Economic Culture and Prediction Markets

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ABSTRACT

How do individual characteristics, such as economic culture, influence the trading behaviors and the acceptance of any consensus reached through prediction market mechanisms? This research explores variations in the usage of prediction (or information) markets that are explained by some of the traders' cultural differences. Four forms of capitalism: state-guided, oligarchic, big-firm, and entrepreneurial, proposed by Baumol et al, are employed to capture aspects of traders' differences. To assess participants' economic culture along the spectrum of capitalist forms a survey instrument has been developed, validated, and tested. Moreover, several concepts related to trading participation, trading patterns, trader's overall performance and trader's acceptance of market outcomes are described and hypothesized against the economic culture forms. A series of research questions are proposed that explore how trader economic culture may affect prediction market use. The research landscape specified by Jones et al. is extended to recognize the potential differences between trader and market outcomes.

Keywords: Economic Culture, Prediction Markets, Information Markets, Forms of Capitalism, State-Guided, Oligarchic, Big-Firm, Entrepreneurial, and Trading Patterns.

1. INTRODUCTION

Information or prediction markets are mechanisms that allow a group of possibly geographically dispersed participants to reach and continuously re-evaluate consensus by discovering the value of alternative outcomes. This emerging technology can support a large number of participants, engaging many people in the decision making process. The process itself is very democratic, with all participants enjoying equal access to buy and sell their favored outcomes, typically in an anonymous market. Information markets are less expensive mechanisms than face-to-face meetings or facilitated group consensus methodologies. In addition, markets are able to operate continuously, thereby allowing participants to immediately respond to unfolding events. Re-pricing based on newly available information makes markets excellent feedback mechanisms that can be integrated into more complex and dynamic business processes. Prediction markets focus on the problem of selecting a particular outcome of a future event, such as the winner of a game or the delivery date of a software project, which can later be compared with an actual outcome (or verified in some other way). Classic examples of predictions markets include the election markets conducted by the Iowa Electronic Markets (IEM) and the Hollywood Stock Exchange markets for expected box office returns.

This research is focused on assessing important individual traits, such as economic culture, and how these individual differences can affect prediction market usage. People experience a variety of economic models as children growing up in different societies, by studying within different educational systems, and through direct involvement in different economies. It is likely that someone's general economic experience will affect their engagement in information markets, as well as their acceptance of the consensus outcomes, since an entrepreneurial economic culture is embedded in the design of such technologies.

2. PREDICTION MARKET TYPOLOGY

There are many different types of information markets that accommodate a variety of decision making tasks. Some markets are aimed at predicting the outcome of a specific event, while other markets are used for idea generation. Market designers have a wide range of options to choose from when adapting market mechanisms to specific decision making contexts. Information markets can be divided into two distinct sets based on their outcomes, verifiable and unverifiable (Jones et al., 2009), [8]. Since prediction markets, by their definition, attempt to foretell the state of an event that will be known at some future time, the results can be verified against an actual outcome. Most prediction markets can be considered event markets, where the choices are discrete and mutually exclusive, such as the winner of a presidential election. The choice models can be more complex, including the selection of quantitative outcomes from a range of possible outcomes, or even forecasting numeric information in estimation markets. Other markets are used for evaluating a range of decision options or brainstorming alternatives. These decision and idea markets, because they are creating the future based on market outcomes, will not have comparable events with which the results can be easily verified.

3. FORMS OF CAPITALISM

The role and form of capitalism has been the subject of debate, at varying levels of sophistication and animosity, since these economic and philosophical ideas first took shape. For the purposes of this research, the premise is simply that not all forms of capitalism are equal with regard to the role of markets and the types of organizations that participate in the economy. Furthermore, the immersion of an individual in these different types of capitalism will color their views of markets, through formal education and informal experience. These different views of economic and market activity are likely to have an impact on how individuals participate in and draw conclusions from prediction markets.

While there are several existing frameworks for organizing forms of capitalism (and new ones likely to arise), a simple and intuitive classification is offered in *Good Capitalism, Bad Capitalism, and the Economics of Growth and Prosperity* (Baumol et al. 2007), [1]. The classification includes four broad types of capitalism: state-guided capitalism, oligarchic capitalism, big-firm capitalism, and entrepreneurial capitalism as described below.

1. **State-guided capitalism** is characterized by the deep involvement of government in centrally planning or guiding markets, "most often by supporting particular industries it expects to become 'winners'." Though most nations exhibit aspects of several capitalistic forms, China and Singapore are reasonable state-guided examples.

2. **Oligarchic capitalism** involves the concentration of economic power and wealth in the hands of an elite group of individuals, families, or other tightly integrated social groups. The most appropriate examples can be found among some of the South American countries, such as Venezuela.

3. **Big-firm capitalism** describes an economic landscape dominated by a few well-established and very large organizations (that are not under direct government control). France and Germany are good examples drawn from Western Europe.

4. **Entrepreneurial capitalism** depends on a large number of small innovative firms for a significant portion of the overall economic activity. While no country is purely entrepreneurial, the United States does include a vibrant venture capital industry and many small businesses.

These four types of capitalism provide a basic perspective on the role of markets in a society, with entrepreneurial capitalism providing the most direct experience with markets, and state-guided capitalism insulating individuals the most from market mechanisms and risks through central planning.

4. SURVEY INSTRUMENT

The first goal of this research is to develop a survey instrument to classify individuals along the spectrum of capitalist forms outlined above, thereby assessing a dimension of economic culture. There is a long tradition in the development and use of surveys to assess cultural differences; for example, Geert Hofstede's [5] survey on the dimensions of culture has been employed by countless researchers (see Hofstede (2001) for a summary of the empirical evidence). Following that tradition, we developed items based on the conceptualization of economic cultural differences from Baumol et al. (2007) , [1]. We believe that understanding individual differences with regard to social and educational experiences with economic models can lead to insights about how these individuals might participate in prediction markets, or use the outcomes of such markets. While economic culture is certainly a complex concept, the four forms of capitalism serve as a useful starting point. Please see Table 1 for sample items from the survey.

A complete survey instrument has been developed as part of this research. Currently, the instrument has been used in several classroom-based market experiments, with item refinement after each use. Table 2 shows the current item reliabilities for the four types of capitalism, along with the number of items (with some low reliability items removed). Again, the instrument is still under development as part of this research (the latest version of the survey is available at www.MilestoneMarket.org) or at (https://www.surveymonkey.com/s/BJYXPJK).

State-Guided Capitalism	I believe that the best system is one in which the government, not private investors, decides which industries in the economy should grow. Government should use its power, through policies and providing resources, to direct the economy toward certain industries and firms.
Oligarchic Capitalism	I am most comfortable when a small number of leaders, inside and outside of government, exercise control over the economy and government. I believe that the best system is one in which both political and economic control is exercised by a few, highly-qualified leaders.
Big Firm Capitalism	I believe that the best economic system is one in which there are many, large companies, or groups of companies, that control some of the industry sectors. Only very large firms in a country have the resources to keep that country competitive with others around the world.
Entrepreneurial Capitalism	I am comfortable with an economic system that typically has a lot of change, even very disruptive change. I am most comfortable with an economic system in which individuals take risks, but also may get high rewards for those economic risks.

Table 1: Sample Items from the Survey

5. THE ROLE OF ECONOMIC CULTURE IN PREDICTION MARKETS

Participant selection is an important factor in any market, especially if the market is small or the knowledge is specialized. Factors such as domain expertise and trading experience may influence market behavior. Therefore, it is important to incorporate individual traits, evolving trading experience, and other factors specific to the particular context into market design. However, involving the ideal set of market participants is not as critical as one may expect. The "no-trade" theory suggests that adverse selection will prevent rational uninformed agents from trading if they believe their counterparts are all informed agents. Including somewhat less informed, or even completely uninformed, traders in a market adds liquidity, as

they may buy and sell contracts at prices that more informed participants would hold (Plott and Chen, 2002) , [11]. In fact, one of the strengths of markets is that they display high levels of efficiency, even though individual traders may have biases and make mistakes (Forsythe et al., 1992, [2]; Oliven and Rietz, 2004, [9]; Forsythe et al., 1999, [3]). Participant traits that support an effective information market include decentralization, diversity, independence, and the number of interconnections among participants in the market (Holland, 1998, [6]; Johnson, 1999, [7]).

Form of Capitalism	Cronbach's Alpha	Number of Items
Entrepreneurial	0.730	7
Big-Firm	0.853	3
Oligarchic	0.805	3
State-Guided	0.839	3

Table 2: Item Reliability Statistics

It is likely that participants' economic culture will affect their views of information markets. For example, state-guided, oligarchic, and to a lesser extent big-firm capitalism have some sort of strong central planning or dominant central influence. Therefore, the individuals relating best to these forms of capitalism may not embrace decentralization as fully as those who tend to be more entrepreneurial. Oligarchic capitalism's concentration of power by elite groups of industry, family, or social groups may decrease the diversity of traders and thus restrict the range of opinions expressed in the market. Likewise government and large firm dominance of state-guided and big-firm capitalism may reduce diversity of market performance in these groups. The only type of capitalism that is dependent on innovation is entrepreneurial. As independent thinking leads to innovation, it would be expected that entrepreneurial capitalists would be better adapted market participants than traders associated with the other forms of capitalism. Finally, state-guided, oligarchic, and big-firm capitalism all emphasize market control in the hands of a select few. This dependence on an influential guide may not foster interactions between trading partners at an individual level, affecting the interconnectedness in the market. This research investigates if these theorized relationships will hold with various concentrations of participants from different economic cultures. This could be especially important when the markets are small or thin, making any skews in the mixture of participants a concern.

Markets can often be quite small, yet still remain effective. As an example, this is likely to be an important consideration in project management markets and other environments where markets might be thin. Project teams may be somewhat small and result in thin markets, despite the recruitment of other stakeholders. For instance, agile methods typically rely on small teams to accomplish development tasks. There are also many software development companies that are simply small in size. In these situations, participants can be recruited from other development teams, quality assurance areas, marketing, internal end-users, and external clients. One positive feature of the project management context is that participants are often naturally divided by area of specialization. There are business analysts, project managers, database administrators, data stewards, programmers of various types, testers, and users that all bring different localized knowledge to the market. Since many software development teams are virtual, often crossing national boundaries, the economic culture of participants in project management markets will certainly be of interest.

Finally, a market must provide some motivation to induce accurate trading behavior. Market participants must have the proper incentives to fully engage in the market, as well as to trade in a forthright manner. That motivation is normally in the form of a monetary payoff. Payoffs can be real money or play money. The "real-money" markets follow the principle that forecasts will be better if traders risk their own money. However, due to regulatory issues mainly surrounding state prohibitions on gambling, many commercial information markets have adopted the concept of play money. Servan-Schreiber, Wolfers, Pennock, and Galebach (2004), [12], compared the accuracy of information markets with real-money and play-money payoffs and found no difference. Their conclusion is that real money is only one of many possible motivators such as the thrill of competition, reputation, and community bragging rights, or prizes for the best forecasters. Do monetary and non-monetary payoffs, or other incentives, affect individuals with varying economic cultures differently? Providing incentives appropriate to the culture will certainly foster participation in prediction markets.

This research extends the research landscape describe in Jones et al. (2009), [8], by acknowledging that trader outcomes and market outcomes are distinctly different (Figure 1). While the market may speak with one voice it is an accumulation of many individual voices. We propose that the market experience will be different for each participant. The outcomes of these experiences include how well the participant performed or their accuracy, how profitable the participant was, the level of confidence and acceptance the individual has in the ultimate outcome of the market, as well as their intent to continue to participate in this or upcoming markets.
The research questions relating individual characteristics such as economic culture, trader behavior and trader outcomes can be placed in the enhanced prediction market context (see Figure 1).

6. PARTICIPATION OR ENGAGEMENT

A core assumption of our focus on market participation is that usage will vary based on trader characteristics, such as cultural differences, domain expertise, and prior experience with financial market concepts. Indeed, previous research in the financial sector does highlight considerable variation in stock market participation across nations. For example, Figure 2 summarizes stock market participation for more than two-dozen countries as the fraction of individuals who directly own stock (Guiso et al., 2007) , [4]. These substantial national differences in market participation lend credence to the role of culture and the socio-economic environment on the grass roots acceptance of financial markets. Therefore, it seems reasonable to expect similar patterns of variation in the usage of prediction markets.
One of the easiest aspects of market use to measure can be labeled engagement. Basically, these measures provide quantitative evidence regarding the level of market use. Example measures include the number of logins, the average or total duration of market sessions, the number of trades (possibly

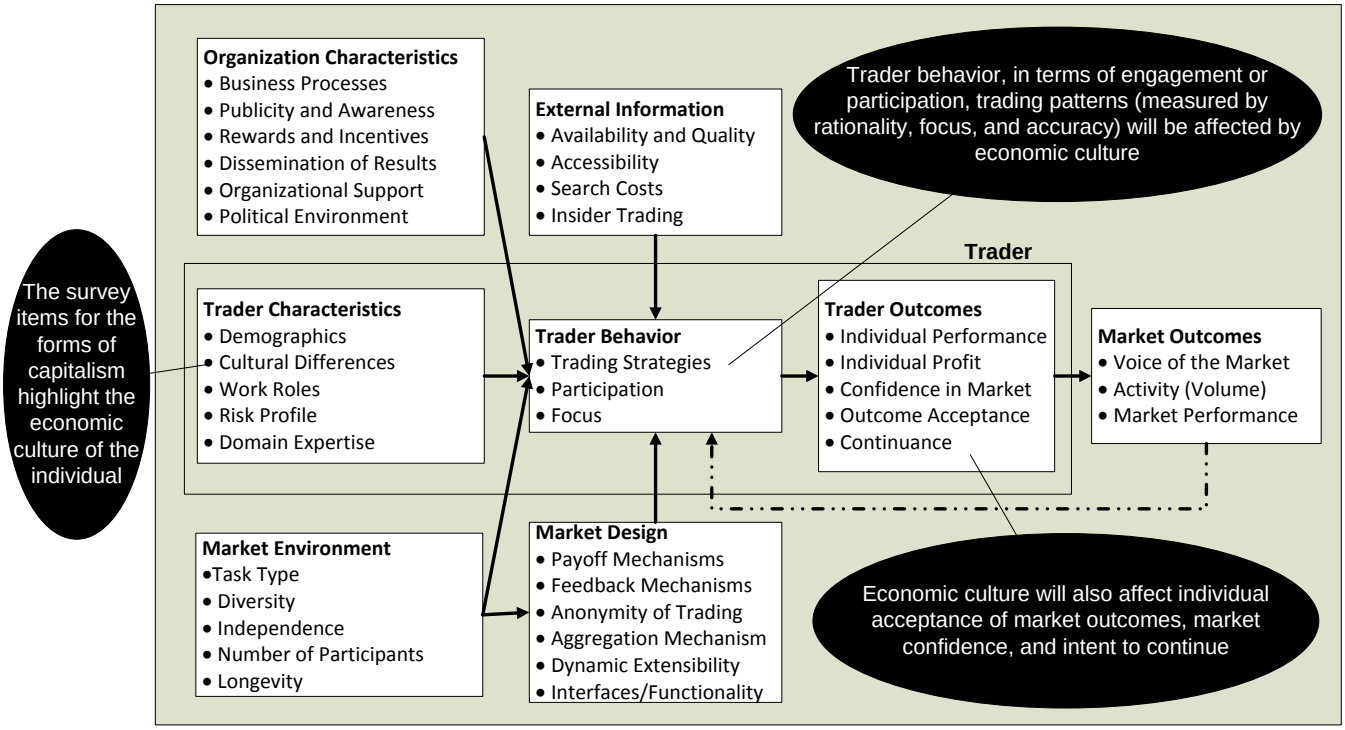

Figure 1: Research Landscape (see Jones et al., 2009) with Economic Culture Relationships

weighted by volume), or counts of specific types of actions such as buys or sells. It can be hypothesized that as individuals move from state-guided capitalism toward entrepreneurial capitalism, market engagement would increase.

7. TRADING PATTERNS

Trading behaviors beyond measures of engagement might be expressed through more complex arrangements of trades. For example, the level of rationality (or irrationality) could be reflected by illogical strategies such as continually buying at high prices and selling at low prices. The consistency of trades could also be measured by considering the set or outcomes being bought or sold.

A more refined measure might be called "trading focus," in which the consistency of trades is considered over time. In other words, the outcomes traded might be very tightly clustered at each point in time, but evolve over time as new information becomes available. Of course, trades can involve buying or selling shares. So, these measures could be evaluated within each type of trade, or the buy/sell ratio may be used as a measure. A less experienced trader is probably more likely to buy and accumulate shares in outcomes, rather than engage in more sophisticated strategies such as taking advantage of arbitrage opportunities. Finally, the overall accuracy of trades at the individual level is certainly an important measure to evaluate. Again, it seems reasonable to hypothesize that as individuals move along the continuum from state-guided to entrepreneurial capitalism, trading patterns will be more rational, consistent, focused and accurate due to a more sophisticated knowledge of markets.

8. INDIVIDUAL AND MARKET OUTCOMES

Market outcomes may also vary as individuals from different economic cultures participate in prediction markets. Traders with more experience in market-based capitalism are more likely to accept or have confidence in the consensus develop through prediction market methods. In addition, they are likely to view the role of diffused responsibility and the wisdom of crowds in different terms. It seems natural to view the outcomes at both the individual and aggregated market level. At the individual level, measures that assess the accuracy of trades as compared with the market consensus are certainly valid evaluations. In addition, the individual trader's ending bank balance or profitability casts light on their performance. At a higher level of analysis, an individual trader's acceptance or belief in the market consensus is likely to vary with economic culture. Finally, the overall accuracy of markets with different cultural mixes of traders could be evaluated, especially for markets with known or verifiable future outcomes.

9. RESEARCH QUESTIONS

One of the central research contributions of this project is the development of the survey instrument for identifying an individual's economic culture based on Baumol's four forms of capitalism, [1]. However, the focus of this section is the subsequent research questions dealing with how variation on this economic culture concept affects the use of information markets.

Research Question 1: How does economic culture, as defined by Baumol's forms of capitalism, affect individual participation in an information market?

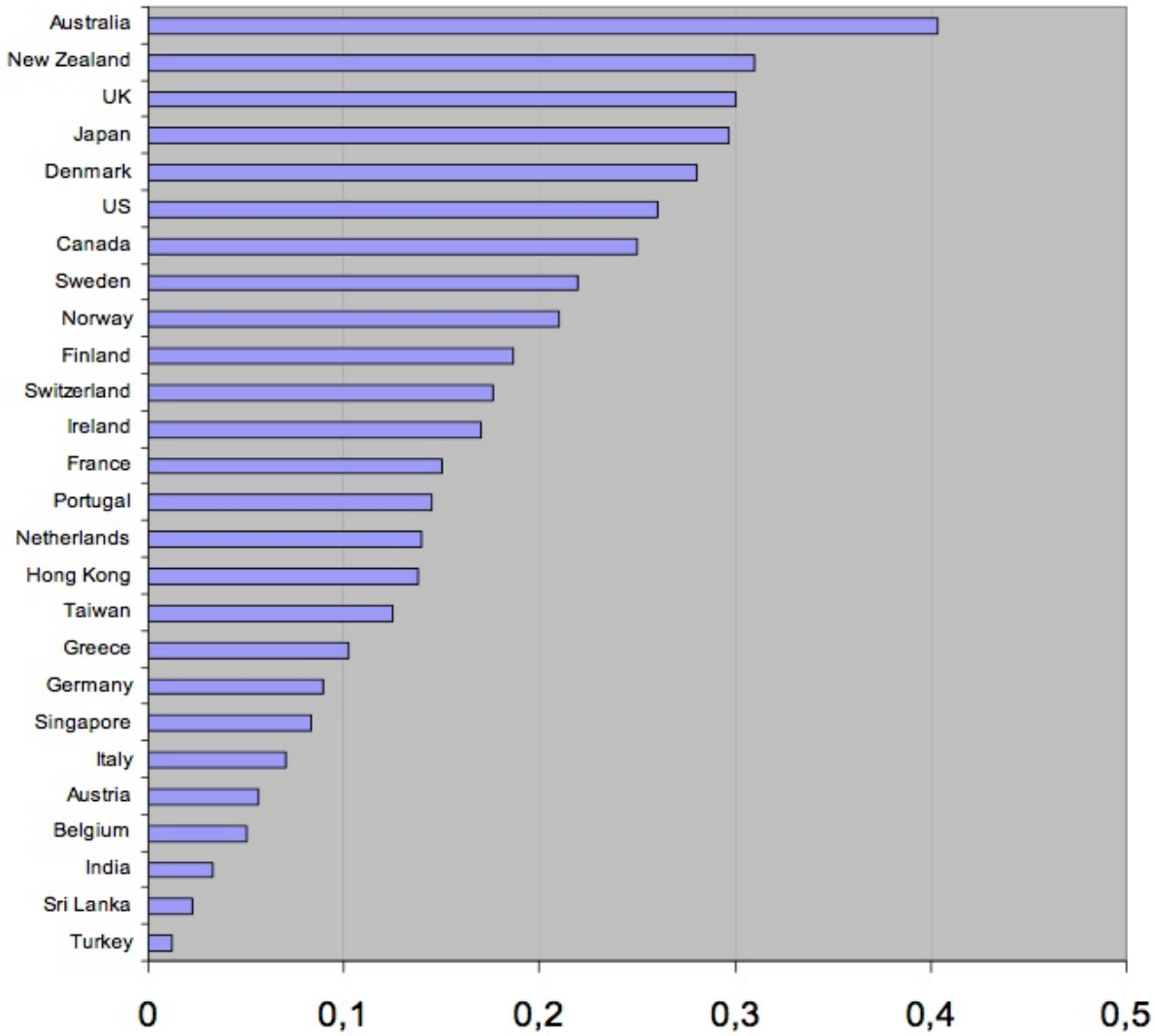

Figure 2: Variation in Stock Market Participation Across Nations (see Guiso et al., 2007)

The expectation is that market participation or engagement will increase as economic culture moves from state-guided to entrepreneurial capitalism. That is, traders will trade more often and spend more time in information markets.

Research Question 2: How does economic culture affect individual trading behavior or the strategies pursued in an information market?

As an individual's economic culture moves from state-guided to entrepreneurial capitalism, the expectation is that trades become more focused. Focus can be defined as the number of different items traded per unit time (such as day or week). A tight focus means that traders confine their actions to a small set of items, rather than trading simultaneously in many different shares or contracts. In addition, buying rather than selling may dominate with less market familiarity, so the buy/sell ratio should be greater than one and larger as economic culture is associated more with state-guided or oligarchic capitalism. Finally, irrationality might be captured by measuring the average cost to purchase a specific type of item and counting the number of trades that sell below the average cost.

Research Question 3: How does economic culture affect an individual's overall performance in an information market?

The expectation is that people with more market experience as reflected by economic culture will end up trading more profitability, therefore ending with larger banks, or trading more accurately as compared with the final market outcome. These are objective measures that can be derived from both ongoing and ending trading data.

Research Question 4: How does economic culture affect an individual's acceptance of market outcomes?

Again, it is likely that traders with economic cultures tending toward entrepreneurial forms of capitalism will be more

accepting of any final consensus reached through a market. At a more abstract level, these traders should also believe more in the general approach of decentralized decision making embodied in markets.

Additional survey items will need to be developed along with this research question, and for any other research question that uses a perceptual-type of dependent variable (as opposed to measuring a trader's or the entire market's behavior or outcomes). For constructs such as *acceptance of market outcomes* we will adapt widely-used items for similar variables. For the particular example of *acceptance of market outcomes*, we will employ expectations-confirmation theory (Oliver 1977), [10], which posits that expectations, coupled with perceived performance, lead to post-purchase satisfaction.

10. CONCLUSION

This research is focused on individual characteristics, such as economic culture, and how these characteristic might influence trader behavior and the acceptance of any consensus reached through prediction market mechanisms. The first step in this research is to develop a survey instrument to assess economic culture. Using the four forms of capitalism described in Baumol et al. (2007), [1], a preliminary set of items tied to state-guided, oligarchic, big-firm, and entrepreneurial capitalism has been pilot tested in some classroom experiments. While there will be continued survey development, the current version has reached reasonable reliability levels. Several concepts related to market engagement, trading patterns, and market outcomes are described in this paper. A series of research questions are proposed that explore how individual economic culture may affect prediction market use. The next steps in the research will involve developing quantitative measures that can be extracted from detailed trading data and compared with individual differences in economic culture. The ultimate goal is to better understand individual economic culture and develop best practices for the recruitment of information market participants.

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