. In this paper I include fixed effects for French, German, and Scandinavian legal origins, with English Legal origins as the excluded category. See La Porta et al 2008 for a summary of this measure and the literature surrounding it.

LEGAL RIGHTS INDEX: The World Bank strength of legal rights index measures the degree to which a country's collateral and bankruptcy laws protect the rights of borrowers and lenders and thus facilitate lending. The index ranges from 0 to 10, with higher scores indicating that these laws are better designed to expand access to credit. For details, see the World Bank Doing Business Project, (www.doingbusiness.org).

PCGDP is gross domestic product divided by midyear population. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in constant U.S. dollars from the year 2000.

GDSR: The Gross domestic savings rate is calculated as GDP less final consumption expenditure (total consumption), as a percent of GDP. These numbers (as reported by the World Bank) are from World Bank national accounts data and OECD National Accounts data.

REAL INTEREST RATE is the lending interest rate of a country at time t adjusted for inflation as measured by the GDP deflator. The source for these numbers (as reported by the World Bank) is the International Monetary Fund, International Financial Statistics, using World Bank data on the GDP deflator.

OLD_t and YOUNG_t are the percent of the population that are older than 65 and younger than 15 in year t.

Data Summary Table 1 (WVS, Country-Wave Level)

WDI Variables:	Mean	SD
$GDSR_t$	18.2%	14.2%
$PCGDP_t$ (US$)	$7,375	$10,080
$PCGDP_{t-1}$ / $PCGDP_t$	0.967	0.043
Real interest $rate_t$	6.28%	15.9%
Old_t	9.14%	4.87%
$Young_t$	26.9%	9.26%
Legal rights index (1 to 10)	5.99	2.31

WVS Variables:	Mean	SD
Trust (country aver)	25.9%	14.9%
Family (country aver)	1.11	0.074

Legal Origins (# of countries):
UK (19), French (37), German (16), Scandinavian (3)

Data Summary Table 2 (WVS, Household Level)

Variable:	% of Households
Saved this year	23.0%
Strong FTR (language spoken at home)	85.0%
Sex (male)	48.2%
Unemployed	9.84%
Most people can be trusted (agree)	26.2%

Variable:	Mean	SD
Age	40.5	16.1
Age finished school	19.3	6.35
Number of children	1.95	1.85
Family importance (1 ‘very’ - 4 ‘not at all’)	1.10	0.351
Language Share	76.1%	31.9%
FTR Share	97.4%	11.2%

8.4 Variables in the SHARE

HHNETWORTH: A household's net worth in the SHARE "HHNetWorth" is attempt to measure all real assets net of any debts on them. It is equal to the estimated value of a household's: main residence, real estate other than the main residence, businesses, cars, bank accounts, bonds, stocks, mutual funds, life insurance, minus mortgage and other debt, in 2005 Euros, as collected by the OECD.

AVERDISINC: A country's average disposable income is per head, with PPP and in 2005 Euros, as collected by the OECD.

SMOKED: This codes whether an individual reports: "Have you ever smoked cigarettes, cigars, cigarillos or a pipe daily for a period of at least one year?"

PHYSICALLY ACTIVE: Physical inactivity is defined as "never or almost never engaging in neither moderate nor vigorous physical activity." Being physically active is not being inactive.

OBESITY: This is defined as a body-mass index of 30 or greater.

WALKING SPEED: This was measured only among individuals aged 76 years and older. Walking speed was averaged over two tests, as measured in meters per second, down a hallway at least 10 meters long.

GRIP STRENGTH: Grip strength is measured with a dynamometer at the interview (in kg).

PEAK FLOW: Peak expiratory flow measures a person's maximum exhalation air-flow, as measured with a peak-flow meter (in L/min).

Data Summary Table 3 (SHARE, Household Level)

Variable:	% of Households
Smoked	47.6%
Physically inactive	89.4%
Obesity (BMI > 30)	17.6%

Variable:	Mean	SD
Household net worth (€)	333,417 €	1,183,231 €
Disposable income (€)	21,354 €	3,935 €
Age (years)	65.9	10.5
Education (years)	10.7	4.42
Number of children	2.13	1.41
Walking speed (m/s)	0.692	0.373
Grip strength (kg)	34.5	12.1
Peak expiratory flow (L/min)	337	160

8.5 Variables in the DHS

SMOKE: This codes whether an individual reports currently smoking.

OBESITY: This is defined as a body-mass index of 30 or greater.

CONTRACEPTION: This codes whether the respondent reports currently using any form of contraception.

CONDOM: This codes whether the respondent reports having used a condom during their last sexual encounter.

WEALTH and EDUCATION are coded categorically in the DHS. Wealth is reported as a five-level wealth index, while education is coded by highest level of education attained.

Data Summary Table 4 (DHS, Household Level)

Variable:	% of Households
Smoke	4.83%
Obesity (BMI > 30)	23.1%
Use any form of contraception	24.7%
Used a condom last sexual encounter	8.85%
Sex (male)	29.9%
Education: Primary School	22.1%
Education: Secondary School	29.2%
Education: Higher	6.11%

Variable:	Mean	SD
Age (years)	29.3	10.4
Number of children	3.06	3.41
Household Size	6.74	4.19

8.6 OECD Variables

All GDP-based measures are computed using the expenditure method, with constant PPPs using US dollars from the OECD base year (2000).

CAGR is the average growth rate of the country from 1993 to 2009 (the earliest date for which data is available for all countries).

OLD_t and YOUNG_t are the percent of the population that are older than 65 and younger than 15 in year t.

SOC SEC_t is the the per-capita fraction of GDP spent by a country in year t on social security payments, divided by the fraction of the population that are over 65. These payments include expenditures on disability, old age, and survivors benefits.

DIST FROM EQUATOR is the distance in thousands of miles between a country's capital and the equator.

Data Summary Table 5 (OECD Country-Year Level)

Variable	Mean	SD
GDSR_t	24.2%	5.90%
Strong FTR	64.6%	46.6%
PCGDP_t (US$)	$22,096	$9,259
PCGDP_{t-1} / PCGDP_t	0.978	0.030
CAGR_t	9.69%	9.90%
Old_t	13.1%	3.48%
Young_t	20.2%	4.94%
Social Security_t	0.743	0.233
Distance from the Equator	3.214	0.666

Legal Origins (# of countries):

UK (7), French (12), German (11), Scandinavian (5)

9 Appendix B: Measures of Future-Time Reference

9.1 Methods for the Online Measures

9.1.1 Selection of Languages to Cover

As a first proxy for languages which are well represented on the web, I look at the set of languages that Google allows a web search to be restricted to, or which are covered by Google Translate (whose main function is translating websites). I exclude languages from this list which are either synthetic (Esperanto) or are not spoken by significant numbers of people as their first language (Latin). I then conduct a Google search for variants of the phrase 'weather forecast', in each of these languages, restricted to results in that language. So for example, I conduct a Google search for the terms "*wettervorhersage*", "*wetterprognose*", and "*wetterberichte*", restricted to websites in German.

9.1.2 Gathering Texts

From here, research assistants and I gathered websites indexed within the first 5 pages (or 60 results) returned by Google.[40] We identified those websites which contained full-sentence weather forecasts, as opposed to forecasts expressed pictorially (sun and cloud icons), or as short phrases ('Friday, high of 62'). For several sparsely spoken languages we could find no such websites, and excluded those languages from analysis. This selection methodology resulted in a set of 39 languages for analysis, with the vast majority represented by 3 or more websites.

For each of these 39 languages, we then scraped the web over a period of 3 months (5-2012 through 7-2012), collecting forecasts from the websites we had identified. Restricting analysis to sentences from these scrapings that refer solely to future events (some sentences discuss past weather patterns, or general seasonal patterns), resulted in roughly 46 sentences per language to analyze, for an average of 58.4 verbs.

9.1.3 Computing Measures

In each language, we compiled the set of grammatical markers which linguists agree are future-time markers. Then, for each of these 39 languages, we computed two measures of future-time reference intensity. "Verb ratio" counts the number of verbs which are grammatically future-marked, divided by the total number of future-referring verbs. In other words, in online weather forecasts in a language, what share of verbs about future weather are marked as future-referring? Similarly, "sentence ratio" asks: what share of sentences regarding future weather contain a grammatical future marker? In some languages (Arabic, for example), a sentence with multiple verbs will often mark only the first as future-regarding. Grammatical differences like this produce variation between verb and sentence ratios. The results of this exercise are summarized in Appendix Table 1.

9.1.4 Regressions with Online Language Measures

While the set of languages codable in this way is limited to those which are well represented on the searchable internet, it is extensive enough that both the OECD and SHARE results I report can be run substituting either ratio instead of the binary weak vs. strong FTR measure. Both

[40] I want to thank Yale undergraduates Jane Bang and Ryan Caro, for their invaluable research assistance in assembling these data, and and Yale linguistics doctoral candidate Nicole Palffy-Muhoray for invaluable feedback on sensible measures of future-time reference intensity.

measures produce results that are nearly identical (both quantitatively and statistically) to the results I report in this paper. Please see the online appendix for the results of these regressions.

Appendix B Table 1: Languages and Online FTR Ratios

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

9.2 Methods for the Extending the EUROTYP

The analyses of Thieroff (2000) suggest that the tendency to mark prediction-based FTR maps more generally onto whether "future time reference can be referred to with unmarked form (the present)". Dahl also finds that weak-FTR corresponds strongly with a language's general tendency to require FTR, and suggests that "whether FTR is overtly and obligatorily marked in prediction-based sentences can be used as one of the major criteria for whether it is grammaticalized in a language or not" (Dahl 2000). These analyses motivate my decision to use weak-FTR as a proxy for the general treatment of future time in a language.

Most analyses in this paper study languages directly analyzed by the EUROTYP Theme Group. In those regressions, weak-FTR languages are the set of languages Dahl calls "futureless" languages and Thieroff (2000) calls "weakly-grammaticalized future" languages. Some regressions analyze the World-Values Survey, whose participants speak many non-European languages not analyzed by either Dahl or Thieroff.

To extend their characterization to this broader set, I rely on several other cross-linguistic analyses that have studied how languages mark future time (most notably Bybee et al. 1994, Cyffer et al. 2009, Dahl 1985, Dahl & Kós-Dienes 1984, and Nurse 2008). Most importantly, several African countries are well represented in the WVS and have several national languages. Given their potential importance for within-country identification, I code these languages only when both a cross-linguistic study and a language specific reference grammar agree on a language's FTR structure. Most important were Adu-Amankwah (2003) for Akan, Olawsky (1999) and Lehr, Redden & Balima (1966) for Dagbani and Moore, Newman (2000) for Hausa, Carrell (1970), Emenanjo (1978), Ndimele (2009), and Uwalaka (1997) for Igbo, Bentley (1887) for Kongo, and Awobuluyi (1978), and Gaye & Beecroft (1964) for Yoruba.

I have attempted to be as conservative as possible in extending my weak-FTR coding to languages not covered by the EUROTYP. Several rules applied, which I will describe.

9.2.1 A Conservative Binary Coding

For several languages, multiple sources suggest that that language does not grammatically mark future events. For example, Chinese grammars uniformly find no grammatical marking of future events, and amply available texts demonstrate that Chinese speakers grammaticalize the future exactly like they grammaticalize the present and past. Similarly, Finnish and Estonian are languages in Europe which stand out as lacking FTR grammaticalization. Among African languages, Nurse (2008) analyzes a set of more than 200 Bantu languages, and finds that roughly nine percent of those languages grammaticalize a non-past category, (that is, have no discretely grammaticalized future). Kongo is a notable example. Dahl (1985) studies 64 languages from every major language group in the world, and finds 14 that show no evidence of grammaticalized FTR.

If a language is described as lacking any grammaticalized FTR by several independent sources, I code it as weak-FTR.

Similarly, in these cross-linguistic studies, several languages stand out as having particularly heavily-grammaticalized FTR. For example, Nurse (2008) notes several languages in which not only are future events grammaticalized with a dedicated prefix or suffix, but often posses finer obligatory distinctions, like a hodiernal (before dawn tomorrow) future. Studies like Dahl (1985) allow me to add a quantitative component to this kind of comparison. In his surveys of native speakers, there are languages (like Georgian), which both posses a dedicated inflectional future, and whose speakers use this future in nearly every sentence with FTR.

If multiple sources describe a language in this way, I code it as strong-FTR.

Note that this process is conservative, as there are several languages studied in the EUROTYP which these rules would not have been able to classify. For example, Swedish was classified as weak-FTR ("futureless") by both Dahl and Theiroff, but is a language which I would not have been able to classify.

Please see the online appendix for a full table of all languages included in this study and their coding.

9.2.2 Robustness

An alternative process would be a web-data scraping exercise like the one I describe above, which would result in a continuous (though imperfect in other ways) measure. This suggests two natural robustness checks. First, I could have used the continuous web measure in my regressions. Second, I could have continued to use a binary classification, but tested the sensitivity of my results to moving the cut-off which defines the binary classification along the continuous web measure.

As of now, the small sample of languages that I can analyze using my web-weather-forecast methodology is too small to be useful for WVS regressions. In my regressions in both the SHARE and the OECD data though, both of these robustness checks are possible, and produce results which are both quantitatively and statistically identical to the ones I report in thin paper. This gives me confidence that the procedure I adopted to expand the set of weak and strong FTR coded countries did not systematically bias my results. Please see the online appendix for the results of these robustness checks.

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The Effect of Language on Economic Behavior: Evidence from Savings Rates, Health Behaviors, and Retirement Assets

Online Appendix

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1 Alternate Measures of FTR Structure

The analyses in this appendix investigate the sensitivity of my results to alternate ways of measuring a language's FTR structure. In section 4.2 and in the published appendix of the main paper I discuss two alternatives to the strong vs. weak FTR dichotomy. Investigating how my results change when these alternative measures are used can be thought of as a robustness test of the binary dichotomy I use in the main paper.

1.1 Regressions with Online Language Measures

Section 4.2 and the main appendix of the paper describe a measure of FTR strength based on word-frequency analysis of text retrieved from online full-sentence weather forecasts. As of the writing of the main paper, this analysis covers 39 languages which are well-represented on the internet.

Table 1 in the main appendix reports two measures of how frequently a weather reports grammatically marks future time. "Verb ratio" counts the number of verbs which are grammatically future-marked, divided by the total number of future-referring verbs. In other words: in online weather forecasts in a language, what share of verbs about future weather are marked as future-referring? Similarly, "sentence ratio" asks: what share of sentences regarding future weather contain a grammatical future marker? In some languages (Arabic for example), often a sentence with multiple verbs will grammatically mark only the first as future-regarding. Differences between languages in rules like these lead to variation between verb and sentence ratios.

1.1.1 Regressions with Online Language Measures

While the set of languages codable in this way is limited to those which are well represented on the searchable internet, it is extensive enough that both the OECD and SHARE results I report can be run using either ratio instead of the binary weak vs. strong FTR measure. Online Appendix Tables 1, 2, and 3 report the results of these regressions.

Table 1 reports regressions of OECD savings rates on our two online language measures and numerous economic and demographic controls commonly found in studies of national savings. These regressions are identical in form to those reported in Table 10 of the main paper. Please see the main paper for details on both the estimating equation and details on the controls included in these regressions.

Online Appendix Table 1: GDSRs in the OECD and Online Language Measures

	(1) GDSR_t	(2) GDSR_t	(3) GDSR_t	(4) GDSR_t	(5) GDSR_t	(6) GDSR_t
Sentence Ratio	-5.446		-6.531		-6.124	
	[1.789]**		[2.029]**		[1.579]**	
Verb Ratio		-6.131		-6.987		-6.774
		[1.911]**		[2.139]**		[1.610]**
PCGDP_{t-1} / PCGDP_t	-32.864	-32.528	-43.532	-42.909	-32.454	-32.441
	[8.140]**	[7.971]**	[14.583]**	[14.221]**	[12.025]*	[11.875]*
CAGR	-0.118	-0.127	0.032	0.001	0.010	-0.011
	[0.104]	[0.102]	[0.209]	[0.205]	[0.173]	[0.170]
Unemployment_t (%)	-0.462	-0.44	-0.207	-0.209	-0.301	-0.296
	[0.167]**	[0.163]*	[0.153]	[0.149]	[0.179]	[0.178]
Old_t (%)	-1.162	-1.117	-1.235	-1.154	-1.327	-1.229
	[0.339]**	[0.328]**	[0.366]**	[0.351]**	[0.370]**	[0.361]**
Young_t (%)	-0.544	-0.508	-0.364	-0.339	-0.203	-0.163
	[0.190]**	[0.187]*	[0.275]	[0.266]	[0.215]	[0.213]
1 / PCGDP_t			-87.681	-78.234	-115.33	-110.81
			[59.121]	[58.455]	[45.840]*	[45.384]*
Soc Sec_t (%GDP / Old)			-3.215	-3.178	-4.638	-4.476
			[2.285]	[2.349]	[2.678]	[2.654]
Protestant					-3.808	-3.941
					[1.372]*	[1.361]**
Dist from Equator					2.867	2.660
					[1.520]	[1.491]
Corresponding Coef.	-5.272	-5.272	-5.245	-5.245	-5.730	-5.730
on Strong FTR	[1.798]**	[1.798]**	[1.948]*	[1.948]*	[1.454]**	[1.454]**
Observations	841	841	564	564	564	564
R-squared	0.43	0.45	0.49	0.49	0.58	0.59

Regressions are OLS regressions where the dependent variable is a country's Gross Domestic Savings Rate in year t. Observations are for OECD countries from 1970 to 2009. Protestant is a binary variable that measures if the country is majority protestant or not. Robust standard errors are reported in brackets and clustered at the country level. * significant at 5%; ** significant at 1%.

Similar to the regressions from Table 10 in the main paper, these regressions suggests that countries whose languages never grammaticalize future-time reference save on average about six percentage points more than those which mark FTR 100% of the time.

For the sake of comparison, Table 1 also lists the coefficient on Strong FTR for each regression when my original measure of FTR used. The results I obtain when substituting in either the sentence or verb ratio are nearly identical (both quantitatively and statistically) to the corresponding coefficients on Strong FTR. This suggests the results I report in the main paper are robust to different ways of measuring languages' FTR structure.

Table 2 reports regressions of accumulated retirement assets in the SHARE on our two online language measures. These regressions are identical in form to those reported in Table 6 of the main paper. Please see the main paper for details on both the estimating equation and details on the controls included in these regressions.

Online Appendix Table 2: Ret. Assets in the SHARE and Online Measures

	(1)	(2)	(3)	(4)	(5)	(6)
	$IHS\left(\frac{RA}{DI}\right)$	$IHS\left(\frac{RA}{DI}\right)$	$IHS\left(\frac{RA}{DI}\right)$	$IHS\left(\frac{RA}{DI}\right)$	$IHS\left(\frac{RA}{DI}\right)$	$IHS\left(\frac{RA}{DI}\right)$
Sentence Ratio	-0.400		-0.396		-0.366	
	[0.017]**		[0.047]**		[0.077]**	
Verb Ratio		-0.408		-0.404		-0.373
		[0.017]**		[0.048]**		[0.078]**
Fixed Effects:						
Age	Yes	Yes	Yes	Yes	Yes	Yes
Country × Wave	Yes	Yes	Yes	Yes	Wave	Wave
Income	No	No	Yes	Yes	Yes	Yes
Education	No	No	Yes	Yes	Yes	Yes
Married × Num Chil	No	No	Yes	Yes	Yes	Yes
All FEs Interacted	Yes	Yes	Yes	Yes	Yes	Yes
Countries	All	All	All	All	BE & CH	BE & CH
Corresponding Coef.	-0.390	-0.390	-0.386	-0.386	-0.356	-0.356
on Strong FTR	[0.017]**	[0.017]**	[0.047]**	[0.047]**	[0.079]**	[0.079]**
Observations	39,665	39,665	39,350	39,350	5,937	5,937
F stat	547.74	551.77	70.40	70.76	22.84	22.86

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%.

Regressions 1 through 6 show my predicted effect carries through to using online language FTR measures; moving from a language which does not grammaticalize future-time reference to one that marks it 100% of the time leads households accumulating around 39% less by the time they retire. These regressions are largely identified by the fact that Belgium has large Flemish (weak-FTR) and French (strong-FTR) speaking populations, and Switzerland has large German (weak-FTR), and French, Italian, and Romansh (strong-FTR) speaking populations.

For the sake of comparison, Table 2 also lists the coefficient on strong-FTR for each regression when that is the measure of FTR used. The results I obtain when substituting in either the sentence or verb ratio are nearly identical (both quantitatively and statistically) to the corresponding coefficients on Strong FTR. This suggests the results I report in the main paper are relatively robust to the specification of strong and weak FTR.

Table 3 reports regressions of health behaviors in the SHARE on our two online language measures and a large number of demographic controls. These regressions are identical in form to those reported in Table 8 of the main paper. Please see the main paper for details on both the estimating equation and details on the controls included in these regressions.

Online Appendix Table 3: Health Behaviors in the SHARE and Online Measures

	(1) Smoked	(2) Smoked	(3) Phy Act	(4) Phy Act	(5) Obesity	(6) Obesity
Sentence Ratio	1.248		0.704		1.135	
	[0.042]**		[0.026]**		[0.006]**	
Verb Ratio		1.254		0.699		1.138
		[0.043]**		[0.026]**		[0.006]**
Full set of FEs from reg 4 table 6	Yes	Yes	Yes	Yes	Yes	Yes
All FEs Interacted	Yes	Yes	Yes	Yes	Yes	Yes
Corresponding Coef.	1.241	1.241	0.709	0.709	1.131	1.131
on Strong FTR	[0.042]**	[0.042]**	[0.025]**	[0.025]**	[0.007]**	[0.007]**
Observations	15,750	15,750	9,135	9,135	11,958	11,958

Regressions are fixed-effect (or conditional) logistic regressions with coefficients reported as odds ratios. The dependent variables are: having smoked daily for a year or more, engaging in regular physical activity, and medically obesity. 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%.

Regressions 1 and 2 indicate that moving from a language which does not grammaticalize future-time reference to one that marks it 100% of the time leads to a 25% higher probability of having ever smoked (daily for a year or more). This is consistent with my main findings on savings if the decision to smoke trades off immediate benefits versus future health costs. Regressions 3, 4, 5, and 6 show similar effects for both self-reported physical activeness and measured obesity.

For the sake of comparison, Table 3 also lists the coefficient on strong-FTR for each regression when that is the measure of FTR used. The results I obtain when substituting in either the sentence or verb ratio are nearly identical (both quantitatively and statistically) to the corresponding coefficients on Strong FTR. This suggests the results I report in the main paper are relatively robust to the specification of strong and weak FTR.

2 Regressions with Alternative Typological Language Measures

Section 4.2 of the paper describes two alternative typological distinctions in addition to the strong vs. weak FTR classification I examine in the main paper. **Any FTR** is a weaker criterion which marks the presence of *any grammatical marking* of future events in a language, even if infrequently used. This would include both *inflectional* markers (like the future-indicating suffixes in Romance languages) or *periphrastic* markers (like the English auxiliary 'will'). Mandarin, Finnish, and Estonian are examples of languages that lack either type of future markers. **Inflectional FTR** is a stronger criterion which marks the presence of an inflectional future tense. These alternative criterion satisfy:

$$\text{Any Gr FTR} \supset \text{Weak FTR} \supset \text{Strong FTR} \overset{?}{\supset} \text{Inflectional FTR}, \tag{1}$$

with the first and second inclusions being logically necessary, and the third representing a typological regularity for which I do not have a counterexample.

A natural hypothesis would be that as we move from weaker to stronger measures of a language's FTR structure, the effects I measure in the main paper would strengthen. Unfortunately, this divides languages into 4 sets rather than the 2 defined by strong and weak FTR, which lowers the power of the regressions in the paper and leads to identification off of very narrow sets of languages. For example, once country fixed effects eliminate cross-country variation, Estonian is the only remaining European language with no grammaticalized FTR, and Mandarin is the only remaining Asian language.

However, it is possible to include all three criteria as nested effects in the broader cross-country savings regressions I run. Online Appendix Table 4 presents regressions with these nested effects added to cross-country savings regressions in the World Values Survey (Table 12 in the main paper). Please see the main paper for details on both the estimating equation and details on the controls included in these regressions.

Online Appendix Table 4: Savings Rates in the WVS and Nested FTR Measures

	(1)	(2)	(3)	(4)	(5)	(6)
	$GDSR_t$	$GDSR_t$	$GDSR_t$	$GDSR_t$	$GDSR_t$	$GDSR_t$
Any FTR		-5.752		-3.716		-2.526
		[6.306]		[4.254]		[3.827]
Strong FTR	-15.545	-12.566	-12.253	-10.233	-11.328	-8.836
	[4.814]**	[4.802]*	[3.337]**	[3.939]*	[3.320]**	[3.871]*
Inflectional FTR		-1.032		-0.815		-2.828
		[6.520]		[4.959]		[4.162]
$PCGDP_{t-1}$ / $PCGDP_t$	19.905	22.469	15.108	16.564	15.616	11.208
	[28.120]	[29.389]	[25.197]	[26.142]	[23.366]	[22.869]
Old_t (%)	-1.718	-1.571	-1.916	-1.807	-2.112	-1.881
	[0.839]*	[1.043]	[0.730]*	[0.860]*	[0.687]**	[0.769]*
$Young_t$ (%)	-0.736	-0.632	-0.813	-0.737	-0.891	-0.728
	[0.498]	[0.710]	[0.501]	[0.620]	[0.512]	[0.587]
French Legal Origin	-7.676	-7.143	-3.302	-2.929	-7.578	-7.748
	[2.843]**	[3.658]	[2.828]	[3.448]	[4.887]	[4.778]
German Legal Origin	-9.937	-9.951	-6.735	-6.702	-11.716	-12.253
	[6.790]	[6.308]	[4.980]	[4.681]	[4.828]*	[4.980]*
Scandanavian Lgl Or	-7.430	-7.376	-3.196	-3.13	-6.432	-6.595
	[7.248]	[7.644]	[5.326]	[5.570]	[5.355]	[5.825]
1 / $PCGDP_t$	-4.455	-4.721	-4.819	-5.001	-5.102	-5.541
	[1.726]*	[2.248]*	[1.781]**	[2.067]*	[1.766]**	[2.003]**
$Unemployment_t$ (%)			-0.724	-0.727	-0.587	-0.573
			[0.193]**	[0.196]**	[0.225]*	[0.219]*
Real Interest $Rate_t$			-0.199	-0.193	-0.219	-0.220
			[0.108]	[0.107]	[0.092]*	[0.091]*
Legal Rights Index					-0.899	-1.144
					[0.999]	[0.892]
$Trust_t$					2.947	1.943
					[9.244]	[9.447]
Family is $Important_t$					47.163	48.469
					[15.877]**	[16.973]**
Observations	120	120	113	113	113	113
R-squared	0.32	0.33	0.51	0.51	0.55	0.56

Regressions are OLS regressions where the dependent variable is a country's Gross Domestic Savings Rates in year t. Observations are for the countries in the WVS countries over three waves, from 1994 to 2008. Robust standard errors are reported in brackets and clustered at the country level. * significant at 5%; ** significant at 1%.

These cross-country regressions suggest that as a language increasingly requires a grammatical separation of present and future events, countries which speak those languages tends to save less. While there is not enough variation to separate each level of additional grammatical FTR, results are broadly consistent with our findings when focussing the primary strong vs. weak FTR dimension.

Online Appendix Table 5 lists every language included in this study, and provides information about its family, genus, and whether it is strong of weak FTR.

Online Appendix Table 5: Coded Languages and FTR Values

Language	Family	Genus	FTR
Afrikaans	Indo-European	Germanic	Strong
Akan	Niger-Congo	Kwa	Strong
Alawa	Australian	Maran	Strong
Albanian	Indo-European	Albanian	Strong
Amharic	Afro-Asiatic	Semitic	Weak
Arabic	Afro-Asiatic	Semitic	Strong
Armenian	Indo-European	Armenian	Strong
Azari	Altaic	Turkic	Strong
Azerbaijani	Altaic	Turkic	Strong
Bandjalang	Australian	Pama-Nyungan	Strong
Bambara	Niger-Congo	Western Mande	Weak
Basque	Basque	Basque	Strong
Belorussian	Indo-European	Slavic	Strong
Bemba	Niger-Congo	Bantoid	Strong
Bengali	Indo-European	Indic	Strong
Beja	Afro-Asiatic	Beja	Weak
Bosnian	Indo-European	Slavic	Strong
Bulgarian	Indo-European	Slavic	Strong
Cantonese	Sino-Tibetan	Chinese	Weak
Catalan	Indo-European	Romance	Strong
Cebuano	Western Malayo-Polynesian	Meso-Philippine	Weak
Chaha	Afro-Asiatic	Semitic	Strong
Chichewa	Niger-Congo	Bantoid	Strong
Croatian	Indo-European	Slavic	Strong
Czech	Indo-European	Slavic	Strong
Dagbani	Niger-Congo	Gur	Strong
Danish	Indo-European	Germanic	Weak
Dutch	Indo-European	Germanic	Weak
Dyula	Niger-Congo	Western Mande	Weak
English	Indo-European	Germanic	Strong
Estonian	Finno-Ugric	Finnic	Weak
Ewe	Niger-Congo	Kwa	Strong
Finnish	Finno-Ugric	Finnic	Weak
Flemish	Indo-European	Germanic	Weak
French	Indo-European	Romance	Strong
Frisian	Indo-European	Germanic	Weak
Fula	Niger-Congo	Northern Atlantic	Strong
Gamo	Afro-Asiatic	North Omotic	Strong
Galician	Indo-European	Romance	Strong

Online Appendix Table 5: Coded Languages and FTR Values (Continued)

Language	Family	Genus	FTR
Georgian	Kartvelian	Kartvelian	Strong
German	Indo-European	Germanic	Weak
Greek	Indo-European	Greek	Strong
Guarani	Tupian	Tupi-Guarani	Strong
Gujarati	Indo-European	Indic	Strong
Hakka	Sino-Tibetan	Chinese	Weak
Hausa	Afro-Asiatic	West Chadic	Strong
Hawaiian	Eastern Malayo-Polynesian	Oceanic	Weak
Hebrew	Afro-Asiatic	Semitic	Strong
Hindi	Indo-European	Indic	Strong
Hungarian	Finno-Ugric	Ugric	Strong
Icelandic	Indo-European	Germanic	Weak
Igbo	Niger-Congo	Igboid	Strong
Irish	Indo-European	Celtic	Strong
Isekiri	Niger-Congo	Defoid	Strong
Indonesian	Western Malayo-Polynesian	Sundic	Weak
Italian	Indo-European	Romance	Strong
Japanese	Japanese	Japanese	Weak
Javanese	Western Malayo-Polynesian	Sundic	Weak
Kammu	Austro-Asiatic (Mon-Khmer)	Palaung-Khmuic	Strong
Kannada	Dravidian	Southern Dravidian	Strong
Karaim	Altaic	Turkic	Strong
Kongo	Niger-Congo	Bantoid	Weak
Korean	Korean	Korean	Strong
Kikuyu	Niger-Congo	Bantoid	Weak
Kurdish	Indo-European	Iranian	Strong
Latvian	Indo-European	Baltic	Strong
Lingala	Niger-Congo	Bantoid	Strong
Lithuanian	Indo-European	Baltic	Strong
Lozi	Niger-Congo	Bantoid	Strong
Luba	Niger-Congo	Bantoid	Strong
Luganda	Niger-Congo	Bantoid	Strong
Luxembourgish	Indo-European	Germanic	Weak
Malay	Western Malayo-Polynesian	Sundic	Weak
Maltese	Afro-Asiatic	Semitic	Strong
Macedonian	Indo-European	Slavic	Strong
Mandarin	Sino-Tibetan	Chinese	Weak
Maori	Western Malayo-Polynesian	Oceanic	Weak
Moldavian	Indo-European	Romance	Strong
Montenegrin	Indo-European	Slavic	Strong
Moore	Niger-Congo	Gur	Strong
Norwegian	Indo-European	Germanic	Weak
Oromo	Afro-Asiatic	Cushitic	Weak

Online Appendix Table 5: Coded Languages and FTR Values (Continued)

Language	Family	Genus	FTR
Panjabi	Indo-European	Indic	Strong
Persian	Indo-European	Iranian	Strong
Polish	Indo-European	Slavic	Strong
Portuguese (EU)	Indo-European	Romance	Strong
Portuguese (BR)	Indo-European	Romance	Weak
Quechua	Quechuan	Quechuan	Strong
Romanian	Indo-European	Romance	Strong
Romansh	Indo-European	Romance	Strong
Russian	Indo-European	Slavic	Strong
Serbian	Indo-European	Slavic	Strong
Slovak	Indo-European	Slavic	Strong
Slovene	Indo-European	Slavic	Strong
Soddo	Afro-Asiatic	Cushitic	Weak
Sotho (Northern)	Niger-Congo	Bantoid	Strong
Seraiki	Indo-European	Indic	Strong
Sesotho	Niger-Congo	Bantoid	Strong
Sidamo	Afro-Asiatic	Cushitic	Weak
Spanish	Indo-European	Romance	Strong
Sumatranese	Western Malayo-Polynesian	Sundic	Weak
Sundanese	Western Malayo-Polynesian	Sundic	Weak
Swati	Niger-Congo	Bantoid	Strong
Swedish	Indo-European	Germanic	Weak
Swahili	Niger-Congo	Bantoid	Strong
Swiss French	Indo-European	Romance	Strong
Swiss German	Indo-European	Germanic	Weak
Swiss Italian	Indo-European	Romance	Strong
Tagalog	Western Malayo-Polynesian	Meso-Philippine	Strong
Tamil	Dravidian	Southern Dravidian	Strong
Tenyer	Niger-Congo	Gur	Strong
Thai	Tai-Kadai	Kam-Tai	Strong
Tigrinya	Afro-Asiatic	Semitic	Strong
Tsonga	Niger-Congo	Bantoid	Strong
Tswana	Niger-Congo	Bantoid	Strong
Turkish	Altaic	Turkic	Strong
Ukrainian	Indo-European	Slavic	Strong
Urdu	Indo-European	Indic	Strong
Uzbek	Altaic	Turkic	Strong
Venda	Niger-Congo	Bantoid	Strong
Vietnamese	Austro-Asiatic (Mon-Khmer)	Viet-Muong	Strong
Wolaytta	Afro-Asiatic	North Omotic	Strong
Wolof	Niger-Congo	Northern Atlantic	Strong
Xhosa	Niger-Congo	Bantoid	Strong
Yoruba	Niger-Congo	Defoid	Weak
Zulu	Niger-Congo	Bantoid	Strong