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The Foreign-Language Effect and Utility: The Relationship Between Language and Self-Interest

Noah Bragg
Economics
The University of North Carolina Asheville
One University Heights
Asheville, North Carolina 28804 USA

Faculty Advisor: Dr. Chris Bell

Abstract

A rational agent acts with deliberation and intention. They allow risk, utility, costs and benefits—both realized and expected—to inform their decision-making in a consistently logical way. Above all else, they are self-interested. But to what extent is this classical model of a decision-maker variable? What if a central factor in a decision is not the expected value but rather a process unrelated to the terms of the decision? What if decision-making depends on the foreignness of the language in which the decision is considered? For a rational agent, it should not matter if information is presented in a foreign or native tongue. All else equal, with comprehension assured, decisions should rely on a consistent, internal metric of analysis that weighs outcomes without regard to the medium in which they are presented. There is mounting evidence to suggest, however, that not only do decisions depend on language, but also that something as fundamental as a rational agent's self-interest may depend on language. In order to investigate the relationship between preference and language, two experiments were conducted in two universities, with two central variables informing the inquiry: the nativity of a language and how a choice is framed. The primary experiment focused on whether there would be a statistically significant deviation in utilitarian preference between people that used a non-native language (Spanish) and a native language (English). As long as comprehension is assured, and native Spanish users do not factor into the results, the outcome should be comparable. Praxeology insists that humans are systematically purposeful thinkers, driven by information. If this is true, then the nativity or foreignness of a language should not change the information itself, and choice (normally distributed) should remain consistent. Throughout the investigation, the study will be related back to utility theory and game theory, to give some concrete weight to something that might appear, superficially, as a strictly academic exercise. While the study will take place in an academic environment, it has meaningful, real-world implications. This is especially true as the number of non-native speakers of English continues to grow, and English cements its position as the international language of commerce. Multivariate regression analysis will be used to determine the relationship between a foreign language and utilitarian preference. Goodman and Kruskal's lambda will be employed to proportionally reduce the error and make a reasonable inference about the variance, in spite of a modest sample size.

1. Introduction

It is understood that the brain stores linguistic information and adapts to grammatical patterns during early development, suggesting that a language acquired later in life may have a different relationship with the brain than a native tongue[1]. The connection between language and perception is strong enough that when one looks at a known word, such as *blue*, the brain does not perceive it as a group of letters, but as a picture[2]. Unsurprisingly, it is not the combination of *b-l-u-e* that is registered as significant, but the color. The brain "fills in" missing information as well. For example, in a published case study, a stroke patient with one eye covered perceived part of a shape that passed beyond their field of vision, because it requires less effort for the brain to reroute existing information and create an assumption from existing neural pathways than it is to create new information paths[3].

The ability of the brain to readily make assumptions while pairing words with pictures and ideas holds several other startling implications. In a study of monolingual Himba speakers in northern Namibia, researchers found that despite normal color vision, members of the tribe did not perceive the difference between blue and green in a categorical manner. Despite testing for normal color vision, they lacked a distinct word and color category for blue, causing them to see it as green. Additionally, when the Himba learned English color boundaries, it did not radically change their own perception of color[4,5]. Inversely, it is reasonable to suspect that if English speaker were to learn Himba, they might not perceive Himba color categories in the way that a native speaker would. In standardized language, exact translations are substituted for logical approximations to the native tongue. While there may be no reason to suspect a difference between the English definition of the word *blue* and another Indo-European word for blue, it is worth considering that when an English speaker learns an alternate word for red, their reference point is likely the color they learned to associate with their native word. And if language alters the purportedly objective faculties of observation, determining something as fundamental as sensorial perception, what else might it influence?

In their research into biases and heuristics, Daniel Kahneman and Amos Tversky noted the tendency of people to behave irrationally. Many of their studies addressed the matter of whether humans possess the same kind of aptitude for statistics as they do for language. They found that people, given select information, make predictably irrational decisions, and that the decisions of most depend on framing more than strict utility.

In a particularly well-known thought experiment called the Asian disease problem, Kahneman and Tversky found that framing a problem in specific ways elicits predictably patterned responses[6]. The framing effect's role in altering decision-making forced Kahneman and Tversky to conclude that people evaluate problems with predictable bias. Ultimately, they found that language, not statistics, guided the preference of respondents.

Decision-making involves two processes: one is analytical and deliberate, while the other relies on heuristics and intuitive bias[7,8,9]. At least one of these processes might compare to rational choice theory's traditional view of a decision-maker. But with greater frequency, people defer to intuitive and heuristic thinking when evaluating the prospect of particular decisions, leading to patterned decision biases. These observations led to the subsequent reform of expected utility theory[10]. Even so, is there evidence to support the claim that an important action for a rational agent is not merely to consider given prospects, but whether or not to assess them in a native or foreign tongue?

Language does not exclusively influence perception, as is the case in the names of color categories. In a recent study, researchers at the University of Chicago discovered that decision-making preferences change when one processes information in a language other than their native tongue. In three experiments that used scenarios developed by Kahneman and Tversky, researchers observed that when participants used a non-native language, they were less sensitive to the framing effect, more tolerant of risk, and less averse to loss[11]. A subsequent study on utilitarian preference found that a foreign language heightens utilitarian preference in moral decision-making[12]. It is suggested that the primary factor involved in these observed outcomes is an individual's diminished emotional relationship with the foreign language[13,14,15]. But as evidenced in the study of utilitarian preference, it is not the result of systematic indifference.

Previous research compared the distribution of preference among foreign and native language users that were presented with the trolley dilemma[16]. The ethical problem in the research protocol asks if one would willingly push a person from a footbridge in order to stop a runaway trolley that is on course to kill five people. Those who used a foreign language tended to be utilitarian—preferring to kill one for the safety of five. Those responding in their native tongue were more averse to killing anyone to save five.

This study and its results provoke several pressing considerations. Firstly, that it may be easier to make a utilitarian choice when the decision-maker is a bystander, and not implicated in the outcome. Further, while it is significant that foreign language use predicts utilitarian preference, ethical problems may be somewhat limited in their ability to forecast human behavior in the context of an intensely stressful situation that demands immediate and timely action (such as an oncoming trolley). Therefore, it is important to use scenarios that might better gauge the extent to which a person might defer to utilitarian decision-making.

Lack of emotional reactivity to pushing someone from a footbridge may be the salient difference between the native and foreign language users, but it is not clear to what degree emotionality is limited by the aptly named foreign-language effect. If the deficit in emotionality is substantial enough, then foreign-language effect responses should vary from native speakers on a wide number of key considerations that typically elicit an emotional response.

For native speakers, as demonstrated by the Asian disease problem, the emotional aversion to loss and risk compromises rational thinking. The existence of the endowment effect—characterized by aversion to divestment and asset loss—indicate that emotional attachment may lead an individual to place greater value in an investment than a more favorable outcome[17,18,19,20]. In fact, fear of a small, real loss often provokes a decision that would result in the potential for a much greater loss[21]. But throughout these observations, the effect of reduced emotionality on utilitarian

preference is less predictable and understood. If the current conclusions regarding the foreign-language effect are accurate, then they present an opportunity to investigate how diminished emotional bias might affect expected utility.

2. Replicated Experiment: Framing Effect

2.1 Introduction

In a preliminary experiment that replicated many of the general methods of the literature on the foreign-language effect, the Asian disease problem was tested between English and Spanish language groups.

2.2 Methodology

All one hundred and sixty-five participants were native English speaking undergraduate students from the University of North Carolina Asheville. They received a version of the survey in either English (n = 95) or Spanish (n = 70), with either a loss or gain framing effect. Spanish responses were collected from upper-intermediate and advanced language courses, where respondents self-rated their Spanish proficiency (on a 4-point scale, with four being the most advanced). English data collection came from English classes. The division of language speakers by group represents a notable deviation from the original study. This aspect will receive greater explanation in the *General Discussion*, but for the purposes of this preliminary study, the goal was to maximize *n* for the Spanish group. The relatively substantial *n* was unexpected. Preliminary methodology structure anticipated a higher number of native Spanish speakers as well as native English speakers with low Spanish comprehension. By yielding a low *n*, this would have distorted the results far more than any, arguably negligible, bilingual effect.

Table 1. Asian disease problem responses within three nominal variables: program preference, the framing effect, and language.

	Foreign-Language Effect			**No Foreign-Language Effect**		
	Program A	**Program B**	**Total**	**Program A**	**Program B**	**Total**
Gain Framing	24	11	35	36	12	48
Loss Framing	20	15	35	27	20	47
Total	44	26	n = 70	63	32	n = 95

2.3 Results and Discussion

The literature on the foreign-language effect predicts greater proportional uniformity of response within a foreign language group, but not for a native language. Therefore, log-linear analysis was used to interpret the data, considering the interactions between the three nominal variables (the foreign-language effect, framing effect, and respective preference for *Program A* or *B*). Predictably, the subsequent G-test identified considerable interaction between the framing effect and preference, $G^2 (1, N = 165) = 4.08$, significant at $p = .0434 < .045$ (where *1* represents the degree of freedom). Native language users had a 17.55 percent difference in response, while foreign language speakers had an 11.43 percent response change. A G-test of the combined interactions between the three nominal variables showed that within two degrees of freedom, $G^2 (2, N = 165) = 4.5$. At $p = .1054 > .05$, this interaction was less statistically significant, and a consequence of the additional degree of freedom from the third nominal variable—the foreign-language effect.

This communicated two important lessons about the foreign language effect. Firstly, that while its presence is well documented, it may be difficult to detect (within certain contexts, such as framing techniques) within a small margin of error, where *n* is dependent on a single sample that is not aggregated over several cross-references that arrive at a reliable mean. But given limited resources, and the supportive literature, the observed difference in this study would be attributable to the foreign language effect. Secondly, and perhaps most importantly, it is worth noting that the selection process for this study was less stringent, and there may have been foreign language respondents that were

exposed to Spanish during early development, and had been bilingual for a considerable amount of time. The study may also have failed to completely ensure that English was the primary language. Going forward, this emphasized the importance of restricting *n* by eligibility criteria.

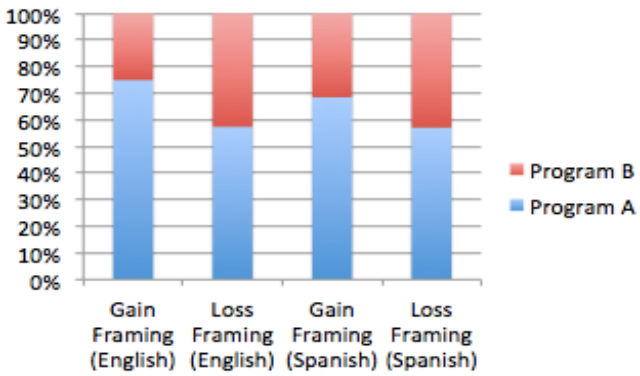

Figure 1. Chart of the distribution in response among the three nominal variables.

3. Primary Experiment

3.1 Introduction

Imagine a Pareto efficient dilemma between two people. An individual, rational agent must compare the values of personal and social utility. In this dilemma, they may choose personal welfare at the cost of another, or put the other's wellbeing first, at the expense of self-interest. In either instance, a choice is a zero-sum game. Now consider another Pareto efficient scenario. Here, there is a group whose aggregate utility is greater than an individual—the rational agent. A gain in their personal utility will cause a loss for the group. Inversely, preference for the utility of the group will result in personal loss, but a greater overall net gain in utility.

John von Neumann and Oskar Morgenstern defined rationality as the state of maximizing an expected value, such as utility[22]. On this premise, John Harsanyi postulated the social welfare function as an outcome where both society and individuals maximize expected utility in a Pareto efficient environment[23].

An individual that relies on a strict, cost-benefit analysis would consider the difference between aggregate gains and losses to identify the option with the highest total utility. However, in a Bayesian game (such as described by Neumann and Morgenstern) the utility maximizing option in a society emerges when individuals make decisions of utility with incomplete information. This is to say, unaware of another's utility function. A well-known proof of this is known as *Harsanyi's theorem*[24,25].

$$w(x) \equiv \alpha + \sum_{i \in M} w_i u_i (x) \qquad (1)$$

Where *w(x)* is social welfare, *α* is constant, and *i* (the utility of u_i) is an element of *M*, the member-set.

This calculation of interpersonal utility, however, ignores the role of the endowment effect. Objectively considered, the endowment effect suggests that personal utility will be consistently overvalued in relation to the utility of another. Further, rational choice theory assumes that individuals make decisions with respect to personal, rather than social, costs and benefits. Even so, how might the foreign-language effect, which should lessen such emotional biases, influence behaviors and utilitarian preference? The results of the foreign-language effect, when tested through the trolley dilemma, suggested that a foreign language induces social utilitarian preference. If lack of emotional response

is the culprit for this response pattern, then how might the foreign-language effect predict utilitarian preference when considering social and personal utilities? Will the foreign-language effect deviate from an optimal outcome postulated by Harsanyi, or conform to it?

3.2 Materials

Below is the primary experiment, an insurance contract, as it appeared to English language respondents.

THE WORLD'S ONLY INSURANCE COMPANY
"Our risk is your gain"

Insured: Yes
Policy number: 000828
Coverage amount: $250,000

Dear insured:

You recently **paid $150** to buy an insurance policy for a very dangerous trip. In the event of an accident, the policy will ensure you for up to $250,000. We must warn you that the chance that you will be in an accident is high. Official estimates indicate that there is a **3 in 5 (60%) chance of injury (potentially fatal).**

We wish to inform you that there are four other people that will accompany you on this trip. Two of them bought the **same policy** as you. The other two have **no insurance.**

We would now like to bring to your attention a unique clause (*Clause VI) that was included in your policy. Clause VI requires that you choose between the following two options.

Examine both options and indicate the one that you prefer:

Option 1: You lose your $250,000 insurance policy and must pay $185. Consequently, two people (the two individuals **without** insurance) will **each** gain a free insurance policy worth $250,000. You will be the only one **without** insurance on the trip.

Option 2: You keep your insurance policy and do not pay $185. Consequently, two people (the two individuals **with** insurance) will lose their insurance policies, **each** worth $250,000. You will be the only one **with** insurance on the trip.

***Clause VI**: The World's Only Insurance Company no longer has competition. But we believe that innovation is an important service to our clients. Therefore, we reserve the right to experiment with our policies in order to collect data that will help us better serve the majority of our clients in the future.*

3.3 Justifications and Description

3.3.1 introduction

It is likely that contractual agreements constitute a more reliable template than ethical dilemmas for predicting interplay of utility preference. Given their central role in the maintenance of civic institutions, especially in the context of social contract theory, they hold an undeniably influential position in the relationship between individuals and society; acting as a regulator and conduit between matters of social and individual utility. Additionally, the act of finalizing a contract makes an active party averse to altering it or its terms[26], inviting respondents to view themselves

as current policyholders gives them a vested interest in the resolution of the problem. The policyholder then assumes that they have made an investment, or endowment ($150), in the terms, and must now react to a simple ultimatum: accept a personal financial loss for the net gain of others, or retain insurance for the net loss of the group. Both parameters contain an emotionally aversive scenario: self-interest results in social loss, while social interest deficits personal utility.

Within the parameters of Pareto efficiency, the above contract synthesizes the trolley dilemma with prospect theory and insights from Peter Hammond in utility[27]; particularly those in relation to Harsanyi's discussion of Bayesian games with incomplete information[28]. Although the premise of the insurance contract is still fanciful, it deviates from Thomson in several, key ways. Thomson considered utilitarian preference against the emotional strain of pushing someone from a footbridge. The contract's new parameter tests socially utilitarian preference against self-interest. With respect to the proofs of utility by Hammond, the contract considers the optimal utilitarian outcome as:

$$W^i(x) > U^j(x) \qquad (2)$$

Where W^i represents social welfare, U^j represents personal utility, and (x) is the value—in this case, an insurance policy. Simply, the insurance contract offers greater social utility than personal utility.

The contract explicitly frames risk for loss (60 percent, rather than emphasizing 40 percent survival). But this is a somewhat inconsequential artifact of the contract, since it frames loss for the other attendees as well as the policyholder. A utilitarian decision will either express personal or social preference, *ceteris paribus*. Compared to Thomson's problem, the expected value is the same, $n(p) = 5(.6) = 6(.5) = 3$, with roughly similar proportions of outcome, $p(n_a - n_b)$, depending on the preferred option. Because risk is a constant, the true measure of utility is the insurance policy.

3.3.2 numerical utility

Consider the difference between the expected value of one insurance policy, $150,000 = .6(250,000)$, and compare it to the total social profit or loss of a given option, roughly ±$149,815, *(300,000-150,185*, in the case of *Option 1).* This represents a rough, although proportionally inverse, utilitarian outcome. In terms of the endowment effect, its role is perhaps best described as the difference between the return on investment (ROI) and social return on investment (SROI). At 99900 percent, *(150,000-150)/150*, the personal ROI of *Option 2* is over a thousand times greater than the 99.7 percent, *(300,000-150,185)/150,185*, SROI of *Option 1*. Undoubtedly, *Option 2* may offer the lowest aggregate utility, but its relative return is quite high for the policyholder. That is, if a respondent chooses to disregard the lost ROI of the other two policyholders by selecting *Option 2*. But of course, as an ethical consideration on par with the trolley dilemma, the precise values are not as important as what these inverse proportions represent.

3.3.3 interpersonal utility

The interplay of utility within the insurance contract is best represented by a particular set of proofs modeled by Hammond to describe interpersonal utility. In the structure of a utility function, the proof makes a profound statement:

$$U^i(x) - U^i(y) > U^j(y) - U^j(x) \qquad (3)$$

Equation (3) illustrates the "preference intensities" of two people. Person *i*'s preference intensity for *x* over *y*, empirically outweighs person *j*'s preference intensity for *y* over *x*. Therefore, if these preference intensity patterns were to shift so that *i* moved *y* to *x*, this would be objectively preferable to the move by *j* of *x* to *y*. This is simply because *i*'s gain will consistently outweigh *j*'s loss. While Hammond used the analogy of two persons in order to describe interpersonal utility, the proof primarily communicates a utility distribution that makes $U^i(x) > U^j(x)$. In this case, the proof is directly related to a welfare utility function in Pareto efficiency.

3.4 Methodology

3.4.1 participants

Ninety-nine native undergraduate students from Western Carolina University participated in the study. All identified English as their native and primary language and performed the task in either their native tongue, English (n = 54), or in a foreign language, Spanish (n = 45). Due to limited access to a statistically significant *n* for native English speakers with sufficient Spanish comprehension, participants performed the task as two separate groups, in English classes and Spanish classes. Those that responded in English may not have understood Spanish, or any other language. As with the preliminary study, this is a critical element of the methodology that will receive more attention and explanation in the *General Discussion*.

3.4.2 procedures

Materials were written in English and Spanish and reviewed in order to communicate the same intent, by bilingual professors of Spanish in the foreign language departments of the University of North Carolina Asheville as well as Western Carolina University. Participants that responded to Spanish materials were enrolled in post-intermediate Spanish courses. Self-identifying non-native English speakers were omitted, as well as responses from students for whom Spanish was spoken in the home during early childhood development. Responses that indicated exceptionally low Spanish aptitude (on a self-reported, 10-point scale) were further excluded from the results. All English respondents were native English speakers in English classes, vetted by identical criteria, excepting Spanish comprehension. In order to eliminate random response and ensure comprehension, respondents were asked—on both English and Spanish iterations of the contract—to provide a written justification for their answer. Some respondents stated outright in their commentary that they did not understand the problem (these participants had a mean self-ranked Spanish comprehension of 3 out of 10). These responses could not be recorded in good faith.

3.5 Results

Table 2. Contingency table of response count, with two nominal variables: language and option preference.

	Option 1	**Option 2**	**Total**
Foreign-Language Effect	29	16	45
No Foreign-Language Effect	26	28	54
Total	55	44	n = 99

Native language respondents were indifferent *(P_b = .51)* to either option, while foreign language respondents tended to prefer social utility *(P_a = .64)*. The 14 percent deviation in favor of the socially utilitarian option is striking. The extent of the statistical significance within $p < .05$ was limited, because $p = .1042$ in a Chi-square test, where $X^2 (1, N = 99) = 2.64$. But because $X^2 = 2.64$ is within 95 percent confidence, and because $p \simeq .1$, the results are promising, given the potential for higher values of *n* and similar proportions.

Among native speakers, *Option 1* was relatively undervalued, at a deviation of -11.7 percent. The standardized residuals (the difference between the observed count and the expected count and its standard deviation) for foreign and native parameters, in relation to social utility preference, were respectively .7 and -.64. The least popular option, by a standard residual of -.78 and a deviation of -17.5 percent, was *Option 2*, among foreign language users. Because the standard residuals do not fall beyond the range of ±2, they do not suggest a necessarily unusual development. The lack of significance, however, is due to the distortive weight of the standard deviation in relation to *n*.

Table 3. Standard Residuals and Percentage Deviations compared between the two nominal variables.

	Standardized Residuals			Percentage Deviations	
	Option 1	Option 2		Option 1	Option 2
Foreign-Language Effect	0.7	-0.78		14%	-17.50%
No Foreign-Language Effect	-0.64	0.71		-11.70%	14.60%

This outcome is worth considering in relation to λ (the Goodman-Kruskal lambda for proportional reduction in error) values, given $\lambda_1 > \lambda_2$, $(\lambda_1 = .0667 > 0.0455 = \lambda_2)$. The difference in values of λ suggest that the interraction between a foreign and native tongue was more significant than the interaction of preference between social and personal utility. Given the current λ, with higher values of n, a foreign language would more likely predict preference; Specifically for *Option 1*. Although λ for either criterion was lower than its standard error, the error for the effect of language was the lowest ($\sigma_1 = .2262 < \sigma_2 = 0.235$). Admittedly, the relatively high standard error (a consequence of n) of λ is noteworthy. But the value of eliminating random response (through qualitative reflection) within a sufficiently stringent selection process cannot be understated. The *general discussion* will analyze why the observed pattern may have emerged, and defend the necessity for further inquiry into the subject.

4. General Discussion

Standard error is an expected outcome and a fact of life. No model can predict every outcome with absolute precision—especially those that involve human behavior (which is not consistently rational). But as long as an error is predictably random, the model is reasonably accurate. Therefore, the key to interpreting the results of this study depends on the answer to a singular question: is this a random error or a systemic bias? If repeated across multiple populations (given the comparable age and marital status that correlates with undergraduate students), will the error average to zero? Or, would using a foreign language embolden people to make these decisions? Would they prefer social welfare? Would they interpret an optimal outcome as the aggregate utility of several persons? Would they make riskier, utilitarian choices? As interactions in government and the marketplace are heavily contractual, and as the global number of non-native speakers of English rises continually, the answer to this question is important.

The data demonstrated a noticeable interaction between the independent and dependent variables. This is to say, the deviation was significant as a proportion of the magnitude of the variable. The Weber-Fechner law, which supports this interpretation—and any outcome of just noticeable difference (JND)—does not account for random statistical error, however. Given a random error, the difference is more moderate.

Similar to the Trolley dilemma, respondents were not indifferent to utility. As a proportion, a foreign language appeared to make a respondent more likely to give up an insurance policy so that others might be covered, by 14 percent more than a native-speaker. These hypothetical policyholders were more likely to defer to social utility (or aggregate utility) than native language respondents. The selection of *Option 2* among non-native language respondents presented most aversion of any outcome, for any group (being disfavored by 17.5 percent).

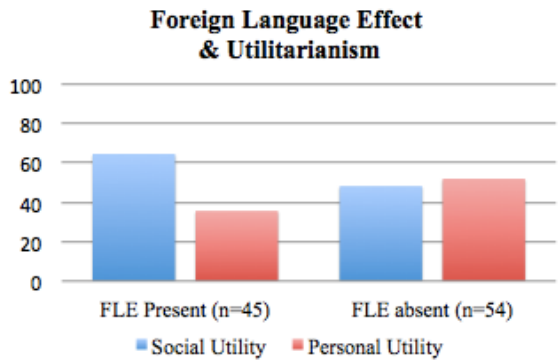

Figure 2. Chart of the distribution (in percent) of utilitarian preference, relative to the presence or absence of the foreign-language effect, represented here as *FLE*.

A reduction in emotional response could have tempted greater indifference among the foreign language group. Conversely, the observed outcome indicates that there was greater indifference among native English speakers. This was unexpected, as the English group might reasonably have preferred *Option 2* (due to the emotional investment in their self-interest) to a higher degree than was observed. But perhaps it is instructive that, in a normal distribution of the population, there are roughly equal proportions of individuals that emphasize the value of either social or personal utility, within Pareto efficient parameters.

Of particular interest is the observation that less emotional decisions (from a foreign language) resulted in choices that seemed to validate Harsanyi's view of social utility as the aggregate utility of individuals, and therefore, in the common interest. Harsanyi's proof was not based on empirical evidence, but studies such as this might suggest that there is an empirical basis for what Harsanyi felt was an objective statement about utility. This conclusion is contingent on the foreign-language effect being an outcome of reduced emotionality. If it is not the result of reduced emotionality, then this raises far more questions about the relationship between language and decision-making. These questions are too far-reaching to receive appropriate attention here, but they would relate to the Sapir-Whorf hypothesis—that a person's worldview depends on the structure of their language (similar to how the Himba perceived color).

It is reasonable to speculate that the confluence of increased risk tolerance and utilitarian preference caused foreign language respondents to prefer *Option 1*. The interpretation that most closely describes this pattern is that of the original University of Chicago study—where a foreign language increases observable risk tolerance. Perhaps, with decreased emotionality, risk was less of a constraint, leaving respondents to weigh the outcomes strictly in terms of utility. But what is particularly noteworthy about this outcome is its suggestion that foreign language use mitigates the perception of risk—including risks that impose a threat to personal wellbeing. If a foreign language can diminish an individual's sensitivity to risks that threaten their gains and losses (in gambling experiments or lottery theorems), then there is less incentive for respondents to shift their decision-making under risk, as is the case in prospect theory.

Respondents were encouraged to justify their choices in writing. Personal justifications reduced random response and helped ensure comprehension of the material. A high number of native speakers that chose *Option 2* expressed anxiety over the risks of the trip. But in the foreign language category, among those that chose *Option 2*, nearly all participants' explanations stated a desire to not pay a fixed cost. Only three responses explicitly identified risk as the motivator. In fact, within one justification, a respondent selected *Option 2* precisely because they felt that the trip was not risky enough, and therefore, the other participants did not need insurance. Determining the degree to which such a sentiment would be an outlier requires a higher *n*, with similar methodology that encourages reflection. But if such a pattern could be observed and analyzed to greater detail by future researchers, this would tell us more conclusively how a foreign language alters utility preference by systematically increasing tolerance to risk.

While the original study initially expressed concern in only testing bilinguals, their results were significant enough that, for the purposes of a study with limited means, it was not necessary to select against a less documented "bilingual effect." Further, multilingualism and varying degrees of native language aptitude may play a role as well. But inescapably, the current literature supports the thesis that the most likely culprit in decision-making variability in this case (between two respondents that share the same native tongue) is the introduction of a foreign language.

In terms of the patterned distribution of response for the native language *n*, several studies in evolutionary psychology, including a review that appeared in *Nature*[29], suggest that altruism and utility are selected for[30], in the sense that *utility* equates to the biological definition of *fitness*[31]. Rational agents are not merely self-interested players that maximize personal utility, because their utility potential (and expected utility) often relies on the utility and output of the group as a whole. This might not be a surprise, as groups typically make better self-interested decisions. The propensity of individuals to have utilitarian preferences that align with the preferences of others allows them to maximize their own utility by forming a group[32]. Such evidence suggests that society exists as a utility maximizing venture of individuals.

In the case of the insurance contract, many might be averse to taking other peoples' insurance policies. Evolutionarily, the behavior would have threatened their (utility maximizing) position within a group[33]. Consequently, the observed pattern of utilitarian preference was perhaps not as unusual as it appeared, even if it contradicted several integral aspects of rational choice theory.

5. Future Research

Roughly translating Hammond's function of interpersonal utility (3), each unit in the matrix below represents a proportionate increase or decrease in aggregate utility, relative to the option selected. Note that the matrix evaluates utility in terms of the outcomes that individual preference patterns for *Option 1* or *2* would create in the world at large. It does not consider a decision pair as necessarily concurrent; rather, it predicts a distribution of aggregate utility in order to draw inferences on economic and utilitarian decision-making.

Table 4. Game theory matrix of utility potentials (1 or -1).

		Other Policyholder(s)	
		Opt. 1	Opt. 2
Policyholder (Self)	Opt. 1	(1, 1)	(1, -1)
	Opt. 2	(-1, 1)	(-1, -1)

Rational choice theory suggests that because social behavior is the cumulative outcome of individual decisions, a reliable metric of economic efficiency must judge individual utility and decision-making in relation to the decisions and utilities of others. Although, it is mentionable that in Pareto optimality, the sum choices of individuals may or may not be favorable to the majority of individuals within the emergent social group. Among the particular preference patterns, the Pareto optimal one would be (1, 1), where a propensity toward *Option 1* unambiguously maximizes aggregate utility. If this Bayesian Nash Equilibrium were extrapolated into a game played throughout society, rather than between individuals, then the optimal outcome would be (1, 1). Such a pattern would result in an absolute social gain, from the doubled payout of an insurance company.

The purpose of the above is not to make a prediction based on an assumption. It is to demonstrate, in somewhat objective terms, that in a globalized world of increasingly complex marketplace interactions of language, the foreign-language effect may have measurable, macroeconomic ramifications—in the way that all systematic human biases do. Regardless of the particulars as to why the foreign-language effect exists, it is clear that more research should be conducted on the connection between language and decision-making. Future contract litigators might note that a foreign language has the potential to compromise judgment in a systematic way. With respect to the apparent altruism of foreign language respondents, it might be useful for future researchers to ask these respondents what the other policyholders should select, if presented with the same ultimatum. These sorts of investigations stand to offer insight into a range of economic behaviors: from negotiations, to commercial interactions, to the preferences of certain multilingual societies. The role of the foreign-language effect may be a great deal more extensive than the original

study realized, even if it only distorts decisions at the margin. Ineluctably, communication may be the most ubiquitous human pursuit, but it is hardly the least mysterious.

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