Viral Verbalization*

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Abstract

Preliminary and Incomplete.

Social learning influences people's behavior and beliefs by emulating others whom they believe are correct. The impact of social learning on aggregate outcomes critically hinges on whether individuals can accurately discern who is right or wrong. This paper examines whether learning from others' verbal reasoning improves or worsens collective outcomes. In our experiments, participants share their thought process regarding financial decisions problems, and others choose to imitate them after listening. Firstly, there is a considerable heterogeneity in the cumulative benefit of imitation: Social learning reduces the influence of misbeliefs on collective outcomes in some tasks while amplifying it in others. Secondly, we document that people's judgments of whether someone is correct are strongly influenced by specific verbal cues, or *how* a person says things. Consequently, the virality of misbeliefs on a particular subject depends on whether the way people talk about the topic is diagnostic of their accuracy.

Keywords: Social Learning, Misbeliefs, Virality, Financial knowledge, Social Cognition, Paralanguage, Speech data.

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1 Introduction

The way we communicate our beliefs through spontaneous verbalization can have significant implications for the transmission of beliefs within social networks. This transmission of beliefs has the potential to increase societal welfare when those transmitted beliefs are correct, but harm societal welfare when they are mistaken. For example, individuals may confidently share their mistaken beliefs about optimal financial investment strategies, such as active investment strategies (Haaland and Næss, 2023), thereby harming others' welfare. Since much of social learning happens through informal conversations (Klemmer and Snyder, 1972), it is critical to understand how it is shaped by people's spontaneous verbalizations.

Motivated by this insight, this paper studies social learning with speech data, focusing on the virality of misbeliefs in the context of financial decisions. In particular, we conduct large scale experiments to study whether and under which circumstances social learning dampens the effect of misbeliefs on aggregate outcomes. To shed light in mechanisms we leverage the richness of our speech data to analyze whether paralanguage – how people say things – affects perceptions of accuracy, the extent imitation, and thereby the virality of misbeliefs.

We start with an orator experiment: Respondents voice their ad-hoc reasoning about a series of standard financial decision problems of varying difficulty. Respondents are instructed to record their reasoning as though they were explaining their decision to a friend in an informal conversation. We employ 12 well-known decision problems from finance, such as the expected returns under active versus passive investing. We focus on financial decision problems since conversations about financial investment decision are highly ecological.

In a next step we measure people's perceptions of these recording in a listener experiment. For each task, respondents are randomly assigned to a recording or no recording. This creates random variation in exposure to recordings with correct or incorrect answers. Subsequently, respondents assess how they perceive an orator's accuracy. We then vary across subjects whether respondents also give their own personal incentivized answer on each respective task or whether they decide how much of their experimental budget to bet on the accuracy of their matched orator's decision.

We first start by studying how social learning affects optimality rates across the different tasks in our sample of respondents from the listener survey. Across problems we document striking heterogeneity in the extent to which people successfully imitate correct but not mistaken beliefs. Social learning dampens the effect of misbeliefs on aggregate outcomes in some tasks, but increases it in others. In the case of beliefs about stock picking, day trading and fixed versus adjustable mortgage rate, optimality rates increase while for beliefs about the value of a call option, money circulation, and debt maturity profiles, optimality rates decrease significantly.

The average effects of social learning on optimality rates shroud substantial heterogeneity depending on whether respondents were exposed to a recording with correct or incorrect choices. In some tasks, like the question related to inflation, optimality rates compared to the no recording group increase both when respondents are exposed a recording with a correct answer and a recording with an incorrect answer. This suggests that for this question people are able to identify respondents who provide wrong answers based on their recording. In other questions, such as the one about crypto mining, money circulation or the debt maturity profile, optimality rates among respondents randomly assigned to a recording with an incorrect answer significantly decrease. This, in turn, shows that in some tasks respondents fail at accurately perceiving whether the answer given in the recording is correct or not.

To shed light on mechanisms, we leverage rich data on perceptions of the recording. Our data reveals that besides perceptions of accuracy, perceptions of other features of the recording, such as confidence, likeability, and trustworthiness, are positively associated with imitation. Moreover, demographic characteristics of the listener, such as race and gender are highly correlated with perceptions and imitation decisions. These patterns suggest that features of the recording above and beyond the content of people's reasoning might play an important role in shaping imitation decisions.

As a next step, we consider the role of non-content features, in particular paralanguage – "how" people say things – as a driver of perceptions of accuracy. We show that people

judge the accuracy of someone's belief based on specific verbal cues. Most importantly, the paralanguage of people's reasoning – "how" a person says things – strongly predicts the extent of imitation.

One implication of our findings is that the virality of misbeliefs on a given topic fundamentally depends on whether paralanguage is diagnostic of accuracy: when paralanguage reveals biases, misbeliefs get filtered out from the aggregate; when paralanguage misleads about accuracy, misbeliefs go viral.

Finally, we plan to conduct a mechanism experiment varying only "how people say things" holding what they say constant. This experiment allows us to examine whether paralanguage causally shapes perceptions of accuracy and imitation decision. More broadly, this evidence helps us understand the role of paralanguage for the virality of misbeliefs.

We contribute to a long-standing literature on whether individual-level biases tend to matter for aggregate market level outcomes (Russell and Thaler, 1985; Sonnemann et al., 2013; List, 2003). In a recent paper, Enke et al. (2023) show that self-awareness about biases reduces the importance of individual level biases for aggregate outcomes through institutions that enable selection. Our paper proposes a new social learning mechanism that shapes the extent to which biases matter in the aggregate: People's ability to accurately perceive others' errors.[1]

Our focus on social learning from people's verbal explanations allows us to characterize the forces underlying the virality of misbeliefs (Shiller, 2017, 2020). We thereby contribute to a new emerging literature on learning from qualitative information in the form of stories (Graeber et al., 2022) and narratives (Andre et al., 2022; Kendall and Charles, 2022; Barron and Fries, 2023).

We also relate to a large literature on social learning (Mobius et al., 2015; Weizsäcker, 2010; Conlon et al., 2021; Eyster and Rabin, 2014), see Mobius and Rosenblat (2014) for a review. In a recent paper, Conlon et al. (2022) show people are much less sensitive to information others discover compared to equally-relevant information they discover themselves.

[1]Our paper builds on a large literature on social cognition in psychology, see e.g. Sherman et al. (1989).

We contribute to this literature by studying how the virality of mistaken beliefs is affected by social learning from others' verbal explanations.

Methodologically, we relate to a small literature analyzing speech data, mostly outside of economics (Qin and Yang, 2019; Hajek, 2022; Gómez-Cram and Grotteria, 2022; Gennaro and Ash, 2022). Graeber et al. (2023) use speech data to characterize how the process of oral communication induces information loss. By contrast, we use speech data as a tool to study how paralanguage – how a person says things – affects perceptions of their accuracy and the extent of imitation.[2]

Our paper proceeds as follows: Section 2 describes the experimental design of our orator and listener experiment. Section 3 provides results from both experiments. Section 6 concludes with a summary and an outlook for next steps.

2 Data and Design

2.1 Orator Experiment

Sample We conducted our experiments on Prolific, which is widely used for experiments in the social science (Eyal et al., 2021). The experiments were run with 500 US respondents in March 2023. Participants were required to have a working microphone enabling them to record their voice.

Baseline design Respondents record their verbal explanation for their answer about a series of standard financial decision problems of varying difficulty.[3] Respondents are instructed to record their reasoning as though they were explaining their decision to a friend in an informal conversation. In particular they receive the following instructions:

[2]We build on work in psychology on verbal reports as data which examined the potential of verbal data as a lens into cognitive processes.(Ericsson and Simon, 1980, 1984). In contrast, we focus on verbalizations as a tool to study social learning.

[3]We embed the recording of speech data through Phonic (`https://www.phonic.ai` in our Qualtrics survey.

> For each question, you will be asked to record yourself once to explain your reasoning. We are interested in how you would answer in an informal conversation with a friend: Your friend cares about what your answer is and why. You should spontaneously share the thoughts that come to your mind.

After recording their reasoning, respondents are tasked to state their answer and perceived certainty about correctly answering the question.

Decision problems We employ 12 well-known decision problems from finance that capture behavioral phenomena such as exponential growth bias, nominal illusion, but also more specific knowledge about different asset classes and knowledge about investment decisions, such as the expected returns under active versus passive investing. We focus on these questions since conversations about financial investment decision are highly ecological and usually involve large stakes. Below we provide a few examples of the questions used. For example, the question about inflation is given as follows:

> Imagine that the interest rate on your savings account was 2.5% per year and inflation was 3% per year. After 1 year, how much would you be able to buy with the money in this account?
> i) More than today
> ii) Exactly the same as today
> ii) Less than today

Some of the questions are highly naturalistic and related to day-to-day investment decision that people might make. For example, the questions on stock picking falls into this category:

> Most people could systematically outperform the stock market by carefully reading free online news articles about how recent events will affect different companies and picking the right stocks based on those readings.
> i) True
> ii) False

Similarly, the question on actively managed funds falls into this category:

> Do actively managed investment funds systematically outperform passively managed investment funds in terms of expected net returns, i.e. after accounting for investment fees?
> (i) Actively managed funds outperform passively managed ones.
> (ii) Actively managed funds do not outperform passively managed ones.

Other questions are more technical in nature. For example one question is concerned with the value of a call option:

> Holding everything else constant, how is the value of a call option for a stock generally affected by a higher volatility of that stock?
> i) Higher volatility increases the value of a call.
> ii) Higher volatility decreases the value of a call.
> iii) Higher volatility has no effect on the value of a call.

Finally, we have some questions that require very specific technical knowledge related to new technologies. Below is an example from the domain of cryptocurrencies:

> Thanks to the blockchain, Bitcoin can process hundreds of transactions per second.
> i) True
> ii) False

2.2 Listener Experiment

Sample As before, we collect our data using the online platform Prolific. We collect 300 respondents in March 2023.

Design In a next step, we measure people's perceptions of these recording in a listener experiment. For each task, respondents are randomly assigned to a recording with a 90%

chance or no recording with a 10% chance. We also leverage random variation in whether our listeners are exposed to recordings with correct or incorrect answers. Respondents receive the following instructions:

> On the following page, you will see the question that was shown to a previous participant and the recording of their answer will automatically start playing.

We then vary across subjects whether respondents also give their own personal incentivized answer on each respective task or whether they decide how much of their experimental budget to bet on the accuracy of their matched orator's decision.

Own beliefs To quantify persuasion rates relative to respondents in the no recording condition, we measure respondents own incentivized belief about the correct response. Subsequently, respondents also state their confidence in the accuracy of their response, following the measurement in Enke and Graeber (2019).

Betting decision To obtain a rich and incentivized measure of perceptions of orator accuracy, we give our respondents the chance to bet any amount between \$0 and \$10 to bet that the other person's answer is correct. Respondents double the amount they bet if the other person's answer is correct, and otherwise lose the amount.

Perceptions of orator To shed light on underlying mechanisms, we ask respondents a few questions about their perceptions about the recording. First, we measure perceptions about the other person's accuracy as well as their confidence. Second, we also measure perceptions of the orator's likeability and trustworthiness. Finally, we ask respondents whether they had difficulty in following the reasoning in the recording as well as whether the orator talked with an accent.

3 Social Learning and the Virality of Misbeliefs

3.1 Social Learning and Aggregate Optimality

We first start by studying how social learning affects optimality rates across the different tasks in our sample of respondents from the listener survey. Figure 1 shows differences in optimality rates among respondents in the "no recording" and "any recording" condition. Across problems we document striking heterogeneity in the extent to which people successfully imitate correct but not mistaken beliefs. Social learning dampens the effect of misbeliefs on aggregate outcomes in some tasks, but increases it in others. In the case of beliefs about stock picking, day trading and fixed versus adjustable mortgage rate, optimality rates increase by more than 20 p.p. (all, $p < 0.01$). For beliefs about the value of a call option, money circulation, and debt maturity profiles, optimality rates decrease by between 9 pp and 17 p.p. ($p < 0.01$).

3.2 Social Learning from Correct and Mistaken Recordings

The average effects of social learning on optimality rates shroud substantial heterogeneity depending on whether respondents were exposed to recording with correct or mistaken beliefs. Figure 2 shows optimality rates by whether respondents were exposed to (i) no recording, (ii) a recording with a correct answer and (iii) a recording with a incorrect answer. The figure highlights substantial heterogeneity in welfare rates across the different groups, and huge cross-task variation.

The average effects of social learning on optimality rates shroud substantial heterogeneity depending on whether respondents were exposed to recording with correct or mistaken beliefs. In some tasks, like the question related to inflation, optimality rates compared to the no recording group increase both when respondents are exposed a recording with a correct answer and a recording with an incorrect answer. This suggests that for this question people are able to identify respondents who provide wrong answers based on their recording. In other questions, such as the one about crypto mining, money circulation or the debt matu-

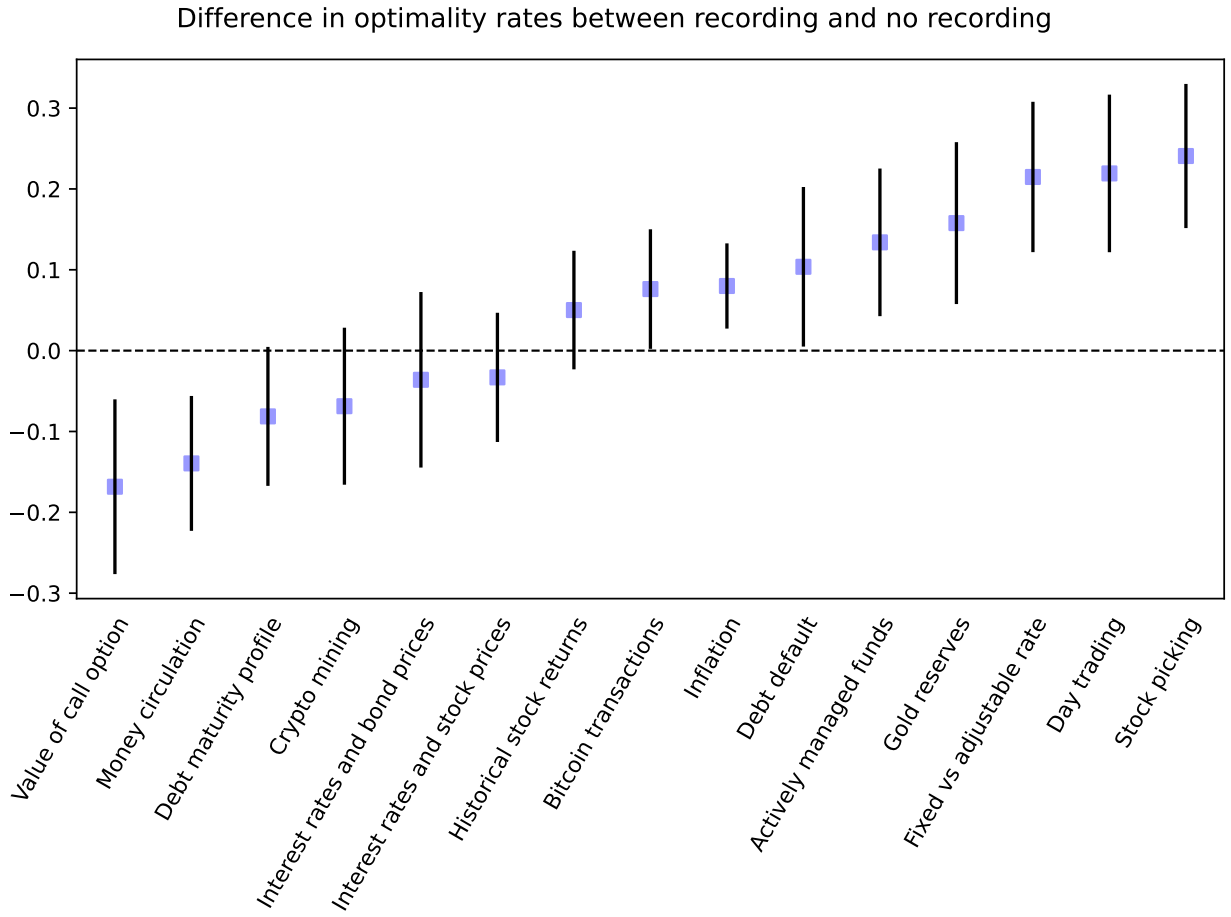

Figure 1

rity profile, optimality rates among respondents randomly assigned to a recording with an incorrect answer significantly decrease. This, in turn, shows that in some tasks respondents fail at accurately perceiving whether the answer given in the recording is correct or not.

In some tasks, like the question related to inflation, optimality rates compared to the no recording group increase both when respondents are exposed a recording with a correct answer and a recording with an incorrect answer. This suggests that for this question people are able to identify respondents who provide wrong answers based on their recording. In other questions, such as the one about crypto mining, money circulation or the debt maturity profile, optimality rates among respondents randomly assigned to a recording with an incorrect answer significantly decrease. This, in turn, shows that in some tasks respondents

fail at accurately perceiving whether the answer given in the recording is correct or not.

The critical question is which features of the recording are predictive of people accurately perceiving whether their matched orator gave a correct or incorrect response. We explore this question in the next section.

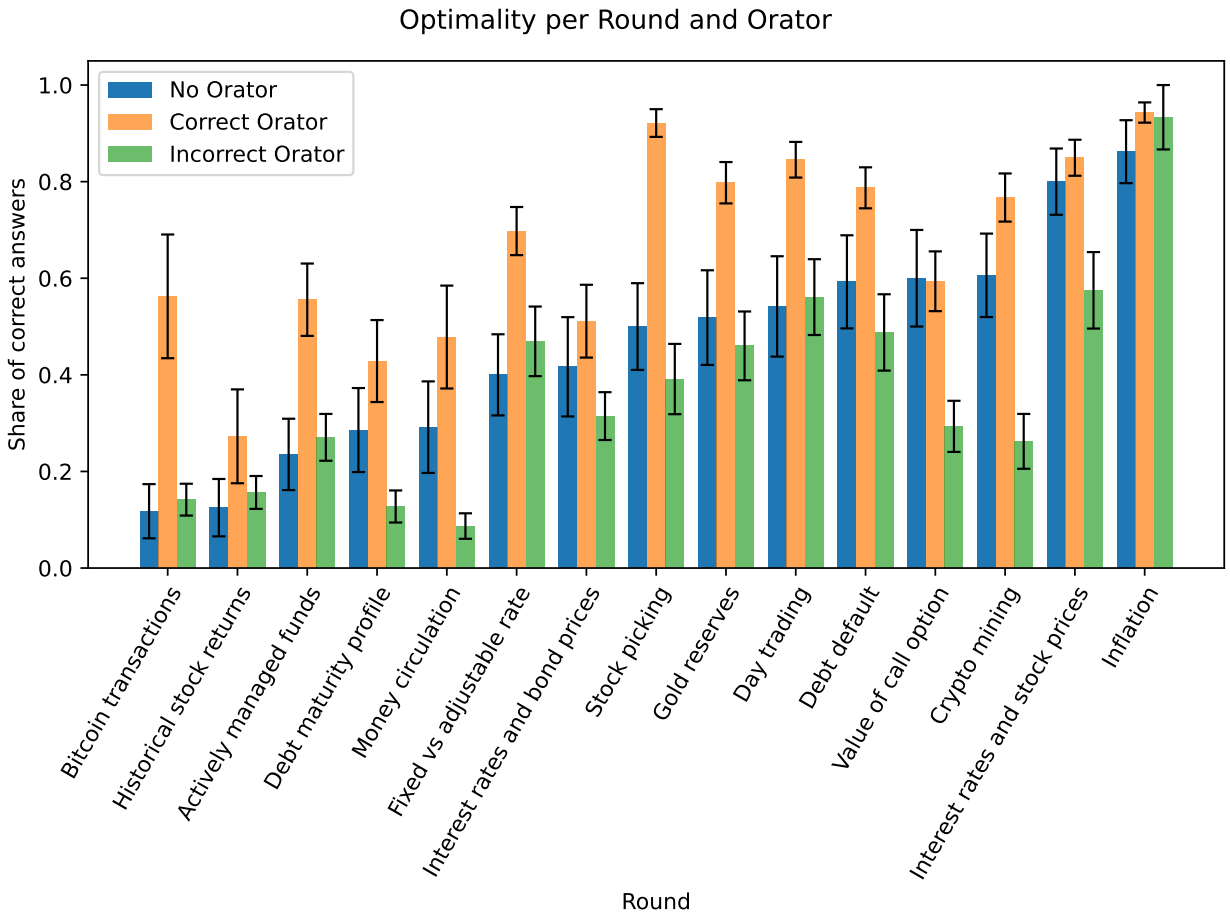

Figure 2

4 Mechanisms

In this section, we aim to shed light on mechanisms underlying the patterns uncovered in the previous section.

4.1 Betting Decisions

To obtain a rich and incentivized measure of perceptions of orator accuracy, we leverage the data from the betting decisions.

Figure 3 displays the cumulative distribution of bets separately for respondents exposed to a recording with a wrong and a correct answer. The figure shows that respondents do on average place higher bets on recordings with correct answers compared to recordings with incorrect answers.

Figure 4 displays the same cumulative distribution across different tasks; and Figure 5 shows the implied average differences in betting between respondents exposed to correct and wrong recordings. The figures showcase that while for most tasks participants bet higher amount on recordings with correct answers, for some tasks respondents systematically bet higher amounts on recordings giving the wrong answer. In particular, consistent with the earlier findings, we show that people are more likely to bet money on wrong recordings in the questions on (i) money circulation, (ii) Bitcoin transactions and (iii) the debt maturity profile. For some tasks differences between correct and wrong recordings are relatively small, e.g. the question on actively managed funds or the value of a call option.

4.2 Perceptions about the recording

To shed light on mechanisms, we leverage rich data on perceptions of the recording.

Perceived confidence One hypothesis posits that verbal cues of uncertainty play a key role in shaping perceptions of accuracy. Figure 6 confirms this conjecture: there is a strong positive correlation between perceived confidence of the orator and the listener's betting decision. This correlation is strong and highly significant when pooling across tasks, and even stronger when aggregated at the task level.

Our data reveals that besides perceptions of confidence, perceptions of other features of the recording, such as likeability, and trustworthiness, are positively associated with betting decisions.

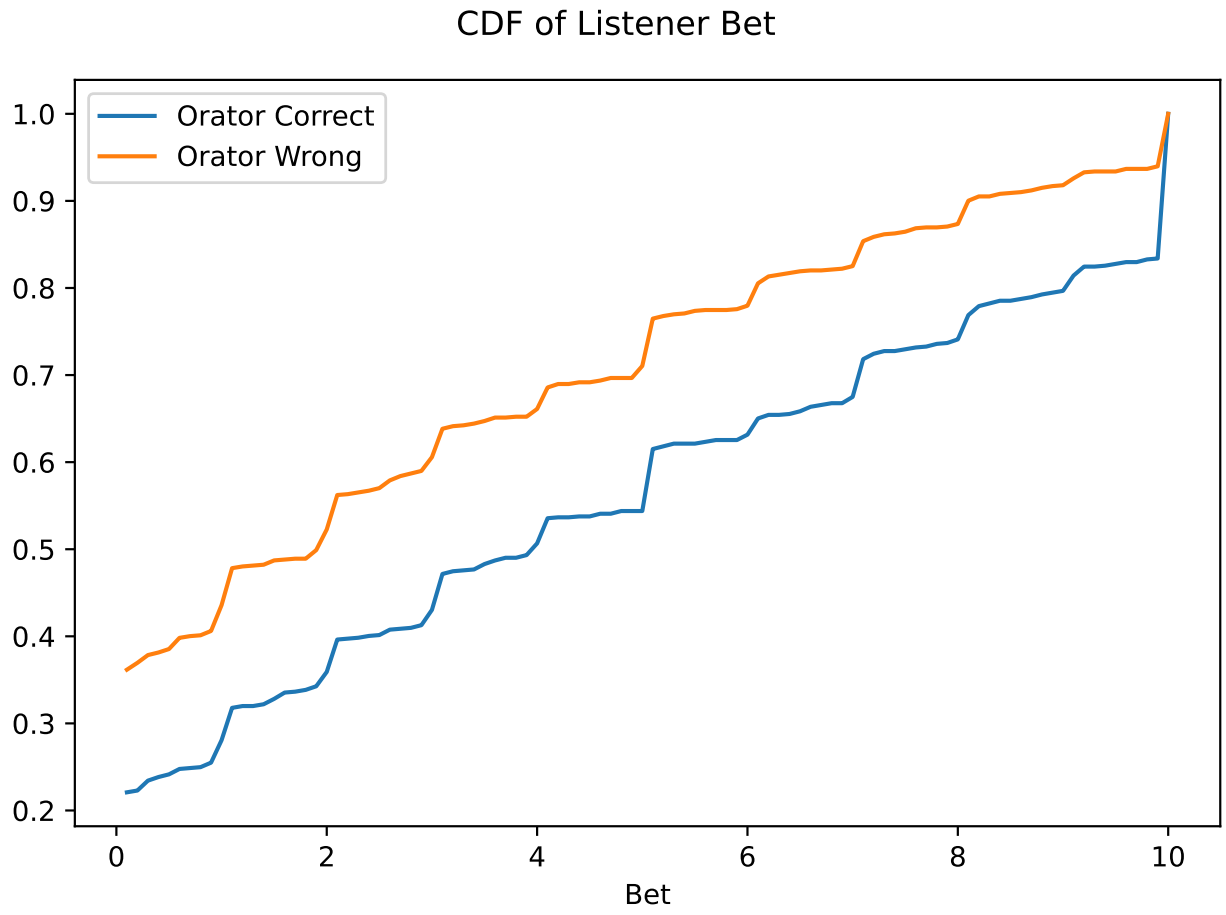
CDF of Listener Bet
Orator Correct
Orator Wrong
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0
2
4
6
8
10
Bet

Figure 3

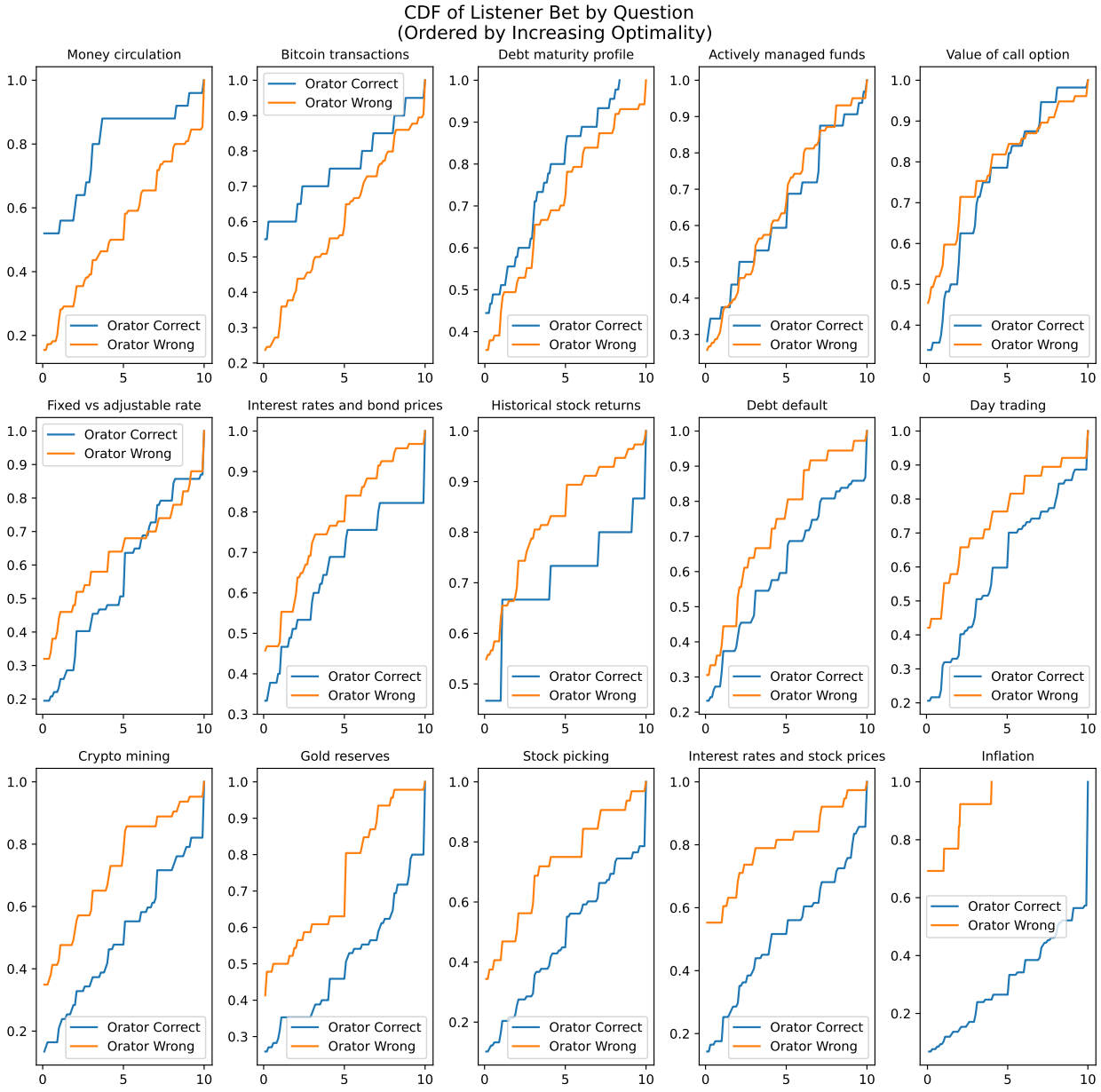
CDF of Listener Bet by Question
(Ordered by Increasing Optimality)
Money circulation
Bitcoin transactions
Debt maturity profile
Actively managed funds
Value of call option
Fixed vs adjustable rate
Interest rates and bond prices
Historical stock returns
Debt default
Day trading
Crypto mining
Gold reserves
Stock picking
Interest rates and stock prices
Inflation
Orator Correct
Orator Wrong

Figure 4

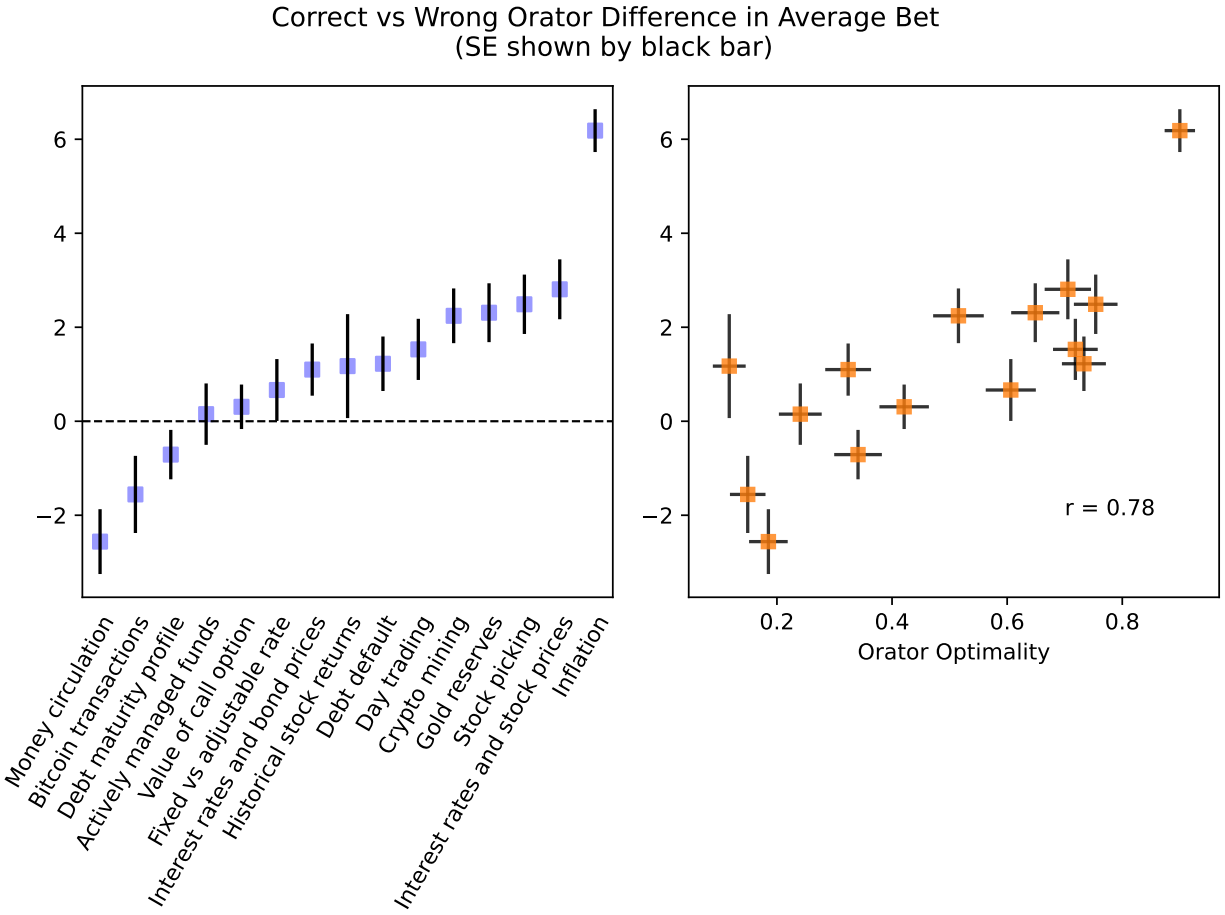
Correct vs Wrong Orator Difference in Average Bet
(SE shown by black bar)
6
4
2
0
−2
Money circulation
Bitcoin transactions
Debt maturity profile
Actively managed funds
Value of call option
Fixed vs adjustable rate
Interest rates and bond prices
Historical stock returns
Debt default
Day trading
Crypto mining
Gold reserves
Stock picking
Interest rates and stock prices
Inflation
r = 0.78
0.2
0.4
0.6
0.8
Orator Optimality

Figure 5

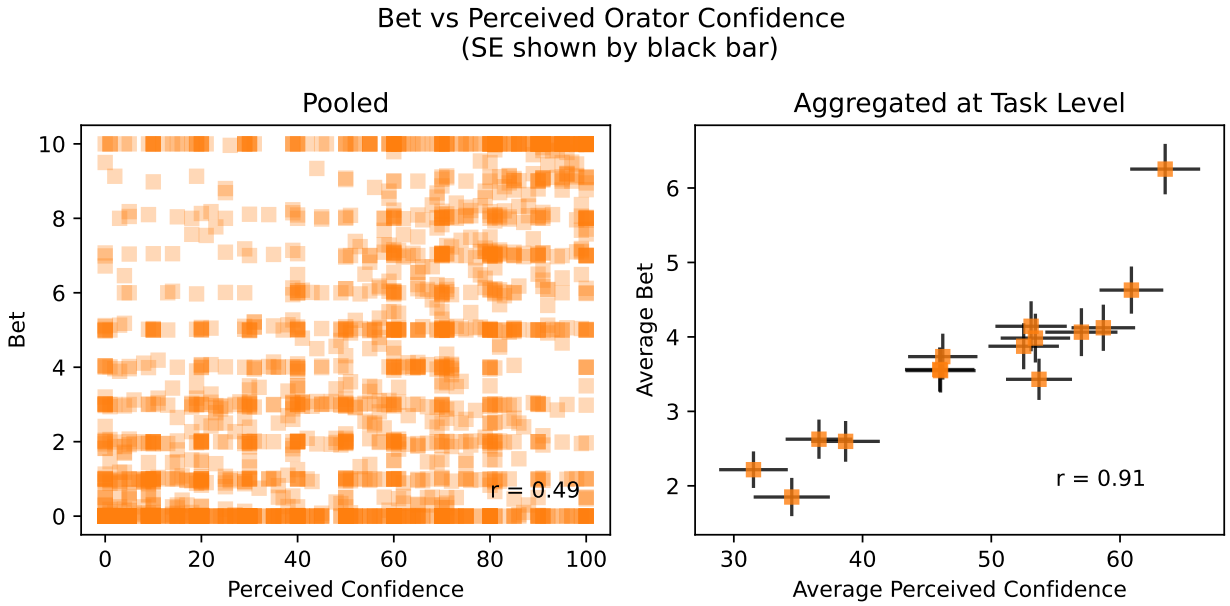

Figure 6

Tables 1 and 2 provide correlations between betting decision and various perception measures with and without individual level fixed effects. These tables confirm that perceived confidence is strongly associated with betting decisions, both when the matched recording gives a wrong or a right answer. On top of this, perceived trustworthiness is also positively associated with betting, while the perceived difficulty of following the recording is negatively associated with betting. Finally, respondents that are perceived to speak with a less strong regional accent are also more likely to attract more bets. These correlations are highly robust and also hold up when controlling for other demographic variables.

4.3 Orator demographics

What is the role of demographic characteristics in shaping perceptions of accuracy and thereby betting decisions? Tables 1 and 2 show that demographic characteristics of the orator, such as their race and gender, are highly correlated with betting decisions. In particular, respondents are more likely to bet on recordings from men and less likely to bet on recordings from African Americans. These effects are both more strongly pronounced for respondents

exposed to recordings with wrong responses.

These patterns suggest that features of the recording above and beyond the content of people's reasoning might play an important role in shaping imitation decisions. We turn to those factors in the next section.

Table 1: Regression on Bet (Vanilla)

	Dependent variable: Bet								
	All	Correct Orator	Wrong Orator	All	Correct Orator	Wrong Orator	All	Correct Orator	Wrong Orator
Perceived Confidence (norm.)	0.049***	0.055***	0.041***				0.049***	0.056***	0.041***
	(0.002)	(0.004)	(0.003)				(0.003)	(0.004)	(0.003)
Likability (norm.)	-0.010**	-0.006	-0.009				-0.009*	-0.008	-0.007
	(0.004)	(0.007)	(0.006)				(0.005)	(0.007)	(0.006)
Trustworthiness (norm.)	0.017***	0.014*	0.016***				0.017***	0.016**	0.017***
	(0.004)	(0.008)	(0.006)				(0.005)	(0.008)	(0.006)
Difficulty (norm.)	-0.004**	-0.001	-0.005				-0.003	-0.000	-0.005
	(0.002)	(0.004)	(0.003)				(0.002)	(0.004)	(0.003)
Accent (norm.)	0.007**	0.008	0.006				0.008**	0.008	0.008
	(0.003)	(0.005)	(0.005)				(0.004)	(0.006)	(0.005)
Male				0.728***	0.708**	0.503**	0.045	-0.154	0.081
				(0.167)	(0.295)	(0.249)	(0.163)	(0.255)	(0.202)
Age				0.014**	0.016	0.007	0.006	-0.000	0.007
				(0.007)	(0.013)	(0.010)	(0.007)	(0.011)	(0.009)
High school				-0.002	-0.046	-0.054	0.151	0.384	-0.096
				(0.295)	(0.478)	(0.447)	(0.262)	(0.409)	(0.341)
Some college				0.681**	0.960	0.612	0.547*	1.054*	0.386
				(0.327)	(0.695)	(0.451)	(0.324)	(0.592)	(0.356)
Associate degree in college (2-year)				0.340	0.511	0.156	-0.008	0.328	-0.250
				(0.308)	(0.578)	(0.429)	(0.289)	(0.464)	(0.335)
Bachelor				0.402	0.814*	-0.109	0.275	0.611*	-0.111
				(0.261)	(0.435)	(0.344)	(0.232)	(0.366)	(0.287)
Master				-0.682	0.147	-1.097	-0.933*	-0.257	-1.352**
				(0.782)	(1.062)	(0.848)	(0.486)	(0.755)	(0.634)
Working (paid employee)				0.370*	0.246	0.450	-0.036	0.015	0.023
				(0.217)	(0.459)	(0.328)	(0.217)	(0.356)	(0.253)
Working (self-employed)				0.250	0.133	0.286	0.139	0.254	0.109
				(0.256)	(0.506)	(0.378)	(0.249)	(0.405)	(0.301)
Work prefer not to answer				0.352	0.274	0.560	0.301	0.672	0.241
				(0.542)	(0.741)	(0.583)	(0.492)	(0.662)	(0.577)
Democrat				-0.217	-0.295	-0.007	-0.074	-0.249	0.154
				(0.190)	(0.350)	(0.280)	(0.191)	(0.295)	(0.226)
Republican				-0.462*	-0.194	-0.276	-0.322	-0.181	-0.190
				(0.268)	(0.519)	(0.389)	(0.270)	(0.427)	(0.327)
Other Politics				0.591	0.076	1.164	0.731	0.286	1.185
				(0.449)	(0.723)	(0.921)	(0.504)	(0.571)	(0.875)
Asian				0.365	0.282	0.320	0.242	-0.025	0.405
				(0.366)	(0.583)	(0.500)	(0.315)	(0.504)	(0.408)
Black or African American				-0.826***	-0.267	-1.167***	-0.703***	-0.077	-1.156***
				(0.254)	(0.410)	(0.306)	(0.235)	(0.350)	(0.253)
American Indian or Alaska Native				1.964	1.944	-0.349	-1.652	-2.053	-3.763***
				(1.771)	(1.748)	(0.363)	(1.608)	(1.854)	(0.470)
Other Ethnicity				-0.421	-0.143	-0.736	0.059	0.127	-0.130
				(0.329)	(0.495)	(0.465)	(0.300)	(0.411)	(0.442)
Const.	0.967***	1.448***	0.486***	0.133	0.617	-0.101	0.644	1.116	0.257
	(0.079)	(0.139)	(0.110)	(0.409)	(0.789)	(0.606)	(0.422)	(0.681)	(0.509)
Observations	2,413	1,177	1,236	2,413	1,177	1,236	2,413	1,177	1,236
R^2	0.275	0.288	0.251	0.020	0.020	0.026	0.283	0.295	0.272
Adjusted R^2	0.273	0.285	0.248	0.013	0.006	0.012	0.277	0.282	0.258

4.4 Paralanguage

As a next step, we consider the role of non-content features, such paralanguage – "how" people say things – as a driver of perceptions.

Table 2: Regression on Bet (Listener & Question FE)

	Dependent variable: Bet								
	All	Correct Orator	Wrong Orator	All	Correct Orator	Wrong Orator	All	Correct Orator	Wrong Orator
Perceived Confidence	0.036***	0.038***	0.029***				0.036***	0.038***	0.029***
	(0.003)	(0.007)	(0.006)				(0.004)	(0.007)	(0.006)
Likability	-0.012**	-0.012	-0.007				-0.012*	-0.012	-0.007
	(0.005)	(0.011)	(0.010)				(0.006)	(0.011)	(0.010)
Trustworthiness	0.025***	0.030***	0.017*				0.025***	0.030***	0.017*
	(0.005)	(0.011)	(0.010)				(0.006)	(0.011)	(0.010)
Difficulty	-0.012***	-0.011**	-0.012**				-0.012***	-0.011**	-0.012**
	(0.003)	(0.005)	(0.005)				(0.003)	(0.005)	(0.005)
Accent	-0.021***	-0.034***	-0.013**				-0.021***	-0.034***	-0.013**
	(0.003)	(0.007)	(0.006)				(0.004)	(0.007)	(0.006)
Male				0.529**	0.158	0.714**	-0.123	-0.535	0.334
				(0.244)	(0.331)	(0.338)	(0.298)	(0.411)	(0.366)
Age				0.013	0.015	0.007	0.002	-0.001	0.002
				(0.011)	(0.016)	(0.016)	(0.014)	(0.020)	(0.018)
High school				0.302	0.766**	-0.092	0.275	0.769**	-0.298
				(0.286)	(0.340)	(0.322)	(0.265)	(0.305)	(0.310)
Some college				0.286	0.577	0.004	0.361	0.549	0.029
				(0.319)	(0.405)	(0.346)	(0.304)	(0.351)	(0.336)
Associate degree in college (2-year)				0.723	0.660	0.514	1.564	1.857	0.655
				(0.850)	(1.178)	(1.319)	(1.175)	(1.595)	(1.448)
Bachelor				0.588**	1.535***	-0.208	0.307	1.013***	-0.369
				(0.263)	(0.296)	(0.264)	(0.253)	(0.287)	(0.257)
Master				-0.317	0.552	-0.704	-0.426	0.002	-0.706
				(0.559)	(0.572)	(0.799)	(0.443)	(0.560)	(0.584)
Working (paid employee)				0.235	0.236	0.289	0.113	0.256	0.045
				(0.259)	(0.336)	(0.330)	(0.279)	(0.371)	(0.342)
Working (self-employed)				0.049	0.083	-0.181	-0.034	-0.046	-0.232
				(0.276)	(0.368)	(0.295)	(0.251)	(0.352)	(0.303)
Work prefer not to answer				0.318	0.419	1.352***	0.086	0.217	1.155***
				(0.475)	(0.531)	(0.348)	(0.355)	(0.468)	(0.365)
Democrat				-0.013	-0.042	0.007	0.151	0.235	0.076
				(0.253)	(0.371)	(0.338)	(0.299)	(0.432)	(0.362)
Republican				-0.185	-0.059	-0.567*	-0.175	0.114	-0.452
				(0.276)	(0.347)	(0.302)	(0.268)	(0.318)	(0.305)
Other Politics				0.458	0.353	0.132	0.717*	0.840**	0.113
				(0.391)	(0.508)	(0.543)	(0.421)	(0.428)	(0.533)
Asian				0.381	0.583	0.566	-0.071	0.007	0.275
				(0.483)	(0.564)	(0.575)	(0.492)	(0.654)	(0.613)
Black or African American				-0.773**	-0.231	-1.376***	-0.520	-0.016	-1.032**
				(0.327)	(0.406)	(0.428)	(0.387)	(0.494)	(0.458)
American Indian or Alaska Native				1.279	1.081	0.595***	0.180	0.129	-0.638**
				(0.826)	(0.904)	(0.207)	(0.707)	(0.843)	(0.261)
Other Ethnicity				-0.306	0.033	-1.089***	-0.174	-0.025	-0.774*
				(0.359)	(0.492)	(0.396)	(0.348)	(0.531)	(0.420)
Const.	0.324	-0.880	0.312	-0.340	-1.912**	0.574	-1.554**	-3.204***	-0.518
	(1.176)	(2.499)	(2.237)	(0.546)	(0.960)	(0.693)	(0.706)	(1.151)	(0.921)
Observations	2,413	1,177	1,236	2,413	1,177	1,236	2,413	1,177	1,236
R^2	0.344	0.475	0.417	0.228	0.369	0.337	0.344	0.475	0.417
Adjusted R^2	0.250	0.306	0.231	0.119	0.170	0.130	0.250	0.306	0.231

Measurement To capture the role of paralanguage – how people say things – we focus on a rich set of available speech cues which capture uncertainty. We make use of two types of measures. First, we count particular words indicative of uncertainty: disfluencies, such as hesitation markers/interjections (filler words: "um", "eh", "like"...) and phrases ("Don't know"), repetitions (syllables, words, phrases) and hedges ("maybe"). On top of the semantic measures, we also leverage features of the audio recording: Pitch, intensity, shimmer, harmonic-to-noise-ratio, pulses and duration; prolonged sounds and involuntary pauses ("blocks").

Results We show that people judge the accuracy of someone's belief based on specific verbal cues. Most importantly, the paralanguage of people's reasoning – "how" a person says things – strongly predicts the extent of imitation.

5 Mechanism Experiments

5.1 Exogenous variation in perceived uncertainty

Our future mechanism experiments aim to demonstrate a causal effect of paralanguage on the virality of misbeliefs by varying only "how people say things" while holding the content of their reasoning constant. For these purposes we provide orators with the same scripts and them prompt them to "very confidently" read out the script or to read it out in a "very uncertain" way.

5.2 Naturally occurring variation in paralanguage

On top of these experiments, which explicitly prompt orators to distort their confidence, we will also conduct an additional mechanism experiment in which we merely hold the scripts constant that we provide orators with. We will then use naturally occurring variation in paralanguage to examine its downstream consequences for perceived accuracy.

6 Conclusion

Our paper examines the impact of social learning on aggregate outcomes when making financial decisions. We explore whether learning from others' verbal reasoning about their choices improves or exacerbates the outcomes of such decisions. In our experiments respondents record their reasoning about financial decision problems, with others deciding whether to imitate them after listening to their verbal explanations. We discovered two key findings: Firstly, we found striking heterogeneity in the extent to which people successfully imitate correct but not mistaken beliefs. Social learning can dampen the effect of misbeliefs on aggregate outcomes in some tasks, but increase it in others. Secondly, we demonstrated that people judge the accuracy of someone's belief based on specific verbal cues. The paralanguage of people's reasoning - that is, "how" a person says things - strongly predicts the extent of imitation. As a result, the virality of misbeliefs on a given topic depends fundamentally on whether paralanguage is diagnostic of accuracy. When paralanguage reveals biases, misbeliefs get filtered out from the aggregate. Conversely, when paralanguage misleads about accuracy, misbeliefs go viral.

Our future mechanism experiments aim to demonstrate a causal effect of paralanguage on the virality of misbeliefs by varying only "how people say things" while holding the content of their reasoning constant. These findings contribute to a deeper understanding of the role of communication and social learning in shaping decision-making outcomes in various contexts.

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A Experimental Instructions

A.1 Orator Experiment

General instructions Thanks for recording your first voice message! This study will take approximately 30 minutes to complete. You will earn a reward of $6.00 for completing the survey.

In the rest of this study, there will be 15 different questions. For each question, you will be asked to record yourself once to explain your reasoning.

We are interested in how you would answer in an informal conversation with a friend: Your friend cares about what your answer is and why.

You should spontaneously share the thoughts that come to your mind.

Provide detail about your reasoning and train of thought.

Importantly:

On pages where there is a recording, each recording begins automatically. You will always be alerted before each page with a recording.

Please do not read the question aloud: you should read the question silently and then start to talk about your answer.

The survey monitors if you leave the tab of this experiment. If you exit this tab, you will not be paid.

We ask you not to search the answers on the internet:

We are interested in how you form your thoughts about a problem.The type of questions you will be asked makes searching for answers online futile.

To ensure participants do not search for answers, the survey will monitor whether the survey window remains active.

Respondents who click away from the survey will not be eligible for the $6.00 reward.

You should remain focused on the survey window and answer questions as best you can using your previous knowledge.

After you click to submit a recording, it can take a little while to upload. We kindly ask you to be patient. The upload typically takes no more than 1 minute.
To complete the study, you will need to read all instructions carefully and correctly answer the comprehension questions.

Money circulation

On the next page, a question will be displayed and the recording starts automatically. Don't read out the question aloud.

PAGEBREAK

Does the government decide the amount of money circulating in the economy?
i) Yes, the amount of money circulating in the economy is decided by the Federal Reserve's Open Market Committee
ii) No, when private banks give out loans that are then deposited again, this creates money without government intervention

Please explain your reasoning.

The recording has already started. Please talk about your spontaneous thoughts now and submit once you're done. After submitting, it may take a few seconds before the next page appears.

[recording]

PAGEBREAK

[Question text with multiple answer response]

Your answer is considered "optimal" if you selected the correct statement. How certain are you that your above answer is optimal?

[Slider from 0% (not at all certain) to 100% (fully certain)]

A.2 Listener experiment

General instructions Thanks for listening to the first voice message! This study will take approximately 30 minutes to complete. You will earn a reward of $6.00 for completing the survey.

In the rest of this study, there will be 15 different questions.

For each question, you will listen to a voice message of another person once.

On some questions, you'll be asked to assess the recording. On those questions, please ignore your own knowledge about the question and focus on how the person sounds.

We are interested in how you evaluate the voice message:

You should pay attention to how the person speaks and will be asked how the other person sounded in the recording.

You will be shown the exact question that the other respondent had to answer and listen to their spontaneous thoughts after hearing the question.

Respondents were recorded immediately after being shown a question, so most voice messages can only be heard after a small delay, as the previous respondent had to read the question before sharing their thoughts.

Importantly: When answering questions about the recording, you should focus on how the person sounded to you. Please ignore what you yourself know about the question.

On pages where there is a voice recording, each recording starts playing automatically.

To complete the study, you will need to read all instructions carefully and correctly answer the comprehension questions.

Money circulation

On the following page, you will see the question that was shown to a previous participant and the recording of their answer will automatically start playing. It may take a few seconds until you hear the other respondent, because they had to read the question before they started talking.

Please pay close attention to the recording.

You will be able to proceed to the next page once the recording has finished playing.

PAGEBREAK

Read the question, then listen!

[Box with orator instructions] Question: Does the government decide the amount of money circulating in the economy?
i) Yes, the amount of money circulating in the economy is decided by the Federal Reserve's Open Market Committee
ii) No, when private banks give out loans that are then deposited again, this creates money without government intervention

Please explain your reasoning

[Respondents then listen to recording]

PAGEBREAK

Betting condition Your decision
You can now place a bet on the person's answer to the previous question
You are shown the question that was asked to the person as well as their answer
You receive a budget of $10
You can bet any amount between $0 and $10 to bet that the other person's answer is correct
You always get to keep whatever amount from your budget you do not bet
If the other person's answer is correct: You double the amount you bet
If the other person's answer is incorrect: You lose the amount you bet

Question: [Display question]

Other person's answer: [Display orator's answer to the multiple choice question]

Select the amount you want to bet on the other person's answer being correct

[Slider from Bet $0 to Bet $10]

Beliefs condition This question asks about what you think is the correct answer to the question.

[Question with multiple choice answer]

Your answer is correct if you selected the right answer.
How certain are you that you selected the right answer

PAGEBREAK

Assessment questions for both betting and belief conditions: Please answer the following questions solely based on how the other participant sounded in this recording.

How likely do you think it is that the other person's answer is correct?

[Slider from Not at all likely to Extremely likely]

How confident did the voice in the recording sound to you?

[Slider from Not at all confident to Extremely confident]

How likable did the voice in the recording sound to you?

[Slider from Not at all likable to Extremely likable]

How trustworthy did the voice in the recording sound to you?

[Slider from Not at all trustworthy to Extremely trustworthy]

How difficult did you find it to follow the reasoning in the recording?

[Slider from Not at all difficult to Extremely difficult]

Did the other person talk with an accent

[Slider from No accent at all to Very strong accent]

A.3 Questions for other domains

Inflation Imagine that the interest rate on your savings account was 2.5% per year and inflation was 3% per year. After 1 year, how much would you be able to buy with the money in this account?

i) More than today

ii) Exactly the same as today

ii) Less than today

Gold reserves The U.S. Federal Reserve's reserves mostly consist of gold.

i) True

ii) False

Interest rates and bond prices If the interest rate falls, what should generally happen to bond prices?

i) Rise

ii) Fall

iii) Bond prices are not affected

Stock picking Most people could systematically outperform the stock market by carefully reading free online news articles about how recent events will affect different companies and picking the right stocks based on those readings.

i) True

ii) False

Actively managed funds Do actively managed investment funds systematically outperform passively managed investment funds in terms of expected net returns, i.e. after accounting for investment fees?

(i) Actively managed funds outperform passively managed ones.

(ii) Actively managed funds do not outperform passively managed ones.

Value of a call option Holding everything else constant, how is the value of a call option for a stock generally affected by a higher volatility of that stock? i) Higher volatility increases the value of a call.

ii) Higher volatility decreases the value of a call.

iii) Higher volatility has no effect on the value of a call.

Interest rates and stock prices When the Fed increases interest rates more aggressively than expected by markets, what should happen to stock prices on average? i) Stock prices will rise

ii) Stock prices will fall

iii) Stock prices will stay the same

Day trading Assuming they have the same pre-tax return, are you likely to pay more taxes using a day-trading strategy or a long-term investment strategy?

i) Day-trading strategy

ii) Long-term investment strategy

Debt default The Constitution legally prevents the U.S. government from ever defaulting on its debt.

i) True

ii) False

Fixed vs. adjustable rate If interest rates are unusually high, it is generally better to choose a fixed-rate mortgage over an adjustable-rate mortgage.

i) True

ii) False

Debt maturity profile The U.S. Treasury protects itself from short-term fluctuations in the interest rate by emitting mostly long-term debt.

i) True

ii) False

Bitcoin transactions Thanks to the blockchain, Bitcoin can process hundreds of transactions per second.

i) True

ii) False

Historical stock returns What is the average annual return (in %) of the SP 500 stock market index over the past 20 years? [state beliefs about return in %]

Crypto mining Since the blockchain is decentralized, most Bitcoin mining is done by many small miners.

i) True

ii) False