

SUPPORTERS OF THE MANDATORY PENSION SYSTEM IDENTIFIED

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By: Yana Hovsepyan

Supervisor: Dr. Gurgen Aslanyan



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Abstract

This paper analyzes Armenian citizens supporting the 2018 Mandatory Pension System reform. The dataset retrieved from Caucasus Barometer 2017 Armenia has been filtered to contain 24 variables and 725 observations of people being affected by the reform.

Variables include demographic(age, gender, marital status) and economic(savings, debts, income) indicators. After preprocessing data and describing it through different statistical measures(correlation heatmap, mean, frequency) Logit and Ordinal Logit Classifiers were used to identify the variables that affect support dependent variable the most. Ordered Logit, being the more suitable model, helped us check the initial four hypotheses and identify the ones that could not be rejected. Bounded rationality turned out to be the central finding of the paper, implying that Armenian citizens tend to support mandatory savings if previously they had the same behavior voluntarily. Confirmation bias, presented by the Facebook variable, also affects the support of citizens, but in a negative way, clearly pointing to the stable flow of fake information to social media.

Keywords:

Public Pensions, Founded Pension System, Voluntarily Savings, Mandatory Savings

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Introduction

Increasing life expectancy and decreasing birth rates around the world are creating a gap filled with elderly people. This phenomenon touches almost all countries and is a huge economic burden for governments. Is Armenia also a victim of economic problems caused by an aging population and if so, what measures are being undertaken to decrease the socio-economic effects of this demographic issue?

Further, this paper will examine the questions above and thoroughly analyze supporters of the reform that is aimed at ensuring future welfare for Armenian citizens.

The average life expectancy of an Armenian citizen has increased by 11.9% over 30 years, which gives a positive answer to the first question. The aging population combined with a smaller workforce creates a ‘pension time bomb’ referring to demographic changes causing a rise in the percentage of people entitled to a pension. In 2019, Armenia has reported an age dependency ratio of 46.8%, making more than half of the country’s population dependent on the working minority.

Now that it is clear we have the above described economic concern, it would be logical if the government somehow mildened it, but how? The standard incentive for government intervention in private savings and retirement decisions relies on the assumption that some persons behave myopically, consuming “excessively” during their earnings years and then finding themselves with insufficient savings in retirement. In economics, this is known as a dual-self model or the ongoing ‘fight’ between the farsighted planner and shortsighted doer.

In Armenia, The Mandatory Accumulative Pension System was introduced back in 2014, but was postponed due to distrust towards the former political elite of the country, as a result of mass protests against it. In 2018, the newly updated Pension system was introduced which

obligates people born after 1974 to make monthly contributions to the fund. The overall contribution is 10% of the monthly income, 2.5% paid by the citizen and 7.5% paid by the government.

The findings of the research this paper encompasses are the following:

- Bounded rationality in saving behavior is positively affecting the support for the reform.
- Declinism does not play a role in whether people support the Pension Reform or not.
- The mere fact of already being a participant of the system, does not affect the support for the reform.
- Confirmation bias plays a role in determining the support/absence of support for the reform.

Literature Review

Pension funds, the right type to employ and the long-term effects they have on citizens are topics that are continuously being discussed among scholars, which makes them central topics of many research papers and articles.

It is vital to understand the reasons behind any social reform, and even more important to educate people on those reasons.

Thaler and Shefrin (1981) introduced the concepts of the farsighted planner and the shortsighted doer, discussed earlier. The paper differentiates between discretionary and mandatory saving behaviors with what is called a modification cost. Modification costs occur only when saving is voluntarily withheld, meaning that mandatory saving, on the other hand, produces savings at no psychic cost.

Sent (2018) discusses rationality and bounded rationality stating that those two exist interchangeably. Human rationality is bound to limits and those limits define a person's

tastes, choices and behavior. By itself, rationality is defined through bounded rationality.

Cognitive limitations of the mind define the decision making process and, in that, are central topics of research on behavioral economics. In our case, the fact that people who voluntarily save are more likely to support the reform on mandatory savings, is an example of bounded rationality. The usual 'saving' behavior of people leads them to support the same behavior enforced by law. Why not, considering the higher interest rates on those same savings.

Boeri (2002) designed an identical questionnaire for Italy and Germany, that would reveal whether citizens were informed about the sustainability of their pension system and whether their opinion reflects their economic self-interest. The results were that even though people are well aware of the costs and risks of the Pay-As-You-Go system, the status quo is a majoritarian outcome. Preferences over policy options seem to reflect both economic self-interest and one's normative view about the role of the state.

Roberto Mosquera (2019) discusses the economic effects of Facebook. In the Methodology and Hypotheses section, we see that frequently using Facebook affects the support for the Reform negatively. The platform maintains information from many sources, making it an important and compelling place to go on the internet to keep up with news. While there is a concern that news transmitted through social media could be fake or skewed and affect political outcomes, these type of platforms could also serve to uncover corruption. The findings document that Individuals restricted from Facebook are less aware of politically-skewed sources, and this is stronger for men than women. This partly explains the negative effect of Facebook on support, the remaining part is culture specific and should be observed and analyzed in Armenian community separately.

Data Description

Initial dataset extracted from Caucasus Barometer website. The questionnaire was given to 1648 citizens and conducted via face-to-face surveys with an interviewer. The dataset consists of 372 variables, out of which, 24 were left as final variables for this research.

The variables include both demographic and non-demographic measures such as attitudes and beliefs. The final dataset used for modeling and analysis consisted of 725 observations, those that include people who are affected by the reform, thus born after 1974. Because the variables are mostly binary, taking values of 0 or 1, descriptive statistics and graphs were used to have a more precise understanding of the data.

The variables are:

- Age – The age of the respondent
- Gender– if the respondent is male(1) or female(0)
- Health – if the respondent’s health is good(1) or not good(0)
- Employment – if the respondent is employed(1) or not employed(0)
- High income – if the respondent’s monthly personal income is \$400-\$1200(1) or lower(0)
- Savings – if the respondent has savings(1) or does not have(0)
- Debts- if the respondent has debts(1) or does not have(0)
- Bank account - if the respondent has a bank account(1) or does not have(0)
- Attitude democracy – if the respondent preferred government type is democracy(1) or not(0)
- Working sector – if the respondent is employed in government sector(1) or not(0)
- Participant – if the respondent is currently a participant of a cumulative pension system(1) or not(0)
- Bachelor or higher – if the respondent has at least bachelor’s degree(1) or not(0)

- Married – if the respondent is married(1) or not(0)
- Households – Number of people living in the respondent’s house or apartment
- Trust government– if the respondent trusts the executive government of Armenia(1) or not(0)
- Urban settlement – if the respondent lives in a city(1) or village(0)
- Minimum income – if the amount of money required for normal life is more than \$400 (1) or lower(0)
- English knowledge – if respondent knows English(1) or no(0)
- Read news – if the respondent frequently reads news via internet
- Active FB user – if the respondent is an active Facebook user(1) or not(0)
- Lend money - the respondent answered yes(1) or no(0) to question whether someone owes them money
- Optimism - the respondent is optimistic about Armenia’s future
- Democracy - the respondent considers Armenia to be a democracy, either full or with major or minor problems

Table 1: Descriptive Statistics

Numeric variables

<i>Age(years)</i>	<i>31.7</i>
<i>Households(number of people)</i>	<i>3.2</i>

Binary Variables

<i>Features</i>	<i>Percentage</i>
<i>Gender</i>	<i>37.66%</i>
<i>Health</i>	<i>53.24%</i>

<i>Employment</i>	48.41%
<i>High income</i>	5.24%
<i>Savings</i>	13.79%
<i>Debts</i>	50.21%
<i>Bank account</i>	41.93%
<i>Attitude democracy</i>	44.97%
<i>Working sector</i>	5.66%
<i>Participant</i>	28.55%
<i>Bachelor or higher</i>	32.97%
<i>Married</i>	57.24%
<i>Trust government</i>	20.69%
<i>Urban settlement</i>	63.86%
<i>Minimum income</i>	84.00%
<i>English knowledge</i>	34.62%
<i>Read news</i>	30.07%
<i>Active FB user</i>	47.31%
<i>Lend Money</i>	26.48%
<i>Optimistic</i>	49.10%
<i>Democracy</i>	54.90%

High correlation between independent variables could be a problem and cause a multicollinearity. To avoid this, a correlation heatmap has been made, and as seen in **Appendix (Figure 6)**, there is no correlation passing the 0.7 threshold.

The dependent variable is the support for the pension system reform(‘Support’ for the ordered logit model and ‘Support binary’ for the logit model).

Out of the 725 observations, 82.7% either do not support the reform or are indifferent towards it, while only 17.3% support the reform.

Figure 1: Support for the Reforms

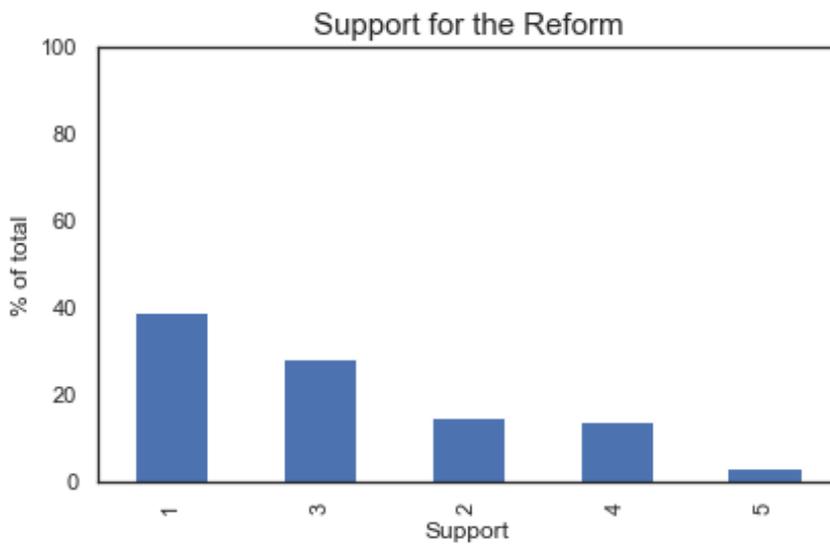
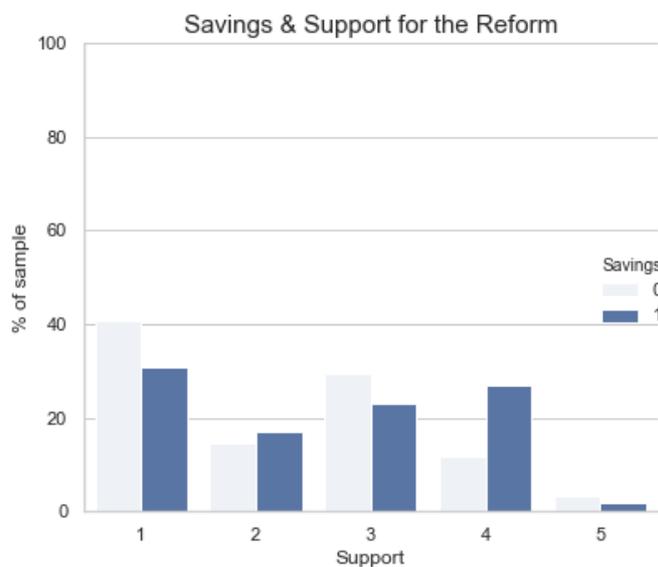


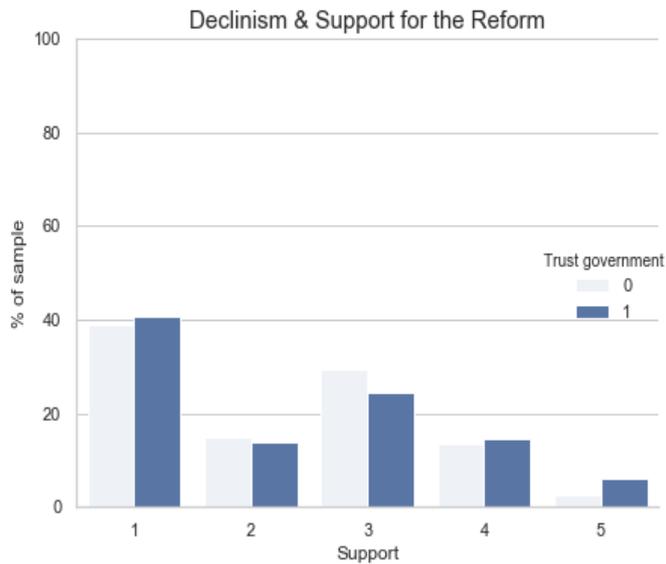
Figure 2: Savings & Support for the Reform



Among those who are against the reform, there are more people that do not have savings than those who have, while after the passing threshold of ‘neutral’ or 3, we see that more people have savings. This clearly displays the finding regarding the bounded

rationality. People who are used to saving are supporting the mandatory saving policy.

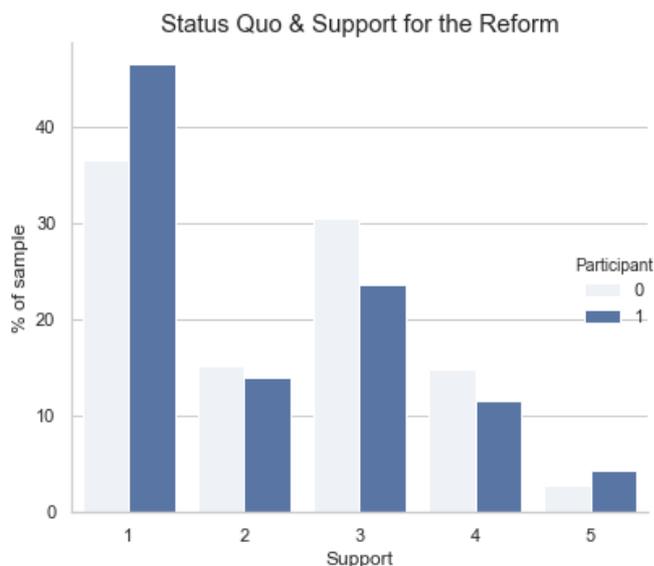
Figure 3: Declinism & Support for the Reform



The second finding was about the declinism, or tendency to think that the future is going to be worse than the past was. Declinism in our dataset is presented by the variable Trust government - trust in executive government, as the graph indicates, there is not really a present pattern

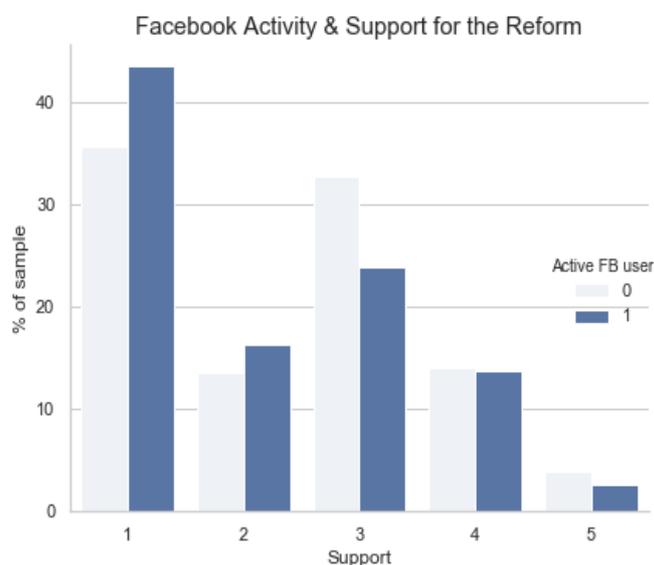
between support for the reform and the trust towards the executive government.

Figure 4: Status quo bias & Support for the Reform



Another finding was that being a participant, or status quo in the pension system, does not guarantee support for the reform. Surprisingly, among ‘anti-supporters’ there are more participants than in positive classes of support variable.

Figure 5: Facebook Activity & Support for the Reform



Lastly, confirmation bias affects the support for the reform. In our dataset the confirmation bias is being represented through Active FB user variable, which refers to activity in Facebook. Facebook algorithm connects people with similar interests and views, thus making sure that those views.

Facebook is known to have negative ramifications for democracy.

The variables that are not binary have been normalized using Min-Max Scaling method and are scaled between 0 and 1, like others.

Hypotheses & Methodology

The four main hypotheses of this research are the following:

Bounded Rationality Hypothesis

Voluntarily savings makes mandatory saving more tolerable, meaning that people who have savings are more likely to support the reform

Declinism Hypothesis

People are against the reform because they don't trust the government

Status Quo Hypothesis

People that are already a participant of the system, are more likely to support the reform

Confirmation Bias Hypothesis

Being an active user of Facebook negatively affects support for the reform

In order to test and verify or reject these hypotheses econometric analysis and machine learning modeling have been used. As the initial data was mostly categorical, all of the variables have been transformed into binary and firstly, the logit model was fitted to our data.

Table 2: Logistic Regression Summary

Logistic Regression			
Feature Names	Coefficient	Odds Ratio	P – values
Savings	0.779	2.180	0.006
Age	0.723	2.062	0.103
Optimism	0.615	1.849	0.006
High income	0.391	1.479	0.38
Health	0.316	1.372	0.167
Democracy	0.230	1.259	0.318
Participant	0.213	1.237	0.456
English knowledge	0.187	1.206	0.459
Gender	0.129	1.138	0.574
Trust government	0.126	1.134	0.616
Lent money	0.105	1.111	0.662
Debts	0.088	1.092	0.688

Attitude democracy	0.041	1.042	0.847
Active FB user	0.032	1.033	0.883
Bachelor or higher	-0.012	0.987	0.964
Employed	-0.023	0.976	0.926
Reads news	-0.046	0.954	0.84
Working sector	-0.188	0.828	0.697
Households	-0.213	0.807	0.736
Minimum income	-0.287	0.750	0.313
Married	-0.308	0.734	0.183
Bank account	-0.466	0.627	0.064
Urban settlement	-0.837	0.432	0
Intercept	-1.858	0.155	0

The dependent variable for logistic regression is ‘Support binary’, which is the grouped version of the original variable. The grouping has been made with the principle that it is more important to identify those who support and characterize them, then those who do not support. The grouping was done with the following logic: observations that had either 4 – ‘Rather Support’ or 5 – ‘Completely Support’ as their value, were marked as 1, all others, including neutral answers were marked as 0.

As we can see in *Table 1*, only two variables are significant in the model. Those are **Savings and Optimism**.

Many nuances cannot be captured in logistic regression, because the dependent variable is transformed into binary and a lot of information is lost because of that. Thus, it was necessary to perform ordinal logistic regression in order to capture all the information from the data. To predict the multi-class ordered ‘Support’ variable, we are going to use the proportional odds logistic regression or ordinal logistic regression technique. The mathematical formulation of the ordinal regression model is as follows:

$$\text{Logit}[P(Y \leq J)] = a_j - \beta x$$

$$J=1, \dots, J-1$$

Where:

J=1 for ‘Completely Disapprove’

J=2 for ‘Rather Disapprove’

J=3 for ‘Neutral’

J=4 for ‘Rather Approve’

J=5 for ‘Completely Approve’

On the right side it is a simple linear model with slope β and the intercept a_j that changes with the dependent variable category. The reason J extends up to J-1 is that we model the probability of being in one category versus being in categories above it. So, for example, $P(Y \leq 2)$ means the probability of ‘Rather Disapproving’ or ‘Completely Disapproving’ versus being ‘Neutral’, ‘Rather Approving’ or ‘Completely Approving’.

The summary of the ordinal logistic regression can be found in **Table 3**. The model assumes a linear relationship between the log odds of support variable and the independent variables, making the coefficient interpretation less intuitive. To be able to bypass this problem, we take an exponent of our initial coefficients, which allows us to explain the odds rather than the log

odds ratio. If a variable has a negative coefficient, the respective odds ratio coefficient is less than 1, indicating a negative relationship with the support variable. For explaining each variable coefficient, we need to consider the ceteris paribus effect.

Table 3: Ordinal Logistic Regression Summary

Ordinal Logistic Regression

<i>Feature names</i>	<i>Coefficient</i>	<i>Odds ratio</i>	<i>P – values</i>
<i>Savings</i>	<i>0.390</i>	<i>1.478</i>	<i>0.069</i>
<i>Age</i>	<i>0.279</i>	<i>1.322</i>	<i>0.356</i>
<i>Optimism</i>	<i>0.349</i>	<i>1.419</i>	<i>0.017</i>
<i>High income</i>	<i>0.752</i>	<i>2.123</i>	<i>0.018</i>
<i>Health</i>	<i>0.258</i>	<i>1.294</i>	<i>0.084</i>
<i>Democracy</i>	<i>-0.046</i>	<i>0.955</i>	<i>0.759</i>
<i>Participant</i>	<i>-0.187</i>	<i>0.826</i>	<i>0.32</i>
<i>English knowledge</i>	<i>0.295</i>	<i>1.344</i>	<i>0.07</i>
<i>Gender</i>	<i>0.115</i>	<i>1.122</i>	<i>0.459</i>
<i>Trust government</i>	<i>-0.000</i>	<i>0.999</i>	<i>0.996</i>
<i>Lent money</i>	<i>-0.067</i>	<i>0.934</i>	<i>0.696</i>
<i>Debt</i>	<i>0.036</i>	<i>1.037</i>	<i>0.802</i>
<i>Attitude democracy</i>	<i>0.165</i>	<i>1.179</i>	<i>0.259</i>
<i>Active fb user</i>	<i>-0.264</i>	<i>0.767</i>	<i>0.071</i>

<i>Bachelor or higher</i>	<i>0.085</i>	<i>1.088</i>	<i>0.635</i>
<i>Employment</i>	<i>-0.091</i>	<i>0.912</i>	<i>0.59</i>
<i>Reads news</i>	<i>0.124</i>	<i>1.132</i>	<i>0.412</i>
<i>Working sector</i>	<i>0.283</i>	<i>1.328</i>	<i>0.371</i>
<i>Households</i>	<i>0.122</i>	<i>1.129</i>	<i>0.771</i>
<i>Minimum income</i>	<i>-0.363</i>	<i>0.695</i>	<i>0.064</i>
<i>Married</i>	<i>-0.067</i>	<i>0.935</i>	<i>0.67</i>
<i>Bank account</i>	<i>-0.341</i>	<i>0.710</i>	<i>0.036</i>
<i>Urban settlement</i>	<i>-0.408</i>	<i>0.664</i>	<i>0.007</i>

Features positively affecting the support:

- Having **savings**, meaning that a person has savings, the odds of supporting the reform will change by 1.476, or go up by **47.8%**.
- Having **good health** also has a positive effect on support, being healthy compared to being not healthy increases the odds of supporting the reform by 1.294378 or by **29.4%**.
- Having **high personal income**, which is considered anything above the \$400 threshold for a month, increases the odds of support by 2.123357 or by **112.3%**.
- **Knowing English** increases the odds of support by 1.344131 or by **34.4%**.

Features negatively affecting the support:

- Having a **bank account** decreases the odds of support by 0.7105063 or by **29%**.

- **Urban settlement**, being settled in Yerevan or any other city in Armenia, decreases the odds of support by 0.6643415 or by 33.5%.
- **Minimum income** for a normal life variable, is the amount of money people consider enough for living for a month, the threshold for this variable has also been set to \$400. Any observation that was above \$ \$400 was marked as a 1. So having high income needs as opposed to having low income needs decreases the odds of supporting by 0.6942657 or by **30.5%**.
- Being a frequent **Facebook** user decreases the odds of support by 0.7668222 or by **23.3%**.

Even though from the logit model, it was already clear that the trust in government is not significant, ordered logit regression output made it clear that the decision of whether people support or do not support the mandatory cumulative pension system is not connected with their attitudes towards the government, **which rejected the 1st hypothesis.**

Savings, on the other hand, are still significantly affecting the support for pension system positively, which is why the **2nd hypothesis is not rejected.**

As for the 3rd hypothesis, Propensity Score Matching was used to understand the effects of being a participant in supporting the system.

Propensity score matching is a technique to understand the effects of a ‘treatment’. The observations are being separated into control and test groups, where, in our case, all participants in the test group are already participants of the cumulative pension system, so the treatment is being a participant versus not being a participant.

Propensity score, by itself, is a probability that the participant will be exposed to treatment.

So here are the four steps in doing an accurate propensity score matching:

1. Propensity Score Estimation

At this point, both control and test group observations are being regressed on the treatment, identifying each observation's likelihood of receiving a treatment, in our case, being a participant. The typical models are logit/probit models.

2. Matching

After the probabilities of each observation are available, observations with similar or very close propensity scores are being matched using few matching techniques.

Most accurate ones are:

- Kernel Matching

Kernel matching is a non-parametric matching estimator that uses weighted averages of all individuals in the control group to construct the counterfactual outcome .

- Radius Matching

Treated observations are being matched with the controlled observations inside a radius that is set. For example, in the above table of radius matching, 0.1 is used as a radius for matching observations, depending on the desired accuracy radiuses can be increased or decreased.

3. Estimate the Average Effects

The Average Treatment Effect on the Treated (ATT) is then being either statistically significant or insignificant.

The area where the test and control groups' propensity scores are overlapping is called the common support region. In our case the region of common support is [0.03710871, 0.98418849].

Table 4: Propensity Score Matching, Kernel Matching

<i>Propensity Score Matching, Kernel Matching</i>				
<i>Treated</i>	<i>Control</i>	<i>ATT</i>	<i>Standard Error</i>	<i>t</i>
207	379	0.032	0.044	0.713

Table 5: Propensity Score Matching, Radius Matching (0.1)

<i>Propensity Score Matching, Radius Matching</i>				
<i>Treated</i>	<i>Control</i>	<i>ATT</i>	<i>Standard Error</i>	<i>t</i>
207	518	-0.008	0.032	-0.254

As the tables above show, both matching methods outputted in ATT's that are not statistically significant for our data, meaning that being in state of participation, does not actually mean that people acquire taste for it. **The 3rd hypothesis is being rejected.**

Having a p value of 0.07 'Active FB user' is also a significant variable, and has an odds ratio of 0.767512. The interpretation is that people who are actively engaged in Facebook activities are $1 - 0.767512 = 0.232488$ or 23.2% less likely to support the system. As mentioned before, Facebook algorithm groups people by their interests, views and likes. This, with the fact of continuous negative news flow about governments into social media, confirms the confirmation bias hypothesis and, thus, **the 4th hypothesis cannot be rejected.**

Discussion

The findings presented in the paper can be valuable in terms of policy development.

We saw that besides savings and Facebook, pessimism, high income, bank account and health are also very good indicators of people's support for the Reform. Knowledge of English also plays a significant role in people's attitude towards reforms. The most informative part of the paper was surely the part that made clear voluntary savings make mandatory savings less intolerable, meaning that the governments of Armenia should initiate policies or legislative changes that will make voluntary saving more attractive for citizens. Facebook activity reduces chances of people supporting the reform, maybe it would be a good idea to spread more positivity regarding governmental figures in social media, right now social media has more of an oppositional role than surely is an obstacle. Even though the data was not going to be used to predict anything, it was still separated to train and test datasets to be sure that the model is not just overfitted to the data.

As it was mentioned in the beginning, people working in the government sector were already contributing to the system and were supposed to not mind the new mandatory system for everyone. The propensity score matching revealed that people who were already a part of the system did not like it either. This information could be used to change the percentage of contribution proportions to advantage citizens, or change other policies. Until Armenia converts to fully funded system policies should be made to make the current PAYG system more favorable to its citizens, otherwise all further laws will also face strong opposition. Even though the dataset was quite informative, there might be a timing limitation, the reform was still too new at the time of the survey. In 2020 people's opinion might have changed about the support and it would be very interesting to do the same analysis on 2020 data and compare it to the 2017 results. As time passes people might not only get used to the mandatory savings, but also learn its benefits and change their mind on that matter. But that's

something that can be checked only after the new dataset is released. For now the situation is as described.

Conclusion

This paper uses Caucasus Barometer 2017 Armenia data to analyze the supporters of the Mandatory Pension System. Logit and ordinal logit models are used to understand the features contributing the most to the support variable. The results from logistic regression show that only ‘Savings’ and ‘Optimism’ variables affect the support and both of them affect it positively. As the original dependent variable is an ordered categorical variable from 1 to 5, Ordinal Logit model has been decided to fit the data better and, indeed, the results became much more informative. From the initial four hypotheses that were:

1. Bounded rationality hypothesis
2. Declinism bias hypothesis
3. Status Quo bias hypothesis
4. Confirmation bias hypothesis

The 2nd and 3rd hypotheses (Declinism bias hypothesis and Status Quo bias hypothesis) are rejected, while the 1st and 4th hypotheses (Bounded rationality hypothesis and Confirmation bias hypothesis) are not rejected. The testing of these hypotheses and the results from the multiple methods used on them, have the potential to become a source of a number of policy improvements in the future.

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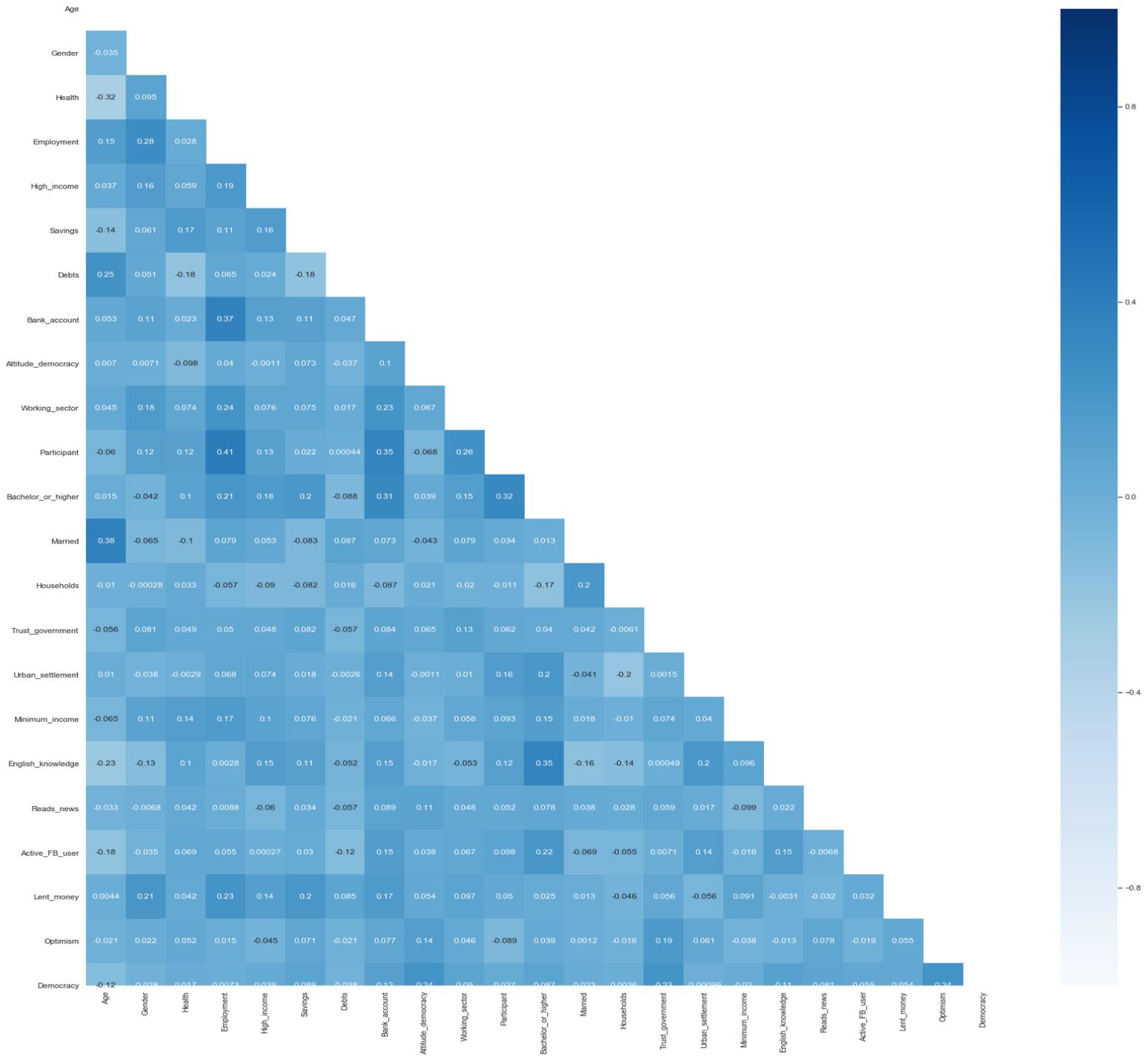
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Appendix

Figure 6: Feature Correlation Matrix



Endnote

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