The Australian Twins Economic Preferences Survey

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Abstract

This paper describes the Australian Twins Economic Preferences Survey (ATEPS). The dataset comprises a wide variety of preference and behavioral measures (risk aversion, impatience, ambiguity aversion, trust, confidence) elicited using incentivised decision tasks. 1,120 Australian adult twins (560 pairs) completed the survey, making it one of the largest datasets containing incentivised preference measures of twins. As the survey was conducted during the COVID-19 pandemic, we also collected information on experiences related to the pandemic, along with a variety of questions on political attitudes and mental wellbeing. We hope that ATEPS can make a valuable contribution to social science and genetics research.

Keywords: economic preferences; twins; twin study

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Introduction

Economists have long sought to understand the nature and malleability of people's economic preferences. Since preferences underly important life choices, a deeper understanding of them may shed light on the pathways through which advantage and disadvantage transmit. With this motivation in mind, ATEPS was conceived to better understand how people's economic preferences are formed by the influence of genetics, family and environment.

For more than a decade, twins research has been making important contributions to our understanding of economic preferences and related behavioral tendencies such as risk aversion (Cesarini et al. 2009; Zhong et al. 2009; Zyphur et al. 2009; Le et al, 2010; Simonson & Sela; 2011; Cesarini et al. 2012; Beauchamp et al. 2017; Harden et al. 2017; Nicolau & Shane 2020), impatience (Anokhin et al. 2011; Cesarini et al. 2012; Harden et al. 2017; Hubler 2018), ambiguity aversion (Cesarini et al. 2012), trust (Cesarini et al. 2008; Hiraishi et al. 2008; Sturges et al. 2010; Van Lange et al. 2014; Wootton et al. 2016; Reimann et al. 2017) and overconfidence (Cesarini et al. 2009). Table 1 summarizes all twin studies to date in terms of shares of variance corresponding to genes, common environment and unique environment. On average, studies have found that genes explain around 20-35% of variation, but estimates vary greatly (see Figure 1).

[Table 1 about here]

[Figure 1 about here]

Very few studies have elicited behaviors using monetarily incentivized decision tasks, which are conceptually superior to hypothetical or attitudinal measures (Harrison 2006). Previous work demonstrated that people make different decisions when they are hypothetical versus when they have real financial consequences (e.g., Holt and Laury 2002; Holm and Nystedt 2008; Etchart-Vincent 2009). Some twin studies have focussed on real-world behaviors related to preferences like risk aversion and patience – such as investment and saving decisions (e.g., Barnea et al. 2010; Cronqvist, Siegel 2014; 2015) – but these behaviors have determinants other than preferences, so do not reveal the heritability of preferences per se. Moreover, rarely have multiple preference and behavioral measures been elicited

within the same sample, allowing their inter-correlations to be explored and controlled for. ATEPS contains incentivized measures of numerous behavioral traits for a large sample of Australian adult twins.

The timing of this survey also coincided with the COVID-19 pandemic. Beyond the direct health impacts, public health restrictions have changed the structure of work and social connection in Australia. These changes may have had a profound impact on individuals' economic preferences and ATEPS presents a unique opportunity to examine this impact using within-twin pair variation.

Sample

Our sample was collected in collaboration with Twins Research Australia (TRA), which maintains the largest twin registry in Australia. TRA recruited twins from their registry by approaching them initially through email, and then progressing to SMS or targeted phone calls. The recruitment sample was drawn from active members of the registry aged 18-65 years at the time of recruitment. Twin pairs with both twins who opted in were then sent an individualized link to an online survey (administered using Qualtrics) by the research team. The survey was first emailed to participants on 8 September 2020 and then progressively sent to additional participants until 25 February 2021. The survey was closed on 1 March 2021. Our protocols and procedures were approved by the University of Technology Sydney Human Research Ethics Committee (application numbers ETH19-4381 and ETH20-5410) and by TRA.

Figure 1 details how the sample filtered down from TRA's recruitment pool to our final sample. TRA recruited from a pool of 6,848 active twin pair members; 69% females and 59% recorded as monozygotic (the rest either dizygotic or unknown, so 59% is a lower bound). Of these, 803 pairs agreed to be sent the survey. 1,447 individuals started the survey with 1,249 fully completing it. After limiting the sample to fully completing pairs, we have 560 pairs.

[Figure 1 about here]

A significant feature of ATEPS is its relatively large sample size. To obtain this sample, TRA recruited for 25 weeks, with an initial pilot batch used to test for any process issues. The sign-up rate from email and SMS invitations to this pilot group was lower than expected. Based on related studies, we determined that 450 twin pairs would constitute a viable sample. To ensure at least this benchmark, we added a prize draw for participants (as an additional incentive beyond the task rewards) and TRA engaged in limited recruitment via phone calls targeted at twin pairs where one had already signed up. There were two rounds of phone calls – one in December and one in January. These calls prioritized dizygotic twins, who are underrepresented in TRA's registry.

The research team contacted participants by email shortly after they opted into the study. Follow-up emails were then sent to those who had not yet completed the survey typically 10 days after the initial email. At most, twin pairs received two further follow-ups before the survey was closed. We also engaged in limited SMS and phone call reminders targeted at half pair completes in December and in February. Participants were not required to complete the survey in one sitting, and if they exited the survey they could restart where they left off later.

There are 401 monozygotic pairs and 159 dizygotic pairs in the pair-completes sample. In total 82.9% of the sample are female. Because it was difficult to reach our recruitment benchmark with only same-sex pairs, we included mix-sex dizygotic twins, although the majority (73.6%) are same-sex. In addition to the sex difference, compared to the general population of Australians aged 18-65 years, participant in our sample are slightly older on average (44.7 versus 40.5 years), have a similar probability of being married (50.8% versus 48.8%), are more likely to have a university degree (59.1% versus 32.4%) and are more likely to be employed (85.3% versus 70.6%). Comparative figures are population weighted means from the 2018 wave of the Household Income and Labour Dynamics in Australia Survey.

In the general population, around 30% of twins are monozygotic. Our overrepresentation of this group partly reflects selectivity into TRA's active participant pool, and partly selectivity into our study. Such selectivity could be problematic if it leads to systematic differences in the twin pair groups that are

related to the outcomes of interest. However, Table 1 shows that monozygotic and dizygotic twins in our sample are very similar in terms of key demographics, which provides some reassurance against this concern.

[Table 1 about here]

The Survey

A copy of the complete survey is available in the Supplementary Material, along with a detailed codebook describing the variables available (note section headings were not displayed to participants). Table 2 summarises the main features of the survey, which we expand on below.

[Table 2 about here]

Zygosity

Zygosity status was determined by self-report if one twin indicated having been genetically tested. If twins reported different blood types they were classified as dizygotic. For all other twins we used responses to the peas-in-a-pod questionnaire, which has been shown to predict zygosity with more than 90% accuracy (Ooki et al. 1990). Of the 518 same-sex twin pairs who fully completed the survey, the zygosity status of 184 (35%) is determined by self-reported genetic test results, 25 pairs (4.8%) are classified as dizygotic due to different blood type and the remainder are classified using the peas-in-a-pod questionnaire. We also included TRA's recorded zygosity status at the time of recruitment for each pair, along with how that status was determined.

Economic preferences

Participants' risk, time, ambiguity preferences and trust were revealed using experimental choice tasks. A unique feature of ATEPS is that participants' preferences were elicited multiple times with different tasks, which can help researchers deal with measurement error (Gillen et al. 2019).

Risk preferences

Risk preferences refer to a person's proclivity towards risky options. Typically, economic experiments measure this through an individual's choice between lotteries with higher and lower variance. For example, an individual is more risk taking if they would prefer a lottery over a sure payment. We used three distinct choice tasks.

In the first task, based on Gneezy & Potters (1997), participants were told that they were given a sum of money and able to invest it in a risky project. For each question, we varied both the probability that the project would be successful and the return from a successful investment. Participants were asked what amount they would choose to invest.

In the second task, based on Eckel & Grossman (2002), participants were asked to choose between six lotteries, which each had a 50% chance of yielding a low or high payoff. More risk seeking individuals would pick the lottery with the greater difference in payoffs.

In the third task, based on Gillen et al (2019)'s adaptation of Holt & Laury (2002), participants were told that there was a box with a certain proportion of red and black balls. Participants first chose red or black as their winning colour. They then had to choose across a multiple price list (MPL) between a sure payment or receiving payment only if a ball drawn from the box matched the colour they chose (50% chance).

Ambiguity aversion

Ambiguity aversion refers to the tendency for people to prefer known risks over unknown risks (Ellsberg, 1961). This is typically studied using incentivised lottery choice tasks where the probabilities of outcomes are left ambiguous. A measure of a person's ambiguity aversion is given by the degree to which a person makes choices that are more risk averse in the ambiguous choice task, relative to the same task with known probabilities. To elicit ambiguity aversion, participants completed a task identical

to the third task measuring risk preferences except that they were not told the proportion of red and black balls in the box.

Time preferences

Time preferences refer to the weight assigned by a person to future consumption relative to current consumption. People who are less patient tend to discount the future more heavily.

Our first task used a series MPLs where participants were asked to choose between a payment sooner or a higher payment later. We varied the amounts and delay between the sooner and later payment, and for each MPL we had a 'now' versus 'future' and 'now + X weeks' versus 'future + X weeks' condition, which can reveal present or future biased behavior.

We also included a certainty equivalent task where participants could nominate an amount that would make them indifferent between that amount today and $X at a future date. To incentivize the choice, we followed Benhabib et al. (2010) by incorporating a Becker-Debreu-Marshack (Becker al al. 1964) mechanism to determine the actual amount received.

Trust

We measured willingness to trust others using a trust game (Berg et al. 1995). This game involved a sender deciding how much money to send to a receiver. The money sent to a receiver is increased by a factor of three and the receiver can then choose how much to send back. A sender is more trusting if they send a greater amount; a receiver is more trustworthy if they return a larger share.

Stated preferences

The survey also elicited stated preferences. Using a scale from 0 to 10, participants were asked to rate their perception of their risk preferences, time preferences and their willingness to trust others following Falk et al. (2016).

Behavioral biases

Another aim of the study is to decompose the variation in participants' propensity to be affected by behavioral biases. Specifically, we obtained measures of default bias, status quo bias and overconfidence.

Default bias

Default bias refers to the tendency to prefer the default option over its alternatives. We measured default bias by asking participants about their default behavior in the superannuation market (compulsory retirement savings). As studies have shown, the failure to switch away from default funds and investment strategies can greatly reduce income during retirement (Productivity Commission 2018). We asked participants whether they are enrolled in their default superannuation fund and whether they make voluntary contributions.

Status quo bias

Status quo bias refers to the tendency to prefer that the current state of affairs remains the same. We measured status quo bias by asking participants how frequently they compare their existing policy to other policies in electricity and private health insurance markets.

Overconfidence

We adopted an approach similar to Cheung & Johnstone (2017) to measure overconfidence by repeating our first risk preference task but with the outcome tied to whether the person scored in the top 50% of participants in a cognitive ability challenge. We would expect that people who are more confident will be less likely to reduce the amount invested compared to the original task.

For the cognitive challenge, participants were incentivised with payment to solve ten puzzles chosen from the matrix reasoning item bank (MaRs-IB) (Chierchia et al. 2019). These tasks are similar to Raven's Matrices. We chose 10 tasks such that the expected average score (based on the original study) was six correct. Although the MaRs-IB is a validated measure of non-verbal reasoning, it has not been

validated specifically using the 10 sub-items we selected, so scores on the puzzle task should be used as a measure of cognition with caution.

As a more conventional measure of overconfidence, participants were also asked how many of the puzzles they believed they answered correctly and what they perceived their rank to be.

Demographics, wellbeing and COVID-19

The survey included several demographics questions, such as relationship status, household composition, education, finances and employment. Some questions were targeted specifically towards understanding the impact of the COVID-19 pandemic on economic preferences. For example, participants were asked whether they had experienced any change in their employment due to COVID-19 restrictions and whether they had been tested for COVID-19. Because of the highly politicized nature of the government response to the pandemic, and the possible influence of political preferences on economic preferences, we included questions on voting attitudes, attitudes towards politicians (Pop-Eleches & Pop-Eleches, 2012) and a conservativism scale (Everett et al. 2013).

Because COVID-19 has caused a significant disruption to the external environment, it is possible that genes and environment may present differently in the variance of economic preferences than at other times. This may affect the comparability of our study to earlier work; it may also affect the relevance of earlier studies for the current (and future) social climate. For context, Australia's experience of the pandemic has been less acute than many other developed countries, with very low rates of infection and death. When we began collecting data on 5 September 2020 there had been cumulatively 26,136 confirmed cases and 737 deaths. When we closed the survey on 1 March 2021 there had been 28,970 cases (around 0.1% of the population) and 907 deaths, and there were no major lockdowns during this period. In comparison, the US had experienced 28,363,488 cases (around 8.5% of the population) and 515,214 deaths while Europe had experienced 38,712,652 cases (around 5% of the population) and 873,354 deaths (World Health Organisation, 2021).

The survey also included a loneliness instrument and a measure of anxiety and depressive symptoms. The loneliness instrument was a three-item questionnaire adapted from Hughes et al (2004). Anxiety and depressive symptomology were elicited using the PHQ-4 (see Kroenke 2009 for a validation study).

Payment

At the end of the survey, a random number generator picked one of the decision tasks and we played it out for real. It was made clear to participants in the Information Statement and survey instructions that they would only be paid based on their responses once both members of the twin pair had completed the survey. Participants also had to explicitly confirm their understanding of this payment condition by selecting 'Yes' prior to answering the substantive questions in the survey. They were informed that they would need to provide valid bank details, and that payments would be processed within 10 days of both twins completing the survey. A small number of participants completed the survey but did not provide valid bank details (usually because of security concerns). These participants are included in the sample but can be filtered out if desired.

We calibrated payments so that participants would receive approximately $16 AUD on average, relative to an expected engagement time of 45-60 minutes (the actual average payment was $15).

Conclusion

ATEPS is an important new resource for social science researchers interested in genetics. Pending TRA approval, ATEPS can also be linked to other existing TRA surveys, expanding its value further. ATEPS is freely available to use for non-commercial research purposes by people affiliated with a valid research institution. Eventually, a de-identified version of the survey will be uploaded to a public data repository. In the meantime, please contact us directly if you would like to access the data.

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Conflict of interest

None.

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Table 1: Estimated AC(D)E shares for economic preferences from twin studies

Preference	Studies	Incentivized	Median pairs	A/D	C	E
Risk	9	2	437	0.35 (0.42)	0.03 (0.01)	0.62 (0.58)
Time	4	1	958	0.25 (0.21)	0.04 (0.03)	0.68 (0.75)
Trust	6	2	582	0.35 (0.42)	0.01 (0.01)	0.64 (0.58)
Ambiguity	1	0	3512	0.16	0.04	0.8
Overconfidence	1	0	460	0.25	0.08	0.67

Note: The last three columns correspond to the average estimated A/D (additive genes/dominant genes), C (common environment) and E (unique environment) shares from previous studies. Figures in parentheses are averages weighted for sample size. We use the estimates from the study's preferred model according to our reading of the paper (e.g., the model with best fit). For studies that used multiple elicitation tasks, we use the mid-point from the range of reported estimates. The column 'Incentivized' reports the number of studies that used incentivized choice tasks. Un-incentivized studies include those using both hypothetical choice tasks and attitudinal preference measures.

Table 2: Sample Characteristics

Characteristic	Monozygotic twins	Dizygotic twins
Number of pairs	401	159
Male-male	57	18
Female-female	334	99
Male-female	-	42
Mean age	44.0	46.3
Married	51.0%	50.3%
University educated	58.9%	59.8%
Employed	85.9%	83.7%

Note: Zygosity status was determined by self-report if one twin indicated having been genetically tested, and if twins reported different blood types they were classified as dizygotic. For all other twins we used responses to the peas-in-a-pod questionnaire.

Table 3: Survey Modules

Module	Survey questions
Zygosity	Peas-in-the-pod; blood type; known status
Risk	Investment task (Gneezy & Potters 1997); Lottery choice task (Eckel & Grossman 2002); Multiple price list (MPL) task (Holt & Laury 2002)
Time	MPL task; certainty equivalent (Benhabib et al, 2010)
Ambiguity	MPL task
Trust	Trust game (Berg et al. 1995)
(Over)confidence	Matrix puzzle task; Investment task
Stated preferences	Risk, patience, trust (Falk et al. 2016)
Default bias	Superannuation plan
Status quo	Switching – superannuation, private health insurance, electricity
Demographics	Sex; Australia born; State; city/country; marital status; children (plus ages); education; employment; retirement; household income; self-assessed health; disability
Mental health	Loneliness (3-items); depression and anxiety (PHQ-4)
Politics	Party affiliation; conservatism; view towards politicians
Covid-19	Exposure; risk perceptions; worry

Figure 1: Box plot of estimated AC(D)E shares for economic preferences from twin studies

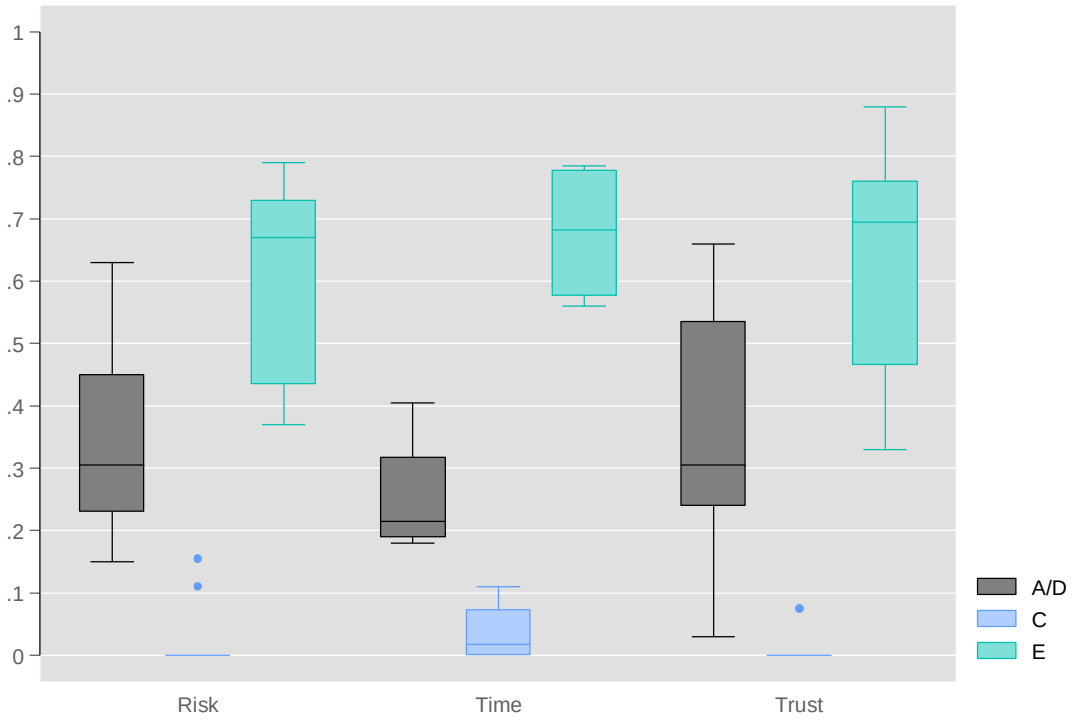
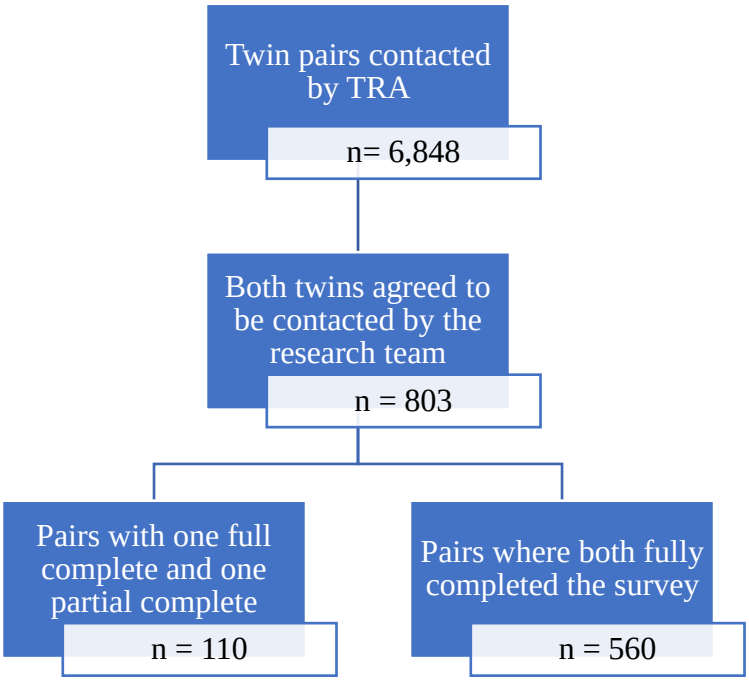


Figure 2: Recruitment hierarchy



Note: One triplet group was contacted, and two siblings fully completed the survey (not included in figures in the third row).