Clusters of economic preferences

evidence from a large-scale classroom experiment

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KRTK KTI Közgazdaságtudományi Intézet

Introduction

- Lately, numerous experiments and surveys that measure *several* preferences at once.
- What do we gain by collecting data on *several* preferences?
  - Is it just a way of economizing resources? Or is there something more to it?
- Two strands (?) in the literature:
  1. How many preferences / traits are we measuring indeed?
  2. Do these preferences add up to personality profiles?
- Both questions involve clustering, but are different: the first is related to clusters of preferences, while the second puts individuals into clusters.
  - While we do both in our paper, I will present just the latter here.

Findings - trailer

Using k-prototype and 3 clusters we identify students

1. that are **patient, risk-tolerant, prosocial and competitive**
2. that are **impatient, risk-averse and altruistic but non-cooperative/non-trusting and non-competitive**
3. and a third who are **low on every social preference** measure but otherwise average

.

We also show that these groups

1. are **above average** in test scores, GPA and parental education
2. **below average** in test scores and GPA and parental ed.
3. average group in test scores and GPA and parental education

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Outline

Data: Preferences and procedures

Preferences

Tasks (in order)

1. **Time 1**: now or 2-weeks,
2. **Altruism 1** Dictator classmate
3. **Altruism 2** Dictator schoolmate (non-incentivized)
4. **Risk**: Bomb risk elicitation task (Crosetto and Filippin, 2013)
5. **Cooperation**: Two person public-good game
6. **Time 2**: 4- or 6-weeks
7. **Trust**: Trust game
8. **Trustworthiness**: Trust-return phase
9. **Competitiveness**: Niederle and Vesterlund (2007) ▸ Details

see Horn et al., 2022

Procedures

- 9 secondary schools from Hungary from 2019 March-2020 March.
  - Not representative (overall, better than average family background and standardized test scores): we have very good, but also not that good schools.
  - 1069 students from 51 classes could be linked to the *National Assessment of Basic Competences* (NABC) that provides rich data on family background, test scores, and school grades.
  - We went to the school on the agreed day, set up our lab, and tested 4-5 classes.
  - 45 minutes (a lesson's duration) per class.
  - Voluntary participation. Consents OK.
  - One of the tasks paid, canteen vouchers as incentives. Expected earnings $\sim$ 1000 HUF, enough to have a lunch (back then).

Do the preferences add up to some personality profile?

Personality profile?

- Many studies report correlations between preferences. e.g.:

	Patience (Delta)	Beta	Risk	Altruism	Trust	Trustworthiness	Cooperation
Beta	-0.39***	1					
Risk	0.16***	-0.12***	1				
Altruism	0.03	0.07*	0.13***	1			
Trust	0.15***	0.05	0.22***	0.27***	1		
Trustworthiness	0.02	0.02	0.02	0.29***	0.32***	1	
Cooperation	0.10***	0.01	0.15***	0.14***	0.45***	0.25***	1
Competition	0.02	0.05	0.08**	0.03	0.05	0.03	0.03

Table 1 from Horn et al. (JEBO, 2022)

- Patience, risk tolerance and trust go together. But are there groups of students that characterized by this set of preferences?
- Correlations are not transitive. Not clear if, for example, patience, risk tolerance, and trust add up to a personality profile and really characterize a group of students.

Personality profile? cont'd

- Chowdhury-Sutter-Zimmermann: Economic Preferences across Generations and Family Clusters: A Large-Scale Experiment in a Developing Country (JPE, 2022)
- Focus on intergenerational transmission of preferences based on *risk*, *time* and *social* preferences measured for 542 families from rural Bangladesh.
  - Substantial intergenerational transmission of preferences.
- More importantly (for us), families are classified into two clusters: relatively patient, risk-tolerant, and prosocial families vs. relatively impatient, risk averse, and spiteful families.
- The relatively patient, risk-tolerant, and prosocial families tend to have higher income and more members.

Findings: Clusters of students according to preferences

Do we see clusters of students?

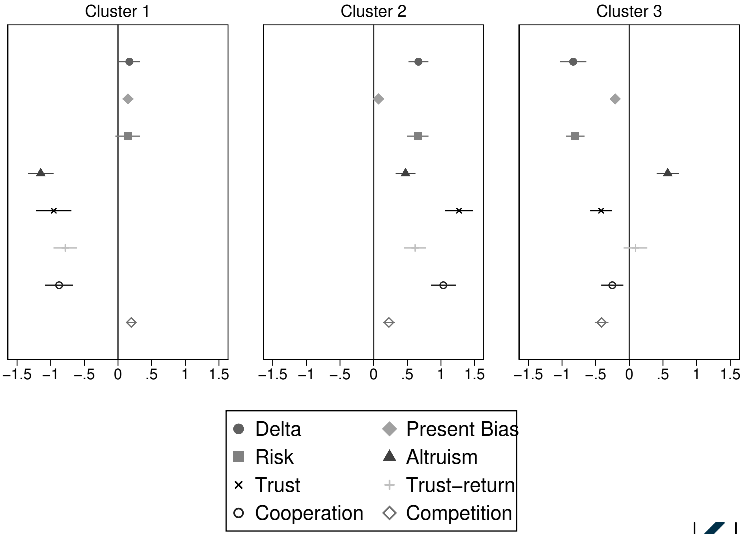
- It is an "unsupervised classification" problem
  - We do not have the "true outcome"
- It is simply not clear how to best group observations in many dimensions.
  - What measure do you use to define distances between points?
  - What is the ideal number of clusters?
  - What approach should we use?
- Many approaches (Madhulatha, 2012; Rokach and Maimon, 2005):
  - Partitioning
  - Density based methods
  - Hierarchical models
  - Model-based methods

Partitioning

- First, we follow Chowdhury et al. (JPE, 2022) and use the **k-medoid** method to find clusters of students with a set of preferences that characterize them.
- Number of clusters is an important issue here.
- (At least) 30 tests to determine the optimal number. Often with very disparate results.
  - Chowdhury et al. (JPE, 2022) only use two such tests.
  - And show results for 2 clusters.
- Here, we present findings for 3 clusters.
- We present finding with **k-prototype** clustering (we believe it is better for this dataset)

Clusters visual

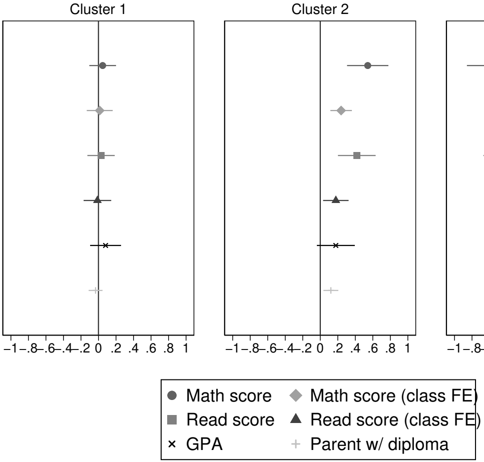
Who are in the 3 k-prototype clusters?



Who are in the 3 k-prototype clusters?

- Cluster 1: Low social preference but competitive
- Cluster 2: Patient, risk-tolerant, prosocial and competitive
- Cluster 3: Impatient, risk-averse, altruistic but non-cooperative/non-trusting, non-competitive

Who are in the 3 k-prototype clusters?



Note: info. from cca. 3 years prior the preference-measures (NABC)

Who are in the 3 k-prototype clusters?

- Cluster 1: Low social preference but competitive - avg. students
- Cluster 2: Patient, risk-tolerant, prosocial and competitive - *above* avg. test-scores (and GPA and parental ed.)
- Cluster 3: Impatient, risk-averse, altruistic but non-cooperative/non-trusting, non-competitive - *below* avg. test scores. (and GPA and parental ed.)

Conclusion

Is cluster analysis a promising venue?

- Clustering students is quite complicated as there are many methods and dimensions to consider.
- But using k-prototype and 3 clusters we
  1. identify students that are **patient, risk-tolerant, prosocial and competitive** AND show that they are **above average** in test scores (and GPA and parental ed.)
  2. we also identify students that are **impatient, risk-averse, altruistic but non-cooperative/non-trusting and non-competitive** AND show that they are **below average** in test scores (and GPA and parental ed.
  3. and there is a third, average group, who have low social preference

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  - Remember Chowdhury et al. (2022): The relatively patient, risk-tolerant, and prosocial families in Bangladesh tend to have higher income and more members

Thanks for your attention! Any questions?

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Time preferences

- Patience (δ) and present bias (β)

$$U^0 = u_0 + \beta \sum_t \delta^t u_t$$

- Two horizons: today vs. 2 weeks later, 4 weeks vs. 6 weeks later
- *Staircase method*: interdependent choices (Falk et al., 2018)
- First decision: 1000 HUF today or 1540 HUF in two weeks, next question comes based on this decision.

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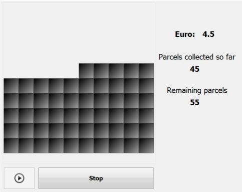
Risk preferences

- *Bomb risk elicitation task* (Crosetto-Filippin, 2013)
  - 100 boxes, 1 contains a bomb, subjects have to decide how much to collect.
  - Computer randomly draws the position of the bomb: b



- If the subject opens k boxes, the payment is γk if $b > k$, 0 otherwise.
- Expected utility $= \gamma k \frac{100-k}{100}$, maximum at $k = 50$, so risk neutral chooses $k = 50$.

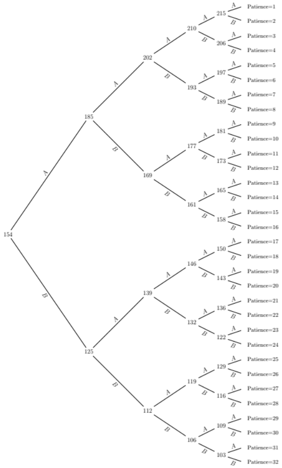
Social preferences

- Altruism - *Dictator game*
  - How much of 2000 HUF would you give to your classmate?
  - How much of 2000 HUF would you give to a student from your school? (non-incentivized)
- Trust and trustworthiness - *Trust game*:
  - Students decide in both roles.
  - 1. move: Students decide on how much to give from 1000 HUF to a random classmate that gets tripled.
  - 2. move: Students decide on how much to give back. Conditional decisions. Average ratio of returned amount=trustworthiness.
- Cooperation - *Two-person public goods game*
  - Students decide on how much to allocate to a common pot, which they share with a random classmate, and which will increase by 50%, and will receive half of it back.

▸ Slider

Competitiveness

- Measured á la Niederle-Vesterlund (QJE, 2007).
- Real-effort task: counting zeros (Abeler et al., AER, 2011)
  - Round 1: Piece-rate payment according to the number of correctly counted matrices.
  - Round 2: Quadrupled payment for the best 25% students who counted the most matrices correctly.
  - Round 3: Choosing the payment scheme for 3^{rd} round and play again.
- Confidence measure - guessing the rank in a rounds 1 and 2.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Patience=32

In this task, let's say you have an endowment of 1000 HUF. We are randomly pairing you with **another participant in the room** who **also has 1000 HUF.** You can both deposit any of the 1000 HUF into a joint account. The amount you've submitted **will increase one and a half times,** and you'll both get **half of the amount** generated. So, in total, you will have the amount of money you keep from the original 1000 HUF, plus half of the amount in the joint account (which has increased 1.5 times).

If at the end of the experiment the computer chooses this task for payment, the program will randomly match you with another participant and then calculate your winnings based on your decisions.The sliders below will help you calculate your expected winnings, feel free to try them out.

Use the sliders below to calculate your winnings depending on the other player's decision.
We emphasize that the sliders below are just examples, not part of the real game. You will need to make your real decision after clicking OK.

By clicking on the sliders, you can try out how much your winnings would be if...

...YOU contributed this much...:.

0
0 100 200 300 400 500 600 700 800 900 1000

...while your PARTNER contributed that much:.

0
0 100 200 300 400 500 600 700 800 900 1000

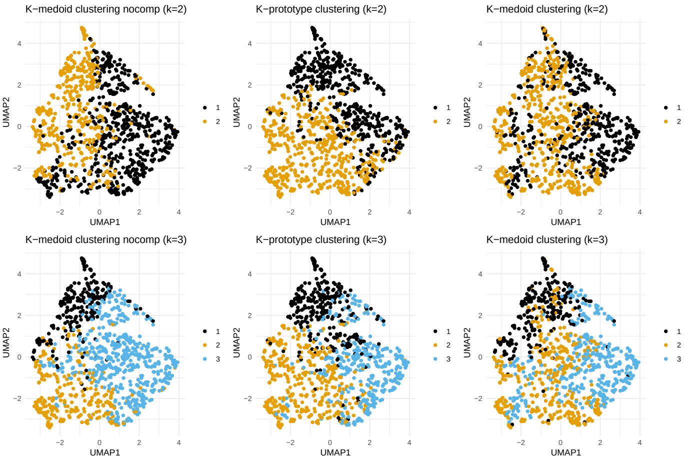
YOUR deposit into the joint account (HUF): 0
The amount deposited by YOUR PARTNER (HUF): 0
Total amount of money in the joint account (HUF): 0
That's what you'd get back from the joint account in this case: 0
Your total profit (the amount that you didn't deposit + that you'll get back from the common account): 0

If everything is clear and you understand what your profit depends on, press OK.

OK

Back

k-medoid and k-prototype



Note: we use the Uniform Manifold Approximation and Projection (UMAP) algorithm (McInnes et al., 2018) **for visualization** to reduce the data into two dimensions.

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