

The Impacts of Matching Contributions on Retirement Savings: Evidence from a Quasi-Natural Experiment

Sadettin Haluk Citci and Halit Yanıkkaya

THE IMPACTS OF MATCHING CONTRIBUTIONS ON RETIREMENT SAVINGS: EVIDENCE FROM A QUASI-NATURAL EXPERIMENT

Sadettin Haluk Citci* and Halit Yanikkaya†

Working Paper No. 1712

August 2024

We thank Brigitte Madrian, Check Ann Tan, Ernst Fehr, Mustafa Akmaz, Søren Leth Petersen, Mustapha Chaffai and numerous seminar participants at Zurich University, South Denmark University, Leibniz Centre for European Economic Research in Mannheim, Economic Research Forum conference, SSES Annual Congress for helpful comments and discussions. Yunis Dede and Zeynep Aktas Koral provided very helpful research assistance. We also thank The Pension Monitoring Center for kindly providing the dataset and their invaluable contributions. This paper was originally presented during the ERF 30th Annual Conference on “Tragedies of Regional Conflicts and Promises of Peacebuilding: Responding to Disruptors and Enablers of MENA Development Pathway”, April 21-23, 2024. The paper received the Best Paper Award during the annual conference.

Send correspondence to:

Sadettin Haluk Citci

Department of Economics, University of Zurich

sadettinhaluk.citci@uzh.edu.ch

* University of Zurich & Gebze Technical University, Department of Economics. E-mail address: sadettinhaluk.citci@uzh.edu.ch & hcitci@gtu.edu.tr

† Gebze Technical University, Department of Economics. E-mail address: halityanikkaya@gtu.edu.tr

First published in 2024 by
The Economic Research Forum (ERF)
21 Al-Sad Al-Aaly Street
Dokki, Giza
Egypt
www.erf.org.eg

Copyright © The Economic Research Forum, 2024

All rights reserved. No part of this publication may be reproduced in any form or by any electronic or mechanical means, including information storage and retrieval systems, without permission in writing from the publisher.

The findings, interpretations and conclusions expressed in this publication are entirely those of the author(s) and should not be attributed to the Economic Research Forum, members of its Board of Trustees, or its donors.

Abstract

Using a large administrative dataset containing information for over 39 million private pension contracts and quasi-experimental research design provided by matching contribution policy reform in Turkey, we investigate the effectiveness of nationwide matching contributions in promoting saving outcomes and explore differences in responses to the program among participants. By leveraging two distinct policy changes, we estimate the marginal and net effects of matching contributions on participants' saving decisions separately. Our differences-in-differences estimations reveal that the matching contribution policy increases contributions paid by 6 percent. Additionally, we analyze the impact of a sharp increase of 30 percent in the match threshold on participants' contributions paid. Our results suggest that the nationwide matching contribution policy wields a notable yet relatively modest impact on augmenting saving contributions. Notably, we discern substantial variations in the responses to the program among different participant groups.

Keywords: Policy Reform, Nationwide Matching Contributions, Promoting Saving Outcomes, Retirement Savings, Quasi-experimental Research, Turkey

JEL Classifications: H2, H3, D14

ملخص

باستخدام مجموعة بيانات إدارية كبيرة تحتوي على معلومات لأكثر من 39 مليون عقد تقاعد خاص وتصميم بحثي شبه تجريبي يتم توفيره من خلال مطابقة إصلاح سياسة المساهمة في تركيا، نحقق في فعالية مطابقة المساهمات على مستوى البلاد في تعزيز نتائج الادخار واستكشاف الاختلافات في الاستجابات للبرنامج بين المشاركين. من خلال الاستفادة من تغييرين متميزين في السياسة، نقدر الآثار الهامشية والصافية لمطابقة المساهمات على قرارات ادخار المشاركين بشكل منفصل. تكشف تقديراتنا للاختلافات في الاختلافات أن سياسة المساهمة المطابقة تزيد المساهمات المدفوعة بنسبة 6 في المائة. بالإضافة إلى ذلك، نحلل تأثير الزيادة الحادة بنسبة 30 في المائة في عتبة المباراة على مساهمات المشاركين المدفوعة. تشير نتائجنا إلى أن سياسة المساهمة المطابقة على مستوى البلاد لها تأثير ملحوظ ولكنه متواضع نسبيًا على زيادة مساهمات الادخار. والجدير بالذكر أننا نلاحظ اختلافات كبيرة في الردود على البرنامج بين مجموعات المشاركين المختلفة.

I. Introduction

Are the matching contributions effective in raising retirement savings, and what are the marginal and net effects of such contributions on individuals' saving decisions? The existing literature on this topic provides mixed evidence, and there is still no adequate answer to these questions primarily due to research design and data limitations. We revisit these questions and provide evidence from the first nationwide matching contributions policy using the administrative dataset for the whole participant population including more than 39 million private pension contracts, 400 million observations and quasi-experimental designs provided by matching contribution policy reforms in Turkey.

In January 2013, Turkey introduced a nationwide matching contribution program to encourage household savings. Under this program, the state matches 25% of private pension account holders' contributions up to a certain threshold. We examine the program's impact on participation and contributions to the individual pension savings system (IPSS). Using a differences-in-differences design, we estimate the marginal effect of the matching program by analyzing data around the threshold. Additionally, we investigate the net effect of the program by studying the impact of a jump in the match threshold on contributions paid.

We first analyze participation decisions of individuals in the IPSS three years before and after the introduction of the matching contribution program and report heterogeneities in these decisions. Our results indicate a 111% increase in the monthly average of new IPSS participants after the policy compared to the pre-policy period, with a 4.7% change in the percentage of the population enrolling in IPSS. The percentage change is similar to findings from previous studies by Duflo et al. (2006) and Engelhardt and Kumar (2007). However, the magnitude of the change implies a substantial increase in the number of participants, from around 2 million in the three years before the policy to 4.5 million in the three years after. Furthermore, we observe significant gender differences in participation in IPSS.

Next, we turn our attention to the effects of the matching contributions policy on contributions paid. Under the matching scheme, contributions are only matched up to a certain threshold. This contribution plan creates non-linear incentives for savings and divides participants into two distinct groups. For those whose previous contributions exceeded the threshold before the program's introduction, the matching contributions policy has no marginal effect. Even if this group of participants increases their contributions paid, there will be no increase in their matching entitlement. However, for those whose previous contributions fell below the threshold, the matching contributions policy has a positive marginal effect. This second group of participants can increase their matching entitlements if they increase their

contributions paid. The implementation of the program has also similar negative income effects on the contributions paid of both groups. Consequently, the policy presents a quasi-experimental research design that allows us to estimate the marginal effect of the matching program. To control the endogeneity of individual preferences, we employ a differences-in-differences estimation for our analysis. Moreover, to examine robustness of our results, we conduct several placebo tests.

Prior to the introduction of the matching policy, there was a significant gap between contributions paid by the two groups. However, after three years of the policy's implementation, the difference in contributions paid by both groups narrowed. Specifically, we find that the ones contributing just below the threshold before the implementation of the policy, and who would benefit from matched contributions for extra contributions paid, raised their contributions by 6% more than the ones contributing above the threshold before the implementation of the policy and who would not receive more matched contribution for an increase in their contributions paid.

We also examine heterogeneities in the responsiveness of groups that differ in gender, age, and education. Our analysis reveals a gender gap in contributions paid, with females, on average, contributing less than males. A possible explanation for this finding is that many women in Turkey do not have independent income, which may prevent them from making their own saving decisions. However, we find no significant difference between females and males in their response to the matching contributions policy.

Furthermore, while the policy increases contributions paid across all age groups, we observe differences in responsiveness among these groups. However, these differences are not particularly compelling. The most noteworthy finding is that people with education less than a university degree are unresponsive to the policy. Matching contributions have no significant impact on the saving decisions of less-educated individuals.

The threshold for matching contributions is set at 25% of the total gross minimum wage each year. In 2016, the minimum wage increased by over 30%, leading to an identical increase in the match threshold. This rise in the threshold provides a quasi-natural experiment for examining the net effect of the matching contributions program and the impact of a threshold increase.

For participants who were already contributing an amount greater than both the former and new matching threshold, the threshold increase had no incentive effect. However, those who were contributing more than the old threshold but less than the new threshold experienced both income and substitution effects resulting from the threshold rise. Our analysis reveals

that the increase in contributions paid for participants who are eligible for matched contributions is, once again, 6% more than for those who do not qualify for a matching contribution increase after the threshold rise.

Our paper is related to the extensive literature about saving outcomes of matching contributions. Prior literature utilizing cross-sectional data presents conflicting evidence on the efficacy of matching contribution plans to increase contributions paid. While some studies have reported positive results (Andrews, 1992; Papke, 1996; Papke and Poterba, 1995; Even and Macpherson, 1997; Clark and Schieber 1998; Kusko, Poterba, and Wilcox, 1998), others suggest that increasing the match rate may even lower contributions (Clark et al. 2000; Munnell, Sund´en, and Taylor; 2001 and Mitchell, Utkus, and Yang, 2007). However, a significant limitation of these studies is their reliance on cross-sectional data, which cannot fully account for the relationship between employer match, worker characteristics, and other unobserved factors that impact retirement saving decisions.

By using the data from the Health and Retirement Study, Engelhardt and Kumar (2007) formulate a life-cycle-consistent econometric specification and take nonlinear saving incentives into account. They establish that increasing the matching rate by 25% leads to only a 5% rise in the participation rate and a limited rise in the contributions paid. A limitation of this study is that the dataset mainly includes data for elderly people (51–61 year olds).

Duflo et al., (2006 and 2007) use field experiment approach and focus on saving incentives for low and middle-income households. They report a similar effect on participation rate as in Engelhardt and Kumar (2007). Choi et al. (2002) and (2004) analyze outcomes of natural experiments and show that 25% match rate leads to a rise in participation rate close to 5% and a raise in contributions paid only around 4% of income. A limitation of these studies is that they focus and study a rather specific groups, for example employees of a single firm, or low and middle-income households.

Prior research on this topic is limited by the reliance on cross-sectional data, which precludes a full control of unobserved factors, such as worker characteristics and employer match. Additionally, other studies are based on specific groups, such as the elderly (Engelhardt and Kumar, 2007) or low-income households (Duflo et al., 2006 and 2007), which makes generalization difficult. Our study employs a quasi-experimental research design and uses data from the entire IPSS population, comprising over 39 million private pension contracts and 400 million observations. Moreover, the research design enables us to distinguish between marginal and net effects of matching contributions.

Furthermore, there is a notable gap in our understanding of the impact of match thresholds on

saving outcomes and how sub-groups with varying gender, age, and education levels respond to matching contributions. Our study makes a significant contribution to the literature by addressing these gaps and examining the effects of a sharp increase in the match threshold. We also investigate the differences in responsiveness among different demographic groups, providing insights into the generalizability of previous studies focused on specific groups.

The existing literature on matching contributions mainly focuses on a small number of high-income countries with established pension systems, where the matching contributions program was implemented in a favorable environment with advanced financial and information systems, robust property rights, and reliable third-party management (e.g., Madrian, 2012; Choi, 2004, 2006; Arnoud et al., 2021). However, the potential for saving incentives in developing countries, where the financial and individual pension systems are less developed and the benefits of increasing individual savings are likely higher, remains largely unexplored (Blumenstock, Callen and Ghani, 2018). Our study, based on a large-scale quasi-experimental dataset from the first nationwide matching contributions policy in Turkey, provides important insights into the effectiveness of matching contributions in a developing country context. Our findings have important implications for the design of retirement saving incentive schemes in other developing and low-income countries.

The remainder of the paper proceeds as follows. Section II describes institutional background and data. Section III presents empirical results on the effects of the matching contributions. Section IV documents heterogeneities in responsiveness to matching contributions. Section V presents analyses outcomes of a rise in the match threshold. The last section concludes.

II. Institutional Background

Institutional Background

Turkish pension system consists of two main components: Social Security System which is compulsory and IPSS, which serves as a supplementary framework to the social security system. Since 2003, IPSS runs on the principle of collection and investment of savings, subsequently providing individuals with the option of lump-sum payments or regular disbursements. Notably, these benefits are in addition to the retirement payments offered by the Social Security System.

The IPSS encompasses both state-owned and private pension companies. Participation in the IPSS can occur through individual action, where an individual maintains a private individual pension account. Alternatively, individuals can enter into a “group pension contract” with a pension company, either as part of a group or by employers including their employees in the

system through a group pension contract.¹ We collectively refer to both individual pension account holders and group pension contract holders as “participants”.

To be eligible for retirement benefits under the IPSS, individuals must remain in the system for a minimum of 10 years from their initial entry and have reached the age of 56.² After meeting these conditions, one may stay in the system and continue paying contributions to raise his savings even more.

An individual may have more than one pension contract. In such a case, when one is entitled to retirement under one of these contracts and intends to use his right to retire, then he must consolidate all his retirement contracts. Individuals may freely select among various pension companies and fund types, granting them flexibility and choice in shaping their retirement savings strategies.

Over the past decade, two significant reforms have been introduced in the IPSS. In 2013, a state funded matching policy was initiated with matching rate of 25%. Four years later, in 2017, another retirement saving policy, the automatic enrollment system, was announced in tandem with the existing nationwide matching contribution policy.

Matching Contribution Policy

On January 1st, 2013, the financial incentive program was initiated. The bill on the nationwide matching contribution program was actually passed by the Turkish General Assembly and became law on June 13th, 2012. Subsequently, the government has been providing matching contributions to all holders of private pension accounts. This program encompasses three notable features:

- The matching rate is 25% of contributions.³
- Extent of matching contributions is contingent on the duration of the participant’s involvement in the IPS.
- The amount of matching contribution has a threshold. The maximum entitlement of the matching cannot surpass 25% of the total gross minimum wage for the current year. To illustrate, in 2013, the annual total gross minimum wage was 12,000 ₺. Individuals

¹Employers may deduct the amount of group pension contributions from the tax base by writing it off as an expense. In the case of an employer group pension contract, the employer and the pension company become the parties.

²While age conditions for retirement eligibility for the Social Security System differ for men and women, they are the same for both men and women for the IPSS.

³At the beginning of 2022, the matching rate is increased to 30% of contributions.

contributing up to 12,000 ₺ (monthly 1,000 ₺) in 2013 were eligible to receive a matching contribution of 25% of their contributions for that year. The maximum amount of matched contribution in this case would be 3,000 ₺ (25% of 12,000 ₺). Therefore, individuals contributing even more than the threshold in 2013 could receive at most 3,000 ₺ (monthly equivalent is 250 ₺).

Data

Our dataset covers observations for all individuals who enrolled in IPSS at least once in the years between 2003 – 2021. This extensive administrative dataset comprises information from over 39 million pension contracts and includes a wide array of financial, occupational, and demographic variables. The full dataset is kindly provided by the Pension Monitoring Center, which is a public body responsible for maintaining and consolidating electronic data on individual pension accounts, pension plans, participants, and contracts in Turkey.

III. Effects of Matching Contribution Plan

Participation

The Individual Pension Savings System (IPSS) was established at the close of October 2003. Figure 1 below shows the number of participants since then. Two specific dates are introduced to the graph. The first one indicates the beginning of 2013, since then the matching contribution program has been in effect. The other point shows the beginning of 2017 when the Automatic Enrollment System (AES) is introduced. A cursory examination of Figure 1 reveals that the matching contribution policy has a discernible effect on increasing participation. However, its capacity to increase participation is notably more restrained when juxtaposed with the drastic surge in the number of participants following the implementation of the automatic enrollment policy.

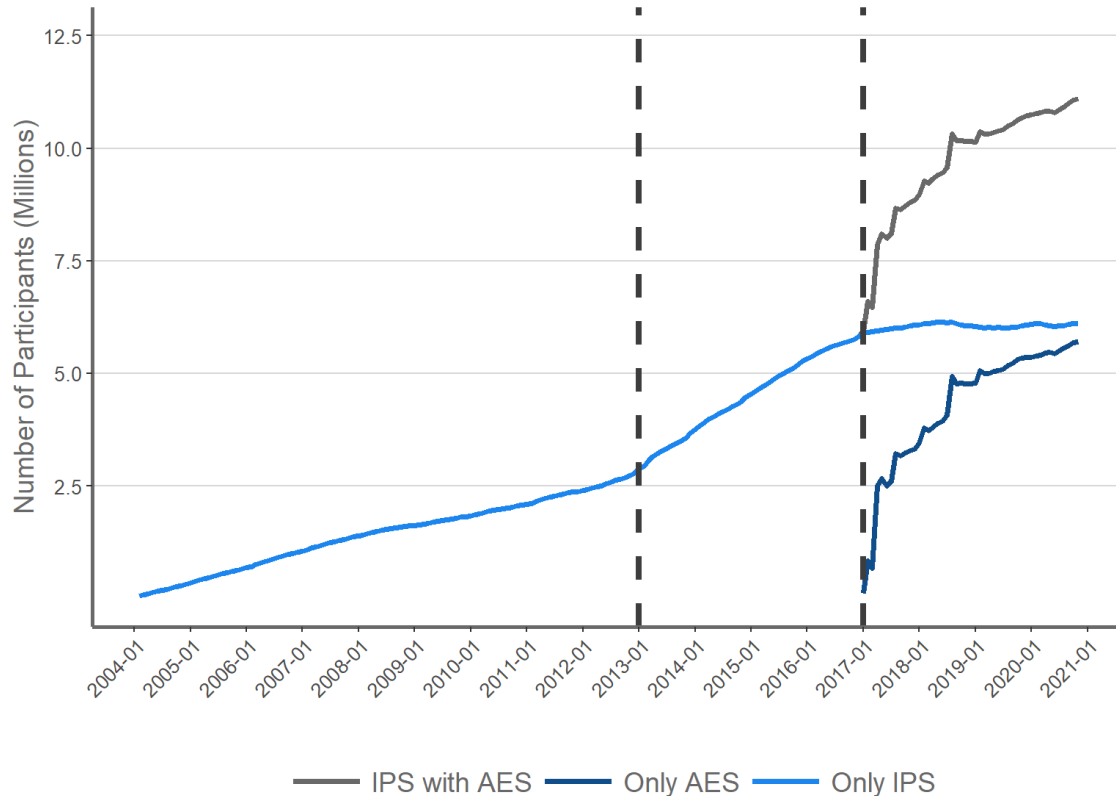


Figure 1: Number of Participants over Years

Note: In construction of the graphic, only new participants are counted in the specified period. Individuals may hold multiple pension contracts or enroll to IPSS multiple times. To prevent multiple counting, we counted an individual only at the date that he started to hold his first contract.

Source: Own calculations based on the administrative data from the Pension Monitoring Center.

Our analysis in this subsection focuses on saving and participation decisions three years before and after the matching contribution program initiated (the years between the first day of 2010 and the end day of 2015). The rationale for this timeframe selection is threefold: three years after the introduction of matching contribution program, the matching threshold increased substantially. Moreover, in 2017, the automatic enrollment policy was introduced and began to be implemented. It is highly plausible that this legislative shift would have a substantial impact on individuals' decisions regarding their participation in the IPSS and their savings behavior. Therefore, we take the three-year period till the end of 2015 into consideration. Furthermore, to compare saving outcomes before and after the matching contribution reform and to impose symmetry between the periods before and after the policy, we then begin to analyze changes in contributions paid from three years ahead of the program initiation. Figure 2 below provides a visual representation of the number of new participants who enrolled in the IPSS each month during the three-year period before and after the

implementation of the matching contribution program.

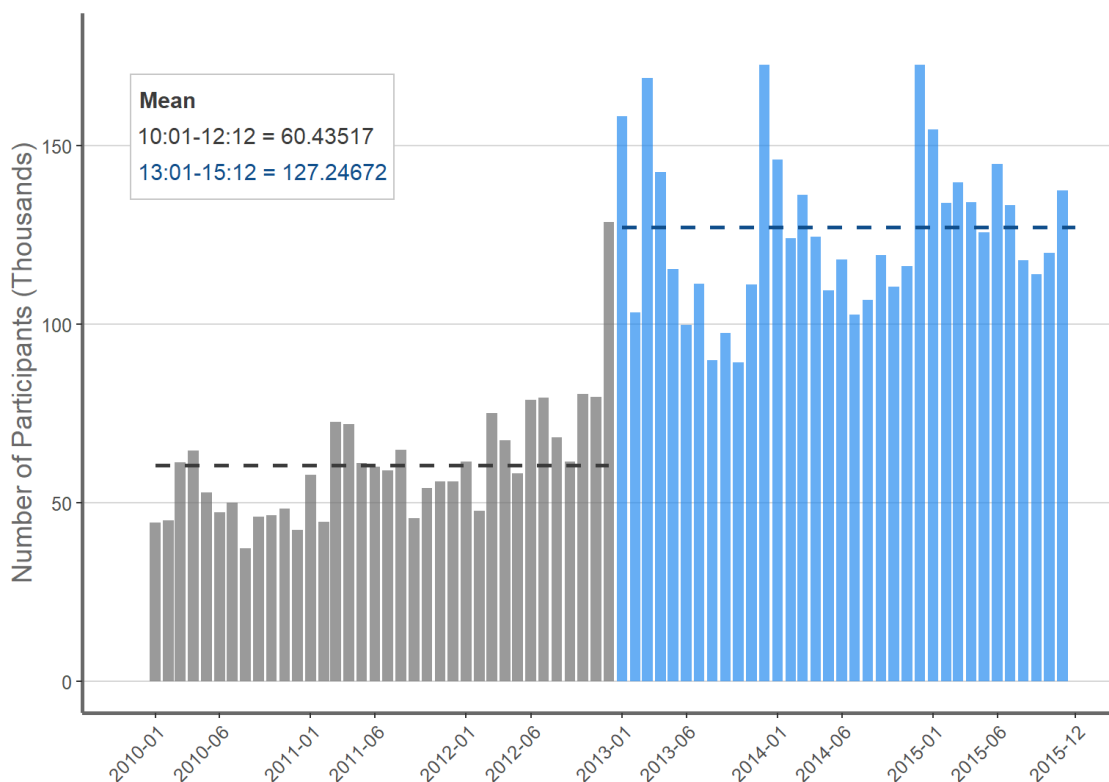


Figure 2: Number of Monthly New Participants (2010 – 2015)

Note: Each bar presents the number of new participants in a month in the specified period. If an individual has multiple contracts, it is counted once. Gray-colored bars show the monthly number of all new participants enrolled in the system before the matching contribution policy, while blue-colored bars indicate the monthly number of new participants after the policy.

Source: Own calculations based on the administrative data from the Pension Monitoring Center.

A significant shift in trends becomes evident following the introduction of the matching contribution program. Prior to the program’s implementation, the monthly average of new participants stood at 60,435. However, after the policy took effect, this average surged to 127,247, representing a remarkable 110% increase.

Table 1 presents a more detailed analysis of the change in the number of new participants in the IPSS. The data reveals that between the commencement of 2010 and the conclusion of 2012, there were 2,175,666 new participants who enrolled in the IPSS. Following the policy implementation, this number more than doubled to 4,580,882 in the period between 2013 and 2015, indicating a 110% increase. Furthermore, a comparison of the number of new participants in the three years before and after the policy reveals that approximately 2.5 million more participants enrolled in IPSS after the introduction of the policy. While

these numbers suggest a substantial rise in the number of participants after the policy, it is important to note that the policy applies to a large domain. In 2012 alone, over 32 million people aged between 26-55 were eligible for matching contributions, which may have contributed to the large difference in the number of new participants between the two periods. As a result, it is essential to acknowledge that the observed increase in participants may, in part, be attributed to the policy’s extensive reach rather than solely reflecting the efficacy of matching contributions.

Table 1: Number of Participants in 2010-2015 Period

	Groups	# New Participants 2010-2012	# New Participants 2013-2015	Percentage Change
Total		2,175,666	4,580,882	110.6
Gender	Male	1,342,175	2,736,338	103.9
	Female	833,491	1,844,544	121.3
Age	≤ 25	54,01	417,144	672.3
	26 – 35	764,07	1,583,463	107.2
	36 – 45	797,101	1,411,850	77.1
	46 – 55	416,609	812,069	94.9
	> 55	143,868	356,348	147.7
Education	Illiterate	44,063	67,034	52.1
	Less than High Sch.	254,98	514,554	101.8
	High Sch – Undergrad	561,712	1,197,791	113.2
	Undergrad and over	586,603	921,637	57.1

Note: For the calculation of participant’s age, we consider 2013 as the reference year. Age groups follow the classification provided by the Pension Monitoring Center. Education captures individual i’s educational level prior to reform announcement.

Source: Own calculations based on the administrative data from the Pension Monitoring Center.

A more accurate depiction of the impact can be obtained by examining the change in the percentage of the population enrolling in the Individual Pension Savings System (IPSS) during both periods. In the three years before the policy, 4.6% of population enrolled. This ratio increased to 9.3% in the initial three years following the policy’s implementation, signifying a 4.7% change between the pre- and post-policy periods. The most substantial increase was observed in the age group of 26 – 35 with a rise by 6.3% and the lowest increase was in the old-age group, where the participation rate in the age group of older than 55 increased by 3.1%.

A large number of studies in the literature employ cross-sectional data and find a significantly positive effect of matching contribution on participation rates (e.g., Andrews 1992; Bassett, Fleming, and Rodrigues 1998; Clark and Schieber 1998; Huberman, Iyengar, and Jiang

2007). Two exceptions reporting no change in participation rates are Papke (1996) and Kusko, Poterba, and Wilcox (1998).

Of particular note are more convincing studies such as those conducted by Duflo et al. (2006) and Engelhardt and Kumar (2007). Duflo et al. (2006) conduct a randomized field experiment analyzing the effects of matching rates on middle- and low-income individuals' willingness to participate and contribute to Individual Retirement Arrangements (IRA). Some individuals were offered to open an IRA with no match; some were offered a match of 20% and some others were offered 50%. They establish that increasing the match rate from 0% match to 20% match results 5% rise in participation and increasing the match rate from 20% match to 50% match results 6% rise in participation. Engelhardt and Kumar (2007) use pension-plan data from the Health and Retirement Study, therefore the focus group of the study is older individuals with an average age of 55. They analyze the effects of naturally occurring variations in match rates on participation and contributions paid decisions of individuals. Similar to Duflo et al. (2006), they estimate that 25% rise in the match rate leads to increase in the participation rate by 5%.

Interestingly, our estimates, which are derived from the entire population encompassing all age and education groups, reveal a remarkable similarity in the percentage increase of participation decisions to those obtained by Duflo et al. (2006), Engelhardt and Kumar (2007), despite focusing on different population groups (low and middle-income households, older individuals, and the entire population of a developing country) and analyzing the effects of different mechanisms (employer-sponsored savings plans, savings from tax refunds, and a nationwide matching contribution policy). Our findings provide support for Engelhardt and Kumar's (2007) conclusion that participation may not be highly responsive to matching contributions. However, our results also demonstrate that in an economy with an underdeveloped individual pension system, such as Turkey, even a 5% increase in participation could translate to millions of new participants in IPSS and a considerable change in the number of individuals participating. Hence, while matching contribution policy may not appear highly effective in terms of percentage increases in participation rates, it holds the potential to bring millions of new participants into the IPSS, particularly when implemented as a nationwide policy.

Table 1 also shows gender differences in response to matching contributions policy. In the three-year period before the policy, the number of new male participants (1,342,175) significantly outnumbered the number of female participants (833,491). Therefore, one may expect the policy would lead a higher increase in percentage change in female participation, simply due to the base effect. However, the change in percent of male population enrolling to IPSS

is also much higher the change in female participation. The change in percent of male population enrolling to IPSS before and after the policy is 5.4 percent, while it is only 4 percent in female population. This outcome suggests that the policy has a more pronounced effect on increasing male participation compared to female participation. A possible explanation for this gender-based difference is that many women in Turkey do not participate in the labor force and do not have individual income. The World Bank Labor Force Statistics shows that in 2012, female labor force constitutes only 30 percent of total labor force, many women were absent in the labor force. As a result, many women do not have a source of income independent of their family. This may offer an explanation for the lower female participation rate in the IPSS and the reduced effectiveness of the policy in encouraging women's participation in the IPSS.

Contributions Paid

Another aspect of the matching program is its impact on the level of individual savings. Next, we try to answer whether the matching contribution scheme is effective in raising individual saving contributions.

To evaluate this inquiry, we again restrict the period for our analysis between the first month of 2010 and the last month of 2015 and consider all contributors who joined IPSS before 2010 and stayed in the system for the whole period, till the end of 2015.⁴ Note that some participants have multiple saving plans. However, the entitlement is paid on an individual basis and the sum of contributions in each contract. In other words, the matching contribution threshold apply to sum of all contracts held by an individual. For each individual, we thus combine his/her plans to sum their contributions up in all saving plans for each year. There are some outliers in the dataset.⁵ To drop the outliers, we exclude individuals who have contributions paid in the minimum or maximum 1 percent of the distribution.

⁴The reason for selecting this period for our analysis is the significant increase in the matching threshold at the beginning of 2016 and the subsequent implementation of the automatic enrollment policy one year later. Both policy changes are anticipated to influence individuals' saving decisions. Therefore, we chose the end of our analysis period as the end of 2015. To maintain symmetry between the periods before and after the introduction of the matching contribution policy, we selected the start of the analysis period as the beginning of 2010.

⁵Outliers in the dataset can be attributed to at least two underlying reasons. There are some individuals who enrolled to the system, paid contributions for the first few months but subsequently discontinued their contributions. Moreover, individuals who had previously made retirement-related commitments to specific institutions, such as associations, foundations, professional legal entities, and other commercial companies, and subsequently transferred their deposits to the Individual Pension Savings System (IPSS), enjoy exemptions from corporate taxes, duties, stamp duties, and bank and insurance transaction taxes applicable on the transferred amount. This legal provision serves as another contributing factor to the presence of outliers in the dataset.

Table 2 presents the summary statics for annual average contributions paid before and after the implementation of the matching contribution policy. Notably, the last column indicates that, in the last three years of the matching plan, average contributions increased by 56% when compared to the average contributions paid in the three-year period prior to the policy reform. Note that during the period considered (calculated between mid-dates of both periods, June 2011 and June 2014) inflation was 28.7%. Consequently, the annual average contribution increased by approximately 27.4% in real terms.

Table 2: Annual Average Contributions Paid in 2010-2015 period

	Groups	Annual Average Contribution (₺) 2010-2012	Annual Average Contribution(₺) 2013-2015	% Difference Pre- and Post-Program
Total		2,221	3,465	56.01
Gender	Male	2,397	3,788	58.07
	Female	2,045	3,142	53.64
Age	≤ 25	1,339	2,286	70.72
	26 – 35	1,708	2,688	57.38
	36 – 45	2,440	3,632	48.85
	46 – 55	2,655	4,18	57.44
	> 55	2,713	4,468	64.69
Education	Illiterate	2,129	3,159	48.81
	Less than High Sch.	1,682	2,9	72.45
	High Sch – Undergrad	2,219	3,33	50.05
	Undergrad and over	2,681	3,923	46.32

Note: Contributions paid is provided in nominal terms, as the match threshold in Turkey refers to nominal values of the yearly minimum wage. For the calculation of participant’s age, we consider 2013 as the reference year. Age groups follow the classification provided by the Pension Monitoring Center. Education captures individual i’s educational level prior to the reform announcement.

Source: Own calculations based on the administrative data from the Pension Monitoring Center.

In both periods, the annual average contributions paid exhibit an increase with age and education with a notable exception. Illiterate individuals tend to have higher contributions paid than those categorized as “less than high school” graduates. The statistics also show that, in the pre-reform period, males contribute more to the IPSS when compared to females. Therefore, one might anticipate a lower percentage change in contributions paid by males following the reform, relative to the change in contributions paid by females. However, the rate of annual average contributions paid remains still approximately 5 percentage point higher for the male group compared to the change observed in the female group. Later, we conduct a detailed analysis to explore the differences in responsiveness to matching contributions between male and female participants.

Table 2 provides a comprehensive overview of the changes in average annual contributions paid following the policy change. A relevant question is whether the increase in annual contributions paid can be attributed to a significant rise in contributions paid by a small group of individuals or if it reflects widespread changes in saving decisions. Figure 3 presents the percentage of contributors along with the corresponding percentage change in annual contributions paid, both three years before and after the reform. Close to 25% of contributors increased their contributions paid by 10 – 30% during this period. It seems that 15% of contributors did not alter their contributions paid. The figure demonstrates that the overall rise in contributions paid is not solely the result of substantial changes in contributions paid by a small group of individuals.

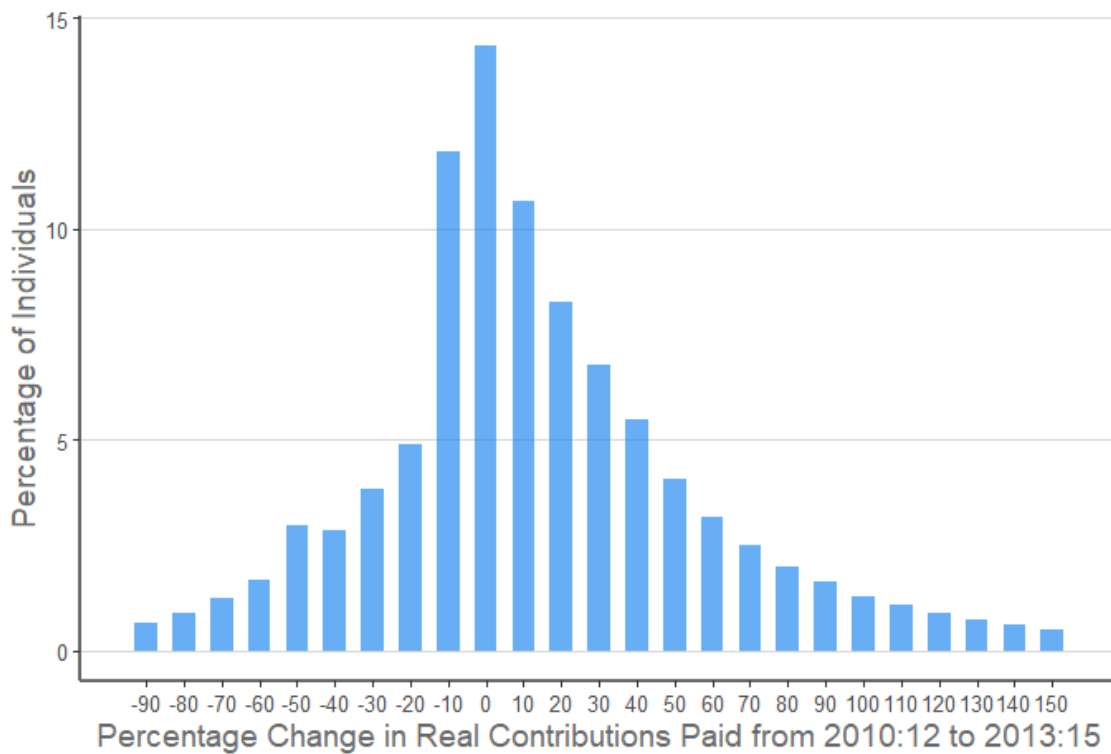


Figure 3: Percentage of Individuals Based on Change in Contributions Paid

Note: Horizontal axis depicts percentage changes in three-year averages pre- and post-reform real contributions paid. The vertical axis presents percentages of individuals that made particular percentage change in contributions paid during the specified period.

Source: Own calculations based on the administrative data from the Pension Monitoring Center.

Tables and figures above are suggestive for the efficacy of the program to raise contributions paid of participants. To further investigate the marginal effect of matching contributions and to control endogeneity of preferences, we employ difference in difference estimations in the following section.

Differences-in-Differences Estimations

In the matching scheme, contributions are matched only up to a certain threshold (as depicted in Figure 4). This plan creates non-linear savings incentives and categorizes participants into two distinct groups. For those whose previous contributions exceeded the threshold before the program’s introduction, the matching contributions policy has no marginal effect. Even if this group of participants increases their contributions, their matching entitlement remains unchanged. However, for those whose previous contributions were below the threshold, the matching contributions policy has a positive marginal effect. This second group of participants can increase their matching entitlements by raising their contributions. The program’s implementation also has similar negative income effects on the contributions paid by both groups.



Figure 4: Matching Scheme

Note: Horizontal axis depicts contributions paid of an individual to the IPSS. The vertical axis presents matching entitlement. The figure presents non-linear structure of the matching scheme.

Following the approach taken by Doruk et al. (2019), we focus locally around the threshold and employ difference-in-difference estimations. The first group in the estimations, “below threshold savers” (BTS), comprise participants who were contributing below but close to

the match threshold, which was set at the annual total gross minimum wage for the relevant year, precisely 12,000 ₺ (or equivalently 1,000 ₺ monthly payment). The second group “above threshold savers” (ATS), consists of those who were already contributing over but close to the match threshold.

To ensure comparability, we restrict the ATS group to include participants whose monthly contribution payments in 2012 (one year before the matching policy program’s implementation) fell within the range of one standard deviation above the threshold, which amounted to a monthly equivalent of the threshold amount, between 1,000 ₺ and 1,235 ₺. Similarly, we restrict the BTS group to include participants whose monthly contribution paid in 2012 was between one standard deviation below the threshold, ranging from 765 ₺ to 1,000 ₺. With these restrictions, participants in the two groups face nearly the same income effects of the matching contributions, and the program has a marginal effect only on the BTS group.

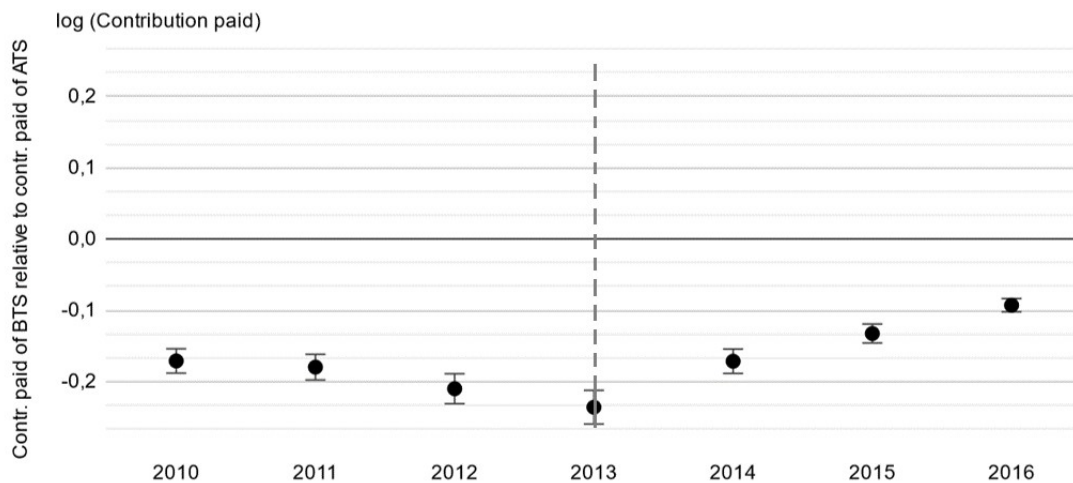


Figure 5: Contributions Paid Differences between ATS and BTS Groups

Note: The figure illustrates the contributions paid by the BTS group relative to their contributions paid during the pre- and post-policy periods. The horizontal axis represents the time period, while the vertical axis depicts the differences between the logarithms of contributions paid by the ATS and BTS groups.

Source: Own calculations based on the administrative data from the Pension Monitoring Center.

Figure 5 illustrates that contributions paid by the two groups remained stable and non-convergent in the pre-policy period. However, a clear trend change emerged after the implementation of the matching contributions policy. Notably, while contributions paid by the BTS group consistently lagged behind and even decreased in comparison to those of the ATS group in the pre-policy period, the situation changed after the policy’s implementation. The

BTS group, for whom the matching contributions policy had a marginal effect, increased their contributions paid relative to the ATS group.

In addition, we conduct several placebo tests to examine whether the contributions paid by the two groups followed a parallel trend. Later in the paper, we present evidence from these placebo tests, supporting that our conclusions are primarily attributed to the policy change itself.

To analyze differences in pre- and post-program, we estimate the following regression equation:

$$Y_{it} = \alpha + \gamma BTS_i + \lambda POST_t + \beta BTS_i * POST_t + u_{it}$$

where Y_{it} is contributions paid for individual i in year t , BTS is the treatment group dummy equal to 1 for the BTS group and 0 for the ATS group. $POST_t$ is the post-treatment period dummy equal to 1 after 2013. β is the coefficient of interest, which captures the effect of the matching policy on contributions paid for individuals. Finally, α is the constant term and u_{it} is the error term.

We also estimate our regressions by adding demographic variables into estimation equations, which significantly reduces our sample though. To ensure the robustness of our results, we examine different windows around the threshold amount of contributions paid by participants. We categorize contributors by symmetrically considering the ranges of 1, 0.75, and 1.25 deviations above and below the match threshold.

Table 3 presents the DID estimations for three different sample sizes as described above. In the sample with one standard deviation, the estimation results in the first column demonstrate that the DID coefficient is significantly positive at the 1 percent significance level. This implies a substantial difference between the BTS group and the ATS group. Following the implementation of the matching contribution policy, the BTS group, contributing below the threshold before the policy's introduction and thus benefiting from matched contributions for additional contributions paid, increased their contributions by 6 percent more than the ATS group who could not benefit from matched contributions for additional contributions paid.

Table 3. DID Estimates

	1 std.			0.75 std.			1.25 std.		
	All contracts	Individual Contracts	All contracts	Individual Contracts	All contracts	Individual Contracts	All contracts	Individual Contracts	
Intercept	9.16*** (0.00)	9.13*** (0.01)	8.78*** (0.02)	9.14*** (0.00)	9.12*** (0.01)	8.78*** (0.02)	9.18*** (0.00)	9.15*** (0.00)	8.79*** (0.01)
Treated	-0.20*** (0.01)	-0.20*** (0.01)	-0.19*** (0.01)	-0.15*** (0.01)	-0.15*** (0.01)	-0.14*** (0.01)	-0.26*** (0.00)	-0.25*** (0.01)	-0.24*** (0.01)
Time	0.18*** (0.01)	0.19*** (0.01)	0.19*** (0.01)	0.19*** (0.01)	0.20*** (0.01)	0.19*** (0.01)	0.17*** (0.01)	0.18*** (0.01)	0.18*** (0.01)
Matching Dummy	0.07*** (0.01)	0.06*** (0.01)	0.06*** (0.01)	0.04*** (0.01)	0.04*** (0.01)	0.04*** (0.01)	0.10*** (0.01)	0.09*** (0.01)	0.08*** (0.01)
Gender			-0.02*** (0.01)			-0.02*** (0.01)			-0.02*** (0.00)
Age			0.005*** (0.00)			0.004*** (0.00)			0.005*** (0.00)
Education			0.02*** (0.00)			0.02*** (0.00)			0.02*** (0.00)
Observations	86,184	56,997	42,119	64,056	42,598	31,603	112,707	74,116	54,557

Note: Significance levels 1%, 5% and 10% are reported as ***, ** and *, respectively. Standard errors in parentheses are clustered on the individual level. The columns with 1, 0.75, and 1.25 standard deviations present estimations for the groups of contributors within in the range of 1, 0.75, and 1.25 standard deviations above and below the match threshold. For the calculation of participant's age, we consider 2013 as the reference year. Age groups follow the classification provided by the Pension Monitoring Center. Education captures individual i's educational level prior to the reform announcement.

Source: Own calculations based on the administrative data from the Pension Monitoring Center.

Our data sample consists of participants with three types of contracts: individual pension contracts, group pension contracts, and employer group pension contracts. While in all three types of contracts individuals may withdraw with their own will, it is also possible that behaviors of individuals may change under different contract types. Therefore, we check the robustness of our results by excluding the latter two group pension contracts and restricting attention to only individual pension contracts. The 2nd and 3rd columns of Table 3 presents the results obtained for only individual contract holders. We obtain almost identical estimates for individual contract holders even though we miss a third of our sample. We then add gender, age, education variables to the estimation and re-estimate the equation. The estimated DID coefficient in the 3rd column is almost identical to the one estimated at the 1st column and it is positive and statistically significant.

The average contributions paid in the BTS group one year before the policy in 2012 stood at 10,405 ₺. Following the implementation of the policy in 2013, there is a mean increase in contributions paid of 458 ₺, bringing the new average to 10,864 ₺. Notably, while the majority of individuals raise their contributions to a level just below the matching threshold, an impressive 33% of the group increase their contributions slightly beyond the matching threshold, thereby taking full advantage of the matching entitlement.

We also explore various contribution ranges around the threshold amount by categorizing contributors into groups based on the symmetrical consideration of 0.75 and 1.25 standard deviations above and below the matching threshold. Theoretically, we anticipate fewer differences in contributions between ATS and BTS groups and a lower matching dummy coefficient for the sample with a narrower range (0.75 standard deviation) since the groups of contributors are closer to the threshold. Conversely, we expect more significant differences in contributions between ATS and BTS groups and, accordingly, a higher matching dummy coefficient for the sample with a wider range (1.25 standard deviation) due to the greater distance from the threshold. In line with our predictions, results indicate a lower matching coefficient for the sample with a narrower range and a higher matching coefficient for the sample with a wider range.

Placebo Tests

Figure 5 above provides suggestive evidence that the disparities between the ATS and BTS groups do not converge, and the BTS group, benefiting from matched contributions on additional contributions, increased their contributions paid compared to the ATS group after the implementation of the matching contributions policy.

To ensure that these results are not influenced by any time trend or grouping choice effects,

we conduct several placebo tests. First, we examine the differences in contributions paid between the same two groups during the pre-policy period and performed a difference-in-differences (DID) analysis. This involves applying the DID approach to the period one year before and after 2012.

Table 4 presents the difference-in-differences (DID) estimates for the pre-policy period. Notably, the matching dummy coefficient is negative and statistically insignificant. This outcome confirms that our main findings are primarily attributed to the policy itself, as contributions paid by both ATS and BTS groups do not decline during the pre-policy period.⁶

Table 4: Placebo Test Pre-Policy Period (2011-2012)

Individual Contracts	
Intercept	9.10*** (0.007)
Treated	-0.12** (0.009)
Time	0.34*** (0.009)
Matching Dummy	-0.02 (0.012)
Observations:	11,94

Note: Significance levels 1%, 5% and 10% are reported as ***, ** and *, respectively. Standard errors in parentheses are clustered on the individual level.

Source: Own calculations based on the administrative data from the Pension Monitoring Center.

Furthermore, to confirm that the estimates are not solely influenced by grouping choices, we try out placebo tests using threshold levels different from the actual one, such as two-thirds of the real threshold (8000 ₺). In these tests, contributors are grouped based on the ranges of one standard deviation above and below the false threshold.

Table 5 reveals that the matching dummy coefficient is negative and statistically significant. As a result, the placebo test provides evidence that our conclusions are not influenced by grouping choices, reinforcing a causal interpretation of our results.

⁶We also conduct several other placebo tests for the pre-policy period using different time periods, sample sizes, and various ranges of standard deviations below and above the match threshold. In all these estimations, we obtain non-positive coefficients for the matching dummy.

Table 5: Placebo Test - False Threshold

Individual Contracts	
Intercept	8.82*** (0.003)
Treated	-0.25*** (0.04)
Time	0.28*** (0.004)
Matching Dummy	-0.05*** (0.005)
Observations:	48,755

Note: Significance levels 1%, 5% and 10% are reported as ***, ** and *, respectively. Standard errors in parentheses are clustered on the individual level.

Source: Own calculations based on the administrative data from the Pension Monitoring Center.

One-Year Window DID Estimates

To observe an instant effect of the policy and further check robustness of the results in a shorter timeframe, we analyze the initial-year changes in contributions paid. We restrict our data covering the period 2012 – 2013, one year ahead and after the program. Table 6 provides the estimation results for three different sample sizes.

Once again, the estimated DID coefficients are significantly positive at the all columns of Table 6. Overall, comparing the first columns of Tables 3 and 4 indicate that the matching contributions coefficient (0.09) is higher than the estimated coefficient (0.06) in the 6-year sample. This result suggests that the initial marginal effect of the matching contribution program becomes large and diminished through time.

Table 6: One-Year Window DID Estimates (2012-2013)

	1 std.			0.75 std.			1.25 std.		
	All contracts	Individual Contracts	All contracts	Individual Contracts	All contracts	Individual Contracts	All contracts	Individual Contracts	
Intercept	9.47*** (0.00)	9.46*** (0.01)	9.33*** (0.02)	9.45*** (0.00)	9.44*** (0.01)	9.30*** (0.02)	9.48*** (0.00)	9.48*** (0.00)	9.34*** (0.02)
Treated	-0.19*** (0.01)	-0.19*** (0.01)	-0.19*** (0.01)	-0.14*** (0.01)	-0.14*** (0.01)	-0.14*** (0.01)	-0.23*** (0.00)	-0.23*** (0.01)	-0.23*** (0.01)
Time	-0.19*** (0.01)	-0.20*** (0.01)	-0.20*** (0.01)	-0.18*** (0.01)	-0.20*** (0.01)	-0.20*** (0.01)	-0.19*** (0.01)	-0.21*** (0.01)	-0.21*** (0.01)
Matching Dummy	0.09*** (0.01)	0.09*** (0.01)	0.09*** (0.01)	0.08*** (0.01)	0.08*** (0.01)	0.08*** (0.01)	0.11*** (0.01)	0.11*** (0.01)	0.11*** (0.01)
Gender									
Age									
Education									
Observations:	34,207	23,778	17,622	25,034	17,5	13,04	42,774	29,517	21,749

Note: Significance levels 1%, 5% and 10% are reported as ***, ** and *, respectively. Standard errors in parentheses are clustered on the individual level. The columns with 1, 0.75, and 1.25 standard deviations present estimations for the groups of contributors within in the range of 1, 0.75, and 1.25 standard deviations above and below the match threshold. For the calculation of participant's age, we consider 2013 as the reference year. Age groups follow the classification provided by the Pension Monitoring Center. Education captures individual i's educational level prior to the reform announcement.

Source: Own calculations based on the administrative data from the Pension Monitoring Center.

Prior studies using cross-sectional data present mixed evidence about the efficiency of matching contribution programs to raise contributions paid. While some studies establish positive results (e.g., Andrews, 1992; Clark and Schieber 1998; Even and Macpherson, 1997; Kusko, Poterba, and Wilcox, 1998), other several studies even find that increasing the match rate lowers contribution (e.g., Munnell, Sundén, and Taylor, 2001 and Mitchell, Utkus, and Yang, 2007).

Notably, two studies, Duflo et al. (2006) and Engelhardt and Kumar (2007), which controlled for the endogeneity of preferences, find positive but relatively modest effects of matching contributions on contributions paid. In alignment with the findings of these two studies, our results also suggest a limited impact of matching contributions on contributions paid on average.

IV. Heterogeneities in Incentives Responses

The findings in the previous section highlight the relatively modest effects of matching contributions on average. However, it is essential to investigate whether different subgroups respond differently to matching contributions. One of the primary objectives of matching contributions or saving incentives is to enhance the savings of groups with lower savings compared to the societal average, such as individuals with lower income, young individuals, and those with lower levels of education (Duflo et al., 2006).

In this section, we delve into the variations in responses to contribution matching among different gender, age, and education groups. For the remainder of our analysis, we continue with the two groups: the BTS group, contributing between the threshold and one standard deviation below the threshold, and the ATS group, contributing between the threshold and one standard deviation above the threshold, for the years spanning from 2010 to 2015.

Gender

Figure 6 presents the changes in annual contributions through the years for both groups. Figure 6 shows that males contribute more both pre- and post-matching contributions policy period. The figure also suggests that for both groups, contributions paid increases after the introduction of the matching contributions.

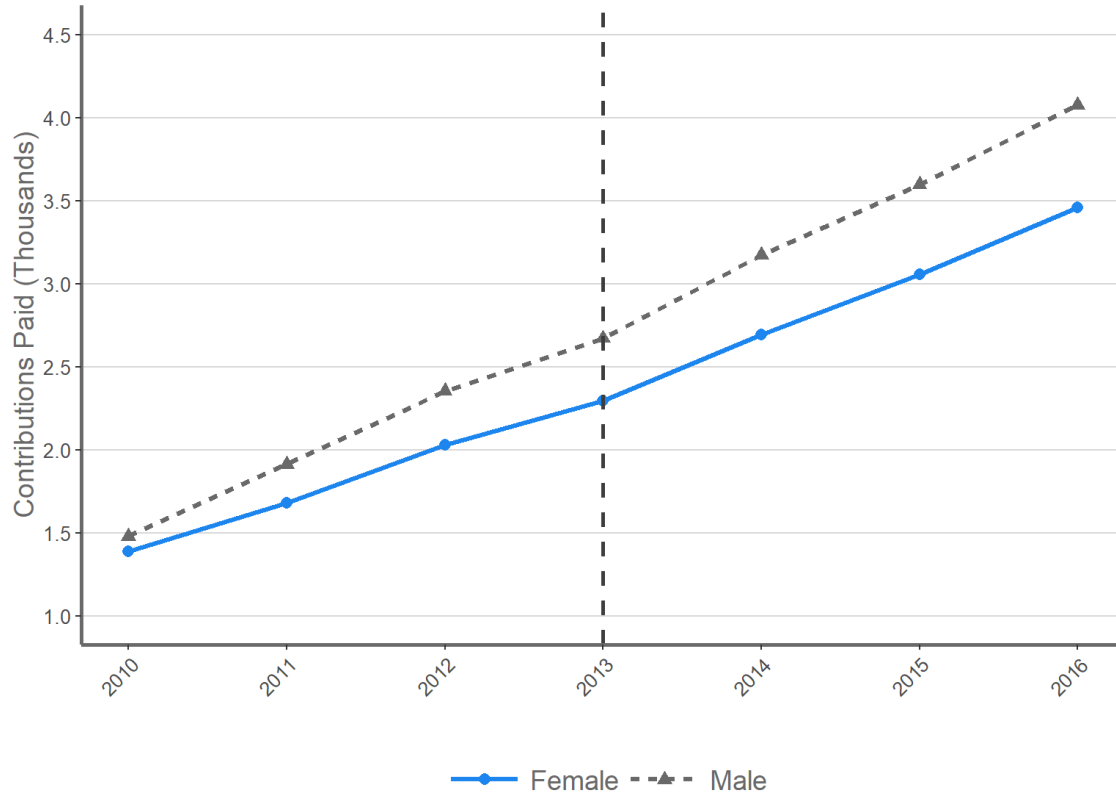


Figure 6: Gender Differences in Contributions Paid (constant 2013 ₺)

Note: Gray-colored line refers to real contributions paid by males and blue-colored line refers to real contributions paid by females. A specific date is introduced to the graph, which indicates the beginning of 2013, since then the matching contribution program has been in effect.

Source: Own calculations based on administrative data from Pension Monitoring Center.

We then repeat our estimations for male and female groups. Table 7 presents the estimation results for male and female groups. For both female and male groups, the difference between pre-match program contributions paid and post-match program contributions paid in the group of BTS is significantly larger than that of difference in the group of ATS.

Table 7: Gender Differences in Responses to Matching Contribution

	Male	Female
Intercept	9.15*** (0.01)	9.11*** (0.01)
Treated	-0.21*** (0.01)	-0.17*** (0.01)
Time	0.20*** (0.01)	0.18*** (0.01)
Matching Dummy	0.07*** (0.01)	0.04* (0.02)
Observations:	37,586	19,411

Note: Significance levels 1%, 5% and 10% are reported as ***, ** and *, respectively. Standard errors in parentheses are clustered on the individual level.

Source: Own calculations based on the administrative data from the Pension Monitoring Center.

Note that both time dummies and DID coefficients are larger for males. We can compare the regression coefficients among these two groups to test the null hypothesis that the estimated coefficients for both male and female participants do not differ. The F statistics of ($F=1.90$, $p = 0.168$) cannot be rejected. This means that the regression coefficients between males and females do not significantly differ. Although on average females contribute less than males do, the responsiveness of these two groups do not seem to differ significantly.

As stated in the earlier section, one reason for lower participation of women in the IPSS compared to men is that many women in Turkey are out of the labor market and do not have an independent income source. Consequently, many women may lack the adequate or independent income necessary to contribute to the IPSS. This could explain the gender gap in contributions paid. Another potential reason could be religious and cultural considerations, given that Turkey is a Muslim-majority country where household responsibilities traditionally fall more on men than on women.

Age

We also examine the impact of the policy change on different age groups. Following to classification of the Pension Monitoring Center, we divide our sample into five age groups: $. \leq 25$, $25 < . \leq 35$, $35 < . \leq 45$, $45 < . \leq 55$ and $55 < .$

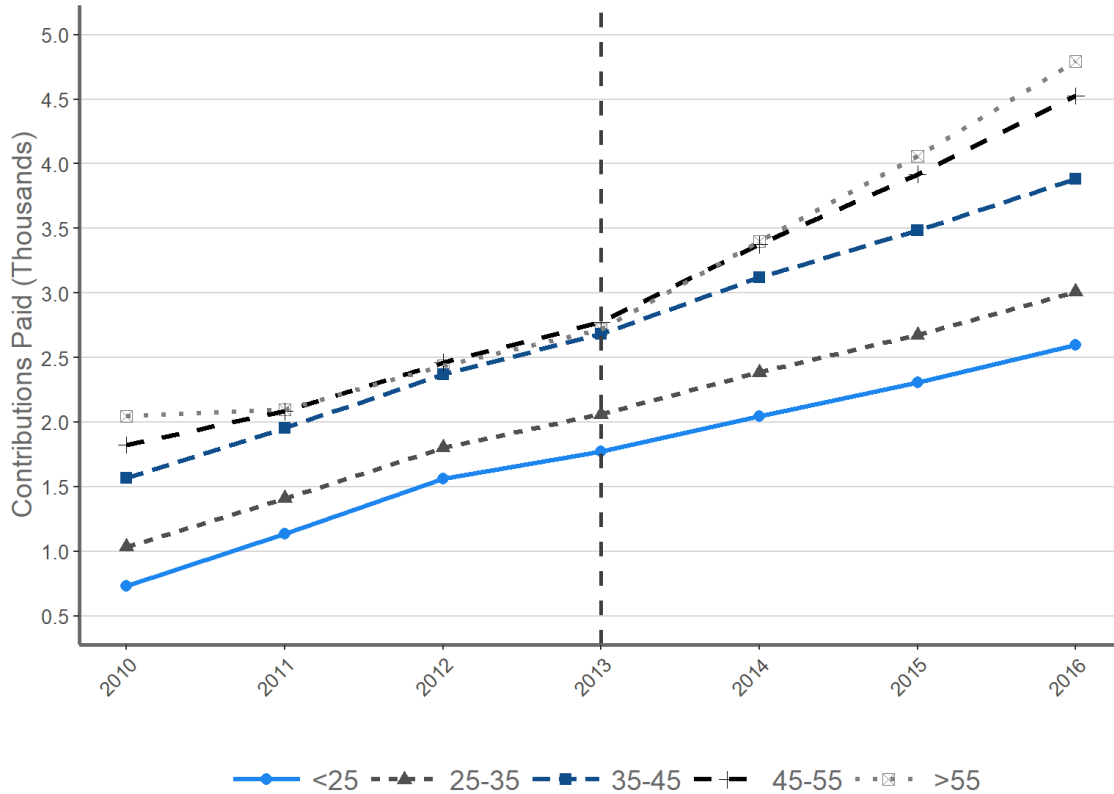


Figure 7: Age Differences in Contributions Paid (constant 2013 ₺)

Note: Colored lines refer to real contributions paid by five different age categories, as defined in Table 1. A specific date is introduced to the graph, which indicates the beginning of 2013, since then the matching contribution program has been in effect.

Source: Own calculations based on the administrative data from the Pension Monitoring Center.

Figure 7 and Table 8 show the impact of matching contributions for different age groups. Figure 7 depicts that contributions paid are higher in older age groups. Note that participants in IPSS can receive 100% of the entitlement on their contributions paid in cases of retirement, death or disability and that they have contributed to IPSS for at least ten years and attained the age of 56. Therefore, contributors at older ages are relatively more advantageous to receive the matched contributions fully, as they are closer to retirement. This may explain why contributions paid are higher in older groups.

Estimates at the Table 8 show that the estimated DID coefficients are significantly positive for almost all age groups. Matching contributions program increases contributions paid of participants in all age groups. When we compare the regression coefficients among these five groups to test the null hypothesis that the estimated coefficients across age groups do not differ. The F statistics of ($F=7.29$, $p = 0.121$) cannot be rejected at the 5 percent level. This means that the regression coefficients across age groups don't significantly differ and

the differences among age groups are not compelling.

Table 8: Age Differences in Responses to Matching Contribution

	age \leq 25	25 < age \leq 35	35 < age \leq 45	45 < age \leq 55	55 < age
Intercept	9.11*** (0.06)	9.08*** (0.02)	9.11*** (0.01)	9.17*** (0.01)	9.17*** (0.01)
Treated	-0.38*** (0.07)	-0.23*** (0.02)	-0.18*** (0.01)	-0.20*** (0.01)	-0.20*** (0.02)
Time	0.12 (0.08)	0.19*** (0.03)	0.19*** (0.01)	0.19*** (0.01)	0.19*** (0.02)
DID	0.27* (0.11)	0.07* (0.03)	0.04* (0.02)	0.08*** (0.01)	0.05 (0.03)
Observations:	655	6,668	22,629	20,828	6,217

Note: Significance levels 1%, 5% and 10% are reported as ***, ** and *, respectively. Standard errors in parentheses are clustered on the individual level. For the calculation of participant's age, we consider 2013 as the reference year. Age groups follow the classification provided by the Pension Monitoring Center.

Source: Own calculations based on the administrative data from the Pension Monitoring Center.

Education

Lastly, we analyze the impact of policy reform on individuals with four different education levels: illiterates, participants with primary school or less education, participants who has education between primary school and high school, and ones with undergraduate or more education.

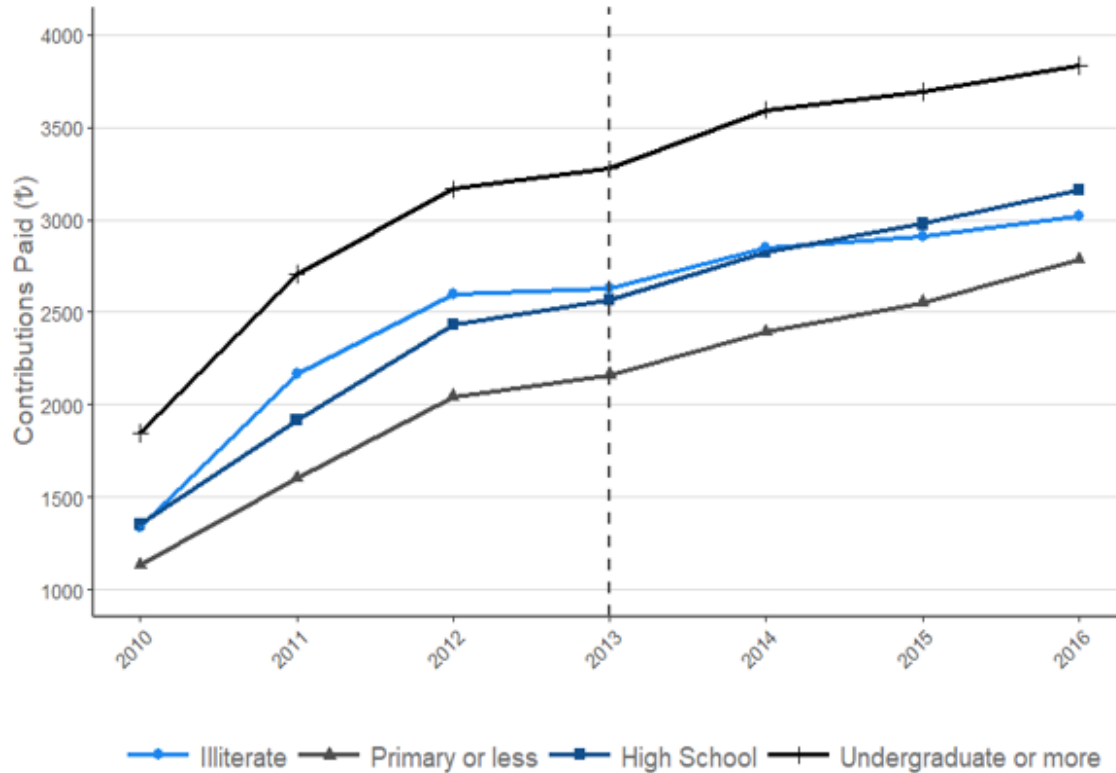


Figure 8: Education Differences in Contributions Paid (constant 2013 €)

Note: Colored lines refer to real contributions paid by four different education categories, as defined in Table 1. A specific date is introduced to the graph, which indicates the beginning of 2013, since then the matching contribution program has been in effect.

Source: Own calculations based on the administrative data from the Pension Monitoring Center.

Figure 8 and Table 9 present the results for these groups. The relation between contributions paid and education groups are non-monotone. On average, illiterates contribute more than the participants with primary school or less education. Table 9 depicts a more important finding: among all education groups, the estimated DID coefficients are significantly positive only for participants with university or higher education level at the 1 percent level. For all other three education groups with education less than university degree, the DID coefficients are not significant. Matching contributions program seems to raise contributions paid of participants in most education groups. When we compare the regression coefficients among these four groups to test the null hypothesis that the estimated coefficients across education groups do not differ. The F statistics of ($F=8.31$, $p = 0.04$) can be rejected at the 5 percent level. This means that the regression coefficients across education groups do significantly differ. Therefore, matching contributions program is ineffective at raising contributions paid by less educated people. One of the aims of saving subsidy programs is to raise retirement

savings of groups with already low level savings. This result shows a possible deficiency of matching contributions policy in this respect.

Table 9: Education Differences in Responses to Matching Contribution

	Illiterate	Primary or less	High school	Undergraduate or more
Intercept	8.99*** (0.04)	8.99*** (0.03)	9.08*** (0.01)	9.17*** (0.01)
Treated	-0.07 (0.05)	-0.18*** (0.04)	-0.19*** (0.02)	-0.20*** (0.01)
Time	0.35*** (0.07)	0.19*** (0.04)	0.23*** (0.02)	0.16*** (0.01)
Matching Dummy	-0.14 (0.08)	0.13* (0.05)	0.05 (0.02)	0.07*** (0.01)
Observations:	998	2,639	10,123	27,924

Note: Significance levels 1%, 5% and 10% are reported as ***, ** and *, respectively. Standard errors in parentheses are clustered on the individual level. Education captures individual i 's educational level prior to the reform announcement.

Source: Own calculations based on the administrative data from the Pension Monitoring Center.

V. A Rise in the Threshold

On January 2016, the monthly minimum wage rose sharply by over 30 percent (see Figure 9). As the upper limit of the matching contribution is tied to the minimum wage of each year, this rise in minimum wage naturally led to the identical increase in the threshold for the maximum level of matching contribution.

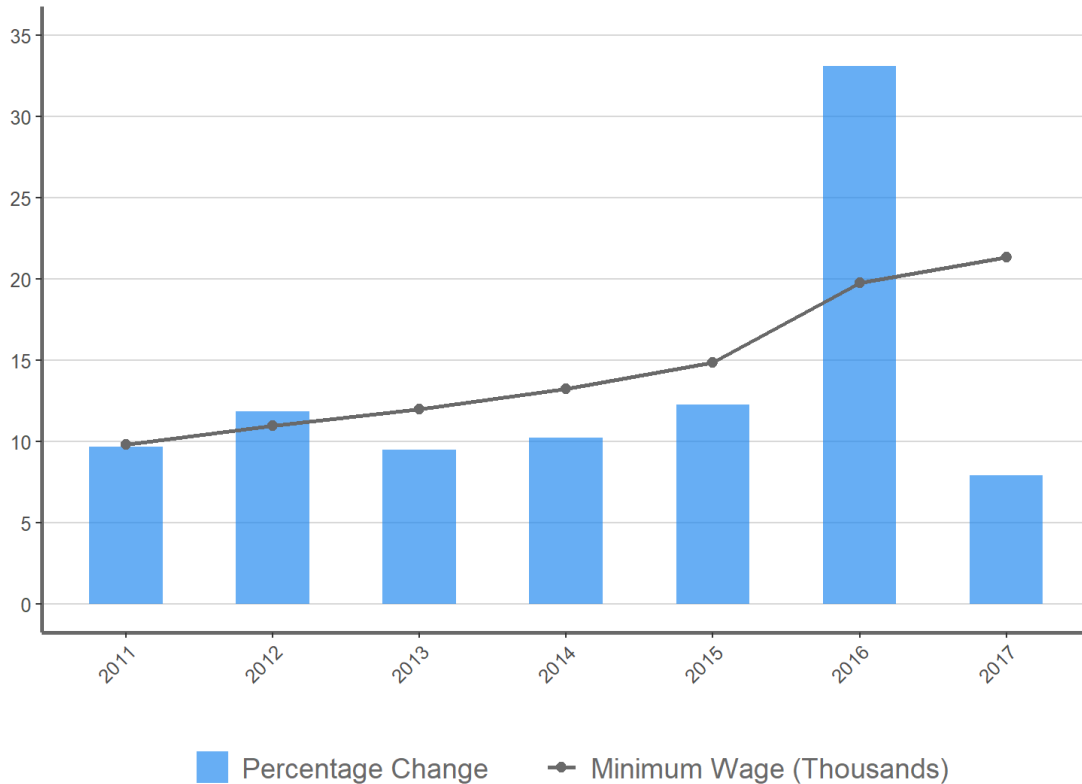


Figure 9: Minimum Wage Over Years

Note: Each bar shows the annual percentage change in the minimum wage (right axis) and the line shows the annual minimum wage in ₺ (left axis).

Source: TURKSTAT

This sharp rise in the threshold enables us to observe the effect of the upsurge in threshold. An analysis of the rise in the matching threshold is important for two reasons. First, several studies (Choi et al., 2002, 2004, 2006) provide evidence on that matching threshold has an important anchoring effect on saving decisions of participants to which contribution rate to select. Madrian (2012, p. 269) summarizing findings in these studies suggests that “A lower match rate with a higher match threshold may be a more effective way to increase individual contributions than a higher match rate with a lower match threshold”. However, existing evidence is very limited and results in previous literature are estimated from single-firm studies. The contribution rates may not be independent of firm-specific shocks, employee characteristics. Therefore, an analysis of the upsurge in threshold from a nationwide matching contribution policy can say more about generalizability of results.

Second, the rise in the threshold serves as a quasi-natural experiment to further examine the causal impact of the matching contributions program. As we describe in the second section, introduction of the matching contributions program produces two separate groups, ATS and

BTS participants. Both groups have almost same income effect from the program, but only BTS participants face substitution effect of the matching contributions. This leads us to examine marginal effect of the program.

The rise in the threshold similarly then generates two groups but provides these groups different incentives than the introduction of matching contributions does. Theoretically, a rise in the matching threshold provides no incentives to participants who were already contributing less than the threshold. Also, for the ones who were already contributing an amount more than both the former and the new matching threshold, the upsurge in the threshold has no effect. The new threshold provides no income or substitution effect to these participants (we call as control group, or CG, hereafter) for their contributions paid.

Differently, participants who were formerly contributing an amount more than the old threshold but less than the new threshold (treatment group, or TG, hereafter) face both income and substitution effect resulting from the rise in the threshold. While the rise in the threshold incentivizes them to increase their contributions paid through the substitution effect, the resulting income effect gives incentives to lower contributions paid. The net effect is thus uncertain. Therefore, comparing these two CG and TG groups enables us to examine causal net effect the matching contributions program on contributions paid. While with the previous analysis, we could examine marginal effect of the program, the analysis of the rise in threshold provides opportunity to examine causal net effect of the matching contributions.

Specifically, group of individuals contributing an amount between monthly payment 1,380 ₪ and 1,647 ₪ in 2015 could not receive an entitlement for a possible rise in their contributions paid. However, after the rise of the threshold to monthly 1,647 ₪ (equal to annual payment 19,764 ₪)⁷ on January 2016, they get an opportunity to receive an entitlement for an increase in their contributions paid. This group constitutes the treatment group (TG). Another group of individuals contributing an amount more than monthly payment 1,647 in 2015 cannot receive an entitlement for a rise in the contributions paid. Differently from the treatment group, individuals in this group still cannot receive an entitlement for an increase in their contributions paid after the rise of the level of threshold. This group constitutes the control group (CG).

To control the endogeneity of individual preferences, we once again utilize the differences-in-differences estimator (DID) for the analysis. We restrict the analysis to period of one year ahead (1 January 2015 – 31 December 2015) and after the upsurge in the threshold level in 2016 (1 January 2016 – 31 December 2016). Since in 2017, a new individual saving reform,

⁷A one-standard deviation below the new threshold level, yearly gross minimum wage in 2016.

the auto enrollment system, is introduced, we choose not to include the beginning of 2017 or later into the analysis. We employ the whole population of contributors who enrolled in IPSS before the year 2015 and had stayed in the system at least till 31 December of 2016.

Table 8 summarizes our findings. The first column of Table 10 presents the results for the simple model including time dummy and DID variables. Further, we check the robustness of our results by including only individual pension contracts in the analysis. These results are reported in the second column. We also control for the effects of age, gender and income and present the estimation results in the last column. In all estimates, the estimated DID coefficients are positive and statistically significant at the 1 percent level and the magnitudes of the coefficients are quite large.

Table 10: DID Estimates (2015-2016)

	All Contracts	Individual Contracts	Individual Contracts
Intercept	9.96 *** (0.01)	9.96 *** (0.01)	9.86 *** (0.02)
Treated	-0.17 *** (0.01)	-0.17 *** (0.01)	-0.17 *** (0.01)
Time	-0.17 *** (0.01)	-0.20 *** (0.01)	-0.21 *** (0.01)
Matching Dummy	0.04 *** (0.01)	0.06 *** (0.01)	0.07 *** (0.02)
Gender			-0.01** (0.01)
Age			0.00*** (0.00)
Education			0.03*** (0.00)
Observations:	29,624	20,890	14,212

Note: Significance levels 1%, 5% and 10% are reported as ***, ** and *, respectively. Standard errors in parentheses are clustered on the individual level. Education captures individual i 's educational level prior to the reform announcement.

Source: Own calculations based on the administrative data from the Pension Monitoring Center.

These results at the second column of Table 10 indicate that there is a significant and positive difference between these two groups. After the rise of the matching contribution threshold, the increase of the contributions paid of the treatment group for whom matching contributions is available for the contributions paid in 2016 is by 6% more than that of the control group who cannot receive an entitlement for a rise in their contributions paid. These results also provide evidence for the causal effect of matching contributions.

DID analyses in earlier sections show that when both groups have almost the same income effect from the program, but only one group (BTS) participants face substitution effect of the matching contributions, they significantly raise their contributions paid more than the other group (ATS), providing evidence on the marginal effect of matching contributions. The current analysis further shows that the treatment group facing both income and substitution

effect of the change in matching contributions raises their contributions paid much more compared to contributions paid of the control group. The results indicate that the net effect of matching contributions also leads to participants to raise their savings.

VI. Conclusion

Our analysis yields several noteworthy conclusions. First, the matching contribution policy has a moderate positive impact on participation in IPSS, resulting in a 4.7% increase. In the three years preceding the policy implementation, the number of participants stood at approximately 2 million. Remarkably, this figure more than doubled to 4.5 million in the three years following the policy change.

Second, the matching scheme is expected to influence participants differently based on whether their contributions are at or below the match threshold. This variation arises from the inherent design of the match threshold. Our differences-in-differences estimations indicate that the marginal effect of matching contributions is 6 percent. Placebo tests also show that our estimates are due to the policy itself. Furthermore, the matching contributions lead to a significant, albeit modest, increase in the contributions paid by participants. A subsequent analysis of the substantial rise in the match threshold in 2016 offers additional evidence supporting the effectiveness of financial incentives in augmenting saving contributions. In summary, Turkey's nationwide matching contribution policy fosters growth in both the number of participants and the contributions paid.

Drawing from predominantly advanced economies, prior research in this field has chiefly concentrated on data from the United States. A considerable portion of these investigations employed cross-sectional data, which inherently constrains the ability to exhaustively account for unobserved factors. Nonetheless, two particularly persuasive studies delineating causality of matching contributions are those by Duflo et al. (2006) and Engelhardt and Kumar (2007). Each of these analyses focuses on distinct and narrowly defined groups—middle- and low-income households in the former, and elderly participants in the latter—yet they both yield analogous outcomes pertaining to the marginal effect of matching rates on contributions and participation decisions. Our findings, which stem from an analysis of a nationwide policy in a developing country setting, reveal similar outcomes regarding the marginal effect of matching rates on contributions and participation decisions. This correspondence suggests that the conclusions drawn from these two earlier studies, despite their narrower scope, may possess a degree of generalizability that transcends economic contexts.

Saving incentives are typically designed to bolster savings for demographic groups with below-average savings rates, such as females, younger populations, and those with less edu-

cation (Duflo et al., 2006; Madrian, 2012). We proceed to examine heterogeneities in IPSS savings, with a particular emphasis on the responsiveness of gender, age, and education groups. Our findings reveal that while a gender gap exists in participation and contributions made to the IPSS, there is no significant difference in responsiveness to the matching contributions policy, as the marginal effect of the matching rate on contributions is consistent between males and females. All age groups exhibit increased contributions following the implementation of the matching contributions program, though notable differences in responsiveness exist among them. Furthermore, the marginal effect of the matching policy on contributions made by participants with education levels below undergraduate is not significant, indicating that the policy is ineffective in raising contributions from less educated individuals. These results suggest that the impact of the matching contributions policy may be limited in elevating savings among groups with savings rates below the national average.

The findings of our study carry several policy implications. While the marginal effect of matching contributions on individual contributions and participation decisions appears to be modest, the nationwide scope of this policy translates to a substantial cumulative change, leading to a significant increase in total IPSS savings. Consequently, this policy may serve as a viable option for other developing countries where the financial and individual pension systems are less developed, the number of IPSS participants is lower, and the benefits of increasing individual savings are considerably higher. However, given that one of the primary objectives of saving incentives is to elevate the savings of low-saving groups, the matching contributions policy seems inadequate in achieving this goal, particularly with respect to individuals with lower levels of education. Complementary policies could be employed alongside the matching contributions policy to address this shortcoming.

References

- [1] Andrews, E. S. (1992). “The growth and distribution of 401 (k) plans.” *Trends in pensions*, 14, 76.
- [2] Arnaud, A., Choukhmane, T., Colmenares, J., O’dea, C., Parvathaneni, A. (2021). “The Evolution of U.S. Firms’ Retirement Plan Offerings: Evidence from a New Panel Data Set.” *Working Paper*.
- [3] Bassett, W. F., Fleming, M. J. and Rodrigues, A. P. (1998). “How workers use 401 (k) plans: The participation, contribution, and withdrawal decisions.” *National Tax Journal*, 51(2), 263-289.
- [4] Blumenstock, J., Callen, M. and Ghani, T. (2018). “Why Do Defaults Affect Behavior? Experimental Evidence from Afghanistan.” *American Economic Review*, 108(10), 2868-2901.
- [5] Chetty, R., Friedman, J. N., Leth-Petersen, S., Nielsen, T. H. and Olsen, T. (2014). .“Active vs. passive decisions and crowd-out in retirement savings accounts: Evidence from Denmark. ” *The Quarterly Journal of Economics*, 1141-1219.
- [6] Choi, J. J., Laibson, D., Madrian, B. C. and Metrick, A. (2002). “Defined contribution pensions: Plan rules, participant choices, and the path of least resistance.” *Tax policy and the economy*, 16, 67-113.
- [7] Choi, J. J., Laibson, D. and Madrian, B. C. (2004). “Plan design and 401 (k) savings outcomes.” *National Tax Journal.*, 57(2), 275-298.
- [8] Choi, J. J., Laibson, D. and Madrian, B. C. (2006). “\$100 bills on the sidewalk: Suboptimal saving in 401 (k) plans.” *National Tax Journal.*, 57(2), 275-298.
- [9] Clark, R. L. and Schieber, S. J. (1998). “Factors affecting participation rates and contribution levels in 401 (k) plans. ” *Living with defined contribution pensions: Remaking responsibility for retirement*, 16, 69-97.
- [10] Clark, R. L., Gordon Goodfellow, Sylvester Schieber and Drew Warwick (2000). “Making the Most of 401(k) Plans: Who’s Choosing What and Why. ” in *Forecasting Retirement Needs and Retirement Wealth*, ed. Olivia Mitchell, Brett Hammond, and Anna Rappaport, 95–138. Philadelphia: University of Pennsylvania Press.
- [11] Doruk, C., Arindajit, D., Lindner, A., Zipperer, B. (2019). “The Effect of Minimum Wages on Low-Wage Jobs.” *Quarterly Journal of Economics*, 1405-1454.
- [12] Duflo, E., Gale, W., Liebman, J., Orszag, P. and Saez, E. (2006). “Saving incentives for low-and middle- income families: Evidence from a field experiment with H&R Block.” *The Quarterly Journal of Economics*, 121(4), 1311-1346.

- [13] Duflo, E., Gale, W., Liebman, J., Orszag, P. and Saez, E. (2007). “Savings Incentives for Low-and Moderate-Income Families in the United States: Why is the Saver’s Credit Not More Effective?” *Journal of the European Economic Association*, 5(2-3), 647-661.
- [14] Engelhardt, G. V. and Kumar, A. (2007). “Employer Matching and 401(k) Saving: Evidence from the Health and Retirement Study.” *Journal of Public Economics*, 91(10): 1920–443.
- [15] Even, W. E. and Macpherson, D. A. (1997). “Saving incentives for low-and middle-income families: Evidence from a field experiment with H&R Block.” Factors influencing participation and contribution levels in 401 (k) plans. Florida State University Working Paper.
- [16] Huberman, G., Iyengar, S. S., and Jiang, W. (2007). “Defined contribution pension plans: determinants of participation and contributions rates.” *Journal of Financial Services Research*, 31(1), 1-32.
- [17] Kusko, A., Poterba, J. and Wilcox, D. (1998). “Survey evidence on employer match rates and employee saving behavior in 401 (k) plans.” *Living with Defined Contribution Pensions: Remaking Responsibility for Retirement*, 98-112.
- [18] Madrian, B. C. (2012). “Matching contributions and savings outcomes: A behavioral economics perspective (No. w18220).” *National Bureau of Economic Research*.
- [19] Mitchell, O. S., Utkus, S. P., and Yang, T. (2007). “Turning workers into savers? Incentives, liquidity, and choice in 401 (k) plan design.” *National Tax Journal*, 60(3), 469-489.
- [20] Munnell, A. H., Sunden, A. and Taylor, C. (2001). “What determines 401 (k) participation and contributions.” *Soc. Sec. Bull.*, 60(3), 64, 64.
- [21] Papke, L. E. (1996). “Are 401 (k) plans replacing other employer-provided pensions? Evidence from panel data. ”
- [22] Papke, L. E. and Poterba, J. M. (1995). “Survey evidence on employer match rates and employee saving behavior in 401 (k) plans.” *Economics Letters*, 49(3), 313-317.