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**Coordinator:** Prof. Enrico Rettore

**Supervisor**: Prof. Marco Bertoni

**Co-Supervisor**: Ch.mo Prof. Lorenzo Rocco

**Ph.D. student** : Debdeep Chattopadhyay

# Essays on Health and Labour Economics

Debdeep Chattopadhyay

University of Padova

## Declaration

I certify that this thesis is solely my own work other than where I have clearly indicated that it is the work of others (in which case the extent of any work carried out jointly by me and any other person is clearly identified in it). The copyright of this thesis rests with the author. Quotation from it is permitted, provided that full acknowledgement is made.

## Statement of co-authored work

I confirm that Chapter 2 was jointly co-authored with Prof. Marco Bertoni and Dr. Yuanyuan Gu and I contributed 33% of this work.

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# Abstract

This thesis is composed of three chapters. Chapter 1 is titled "Did the Massachusetts Health Reform Program Increase Self-Employment?" and is single authored. It investigates whether affordable health insurance could lead to self-employment generation by studying the case of the Massachusetts Health Reform program. In this study, I use the synthetic control methodology to confirm the absence of a statistically significant effect of the reform on aggregate self-employment. However, I do detect positive and significant short-run effects of the reform on the probability that individuals become incorporated self-employed. This effect is restricted to individuals 40 years old or younger. I also find that the reform caused a significant wage reduction for employees in this age range. This finding highlights that the higher reform-mandated health insurance coverage was at least in part financed by employees.

Chapter 2 is titled "Italian MDs' location choices: A Stated Preference Experiment" and is a joint work with Prof. Marco Bertoni (University of Padova, Italy) and Dr. Yuanyuan Gu (Macquarie University, Australia). It studies physicians' migration intentions and relative preferences for various job characteristics by undertaking a Discrete Choice Experiment with medical students at the University of Padova in Italy. Using a mixed logit model, we estimate students' willingness to pay for various job characteristics and find that not only are they willing to sacrifice a significant portion of their yearly salaries for desirable job features but also that they are willing to pay significantly more for them in order to stay in Italy. We also find significant heterogeneities in the likelihood of emigrating on the basis of observable non-cognitive characteristics. Specifically, we find that students with an internal locus of control, higher willingness to take risks and higher levels of altruism are more predisposed to leaving their home countries.

Chapter 3 is titled "Does a Longer Work Horizon Affect Offsprings' Labour Market Outcomes?" and is single authored. This chapter studies the effect of an increase in the work horizon of middle-aged workers on the school-work transition of their offsprings aged 15-29 years. I exploit the variation in the parental work horizon induced by the 2012 Fornero reform in Italy that abruptly changed the age and years of social security contribution requirements for pension eligibility. Utilising a difference-in-difference strategy, the study shows that the reform-induced increase in the work horizon of mothers caused an increase in the probability of their offsprings seeking their first job. This effect is concentrated mostly on male offsprings and is stronger in southern Italy where there is also a significant decline in the offsprings' likelihood of being students. Fathers, however, did not significantly affect the student status or any labour market outcomes of their offsprings.

# Contents

# Chapter 1

# Did the Massachusetts Health Reform Program Increase Self-Employment?

## 1.1 Introduction

As of 2005, 46.6 million people — about 16% of the U.S. population — lacked health insurance. Among those who were covered, about 60% had employer-sponsored health insurance (ESI), while only 9% had coverage plans from the private individual market. The rest had some kind of public coverage like Medicare, Medicaid, or Military Health Insurance (DeNavas-Walt et al., 2006; Fairlie et al., 2008). The private individual market was subject to medical underwritings, that is, individuals being charged premiums on the basis of their health statuses and being denied coverage due to pre-existing conditions. Due to the difficulties of acquiring health insurance from the private individual market, many scholars (Buchmueller, 1996; Niu, 2014) have studied whether ESI can lead to a "job lock" phenomenon, that is, hinder individuals from switching to jobs that do not provide health insurance. For the same reason, people who receive employer-provided health insurance may hesitate to start their own businesses, as doing so would require them to forego their ESI and obtain health insurance through the private individual market.

As of 2015, 15 million — 10.1 percent of U.S. workers — were self-employed[1]. Nation-wide surveys conducted in 2005 and 2008 by the National Association of the Self-employed (NASE) highlighted that access to health insurance is a major problem for micro businesses (businesses with 10 or fewer employees). Only about 67% of entrepreneurs had personal health insurance coverage through their businesses or from the individual market, and the percentage of entrepreneurs with health coverage through their spouses was close

[1] https://www.bls.gov/spotlight/2016/self-employment-in-the-united-states/pdf/self-employment-in-the-united-states.pdf

to 20%. In addition, only 46.8% of micro business firms offered health insurance through their businesses (NASE, 2005, 2008).

While there is extensive research regarding the job lock phenomenon and the effects of health insurance on labor market decisions[2], few studies have probed the effects of the provision of affordable health insurance that can be easily acquired through the individual market without being turned away due to medical underwriting on micro business creation. Self-employment, although often a last resort for unemployed individuals, is an important driver of economic growth. Several studies have shown that increased levels of self-employment lead to increased salaried job creation, growth in per capita income, and reduced poverty rates (Henderson & Weiler, 2010; Rupasingha & Goetz, 2013). The few existing studies that investigate whether ESI is a barrier to self-employment generation have provided contradictory results (Holtz-Eakin et al. 1996; Fairlie et al. 2010). Moreover, when it comes to measuring self-employment, the previous literature on this topic has hardly made any distinction between entrepreneurship and other types of self-employment. This distinction is crucial, as within the self-employed, it is the "entrepreneurs" that drive economic growth through innovation, business creation and undertaking risky ventures to produce new goods and services. Instead, the self-employed who are not entrepreneurs do not generally undertake risky ventures and concentrate mostly on occupations that do not require strong business acumen. Levine and Rubinstein (2013) argued that the incorporated self-employed are a good proxy for productivity-enhancing entrepreneurs, as their daily jobs require them to perform activities demanding in non-routine cognitive skills, such as creativity, analytical problem solving, and inter-personal communication skills needed for persuading and managing.[3] Unincorporated individuals, on the other hand, engage in more manual labor tasks such as carpentry, plumbing, truck driving etc. To differentiate between entrepreneurs and all other types of self-employed individuals, I divide the self-employed into the incorporated and unincorporated self-employed. The legal features of having an incorporated business, like limited liability and a separate legal identity, are valuable to entrepreneurs looking to undertake risky business investments. These features are less attractive to unincorporated individuals. The Current Population Survey (CPS) data used for the main analysis of this study indicate that about 81.5% of incorporated business owners employ themselves in managerial, professional, sales and administrative occupations while only about 57% for the unincorporated self-employed do the same. About 43% of unincorporated self-employed engage in service- and operations-related occupations compared to a mere 18.5% of their incorporated counterparts.

This paper examines whether ESI acts as a barrier to self-employment by focusing on the case of the Massachusetts Health Care Reform (MHCR). The program was initiated in 2006 and mandated that

[2]See Currie and Madrian (1999) and Gruber and Madrian (2004) for a summary of the existing literature on the job lock that arises due to health insurance being tied to employment.

[3]See also Faggio and Silva (2014).

every Massachusetts (MA) resident (with some exemptions, mainly on the basis of affordability) received health insurance coverage. It aimed to provide universal health insurance coverage to the people of MA by expanding Medicaid and introducing private health insurance market reforms to make health insurance more affordable and acquirable in the individual market. This had the potential to weaken job lock and lead to a higher rate of self-employment by enticing aspiring entrepreneurs tied to their salaried jobs. At the same time, the cost of self-employment had increased because of the employer mandate, which required employers with more than 10 full-time employees to sponsor their health insurance. Also, because of this employer mandate, current employees who were acquiring health insurance may not have wanted to switch over to self-employment. Thus, the effect of the reform on self-employment is theoretically ambiguous. It is important to note here that, although the CPS does not provide information on the number of people employed by these self-employed individuals, according to the relatively new Annual Survey of Entrepreneurs, as of 2014, about 22% of businesses with employees on their payroll have 10 or more full-time employees.

In this paper, I use the Basic Monthly files and the Annual Social and Economic Component (ASEC) of the CPS for the years 1996-2011 to investigate whether the MHCR led to an increase in health insurance coverage and self-employment. I use the synthetic control methodology popularized by Abadie and coauthors (Abadie & Gardeazabal, 2003; Abadie et al., 2010, 2015) to analyze the effects of the reform. The Synthetic Control Model (SCM) creates a control state that mimics the treatment state of MA in terms of the outcome variable (health insurance coverage or self-employment). The final coefficient estimate is deduced by averaging the difference in the outcome variable between MA and the synthetic control state over the post-reform period. The SCM has been growing in popularity over the past decade and has important advantages over the difference-in-difference (DID) methodology used in previous studies to analyze the effect of this reform on self-employment (Heim & Lurie, 2014; Niu, 2014). In detail, the selection of the control state in the SCM for comparison with MA is not ad hoc (as in the DID methodology). Instead of using one or more of the 49 other U.S. states as the control unit, which may or may not have properties similar to MA, the synthetic control methodology optimally weights some of these 49 other U.S. states to ensure that the evolution of synthetic control over time closely resembles that of MA. This sort of weighting to create an optimal control state would also be advantageous to deal with the shocks of the Great Recession that affected some of the years used in this analysis as the SCM creates a control state that would be affected similar to MA due to the recession. This is in contrast to the DID, where the control units of the “Rest of the U.S" or the “Northeastern states" as used in previous studies like Niu (2014) would presumably be affected differently to MA due to differences in industrial compositions, socio-demographic factors and labor market conditions.

The preferred method of carrying out statistical inference in the SCM is randomization inference (RI) (Abadie & Gardeazabal, 2003; Abadie et al., 2010, 2015; Peri & Yasenov, 2017; Pichler & Ziebarth, 2018).

RI is essentially a permutation test done under the assumption that the null hypothesis is true. If the null hypothesis of no effect holds true for all units, the treatment effect estimate is independent of whether or not a unit is assigned a treatment or a control status. Thus, the effect of the treatment can be obtained for each unit individually and a distribution of these treatment effects can be obtained. The inference test can then be done by checking whether the treatment effect of the actual treated unit is "surprising" in this distribution or not (Fisher, 1922; Rosenbaum, 1996; Chetty et al., 2009; Kaestner, 2016). RI has the desirable property of not making any parametric assumptions about the functional form of the variance-covariance matrix and so does not suffer from the problem of over-rejecting the null hypothesis (Chetty et al., 2009)[4]. Recent studies have shown it dramatically outperforming conventional methods of inference in a classical DID framework with a small number of treatment clusters (Paz & West, 2019).

I find the effect of the reform on aggregate self-employment to be small and insignificant. On further examination of the effect of the reform on the two different types of self-employment, incorporated and unincorporated, I find evidence of a significant increase in self-employment among those in the incorporated sector. The effect is large in percentage terms and is as high as 38.6% in the months immediately following the reform. After the full implementation of the reform, however, the effect dies down and is not significant. At the same time, the effect of the reform on the unincorporated self-employed is insignificant. Since the demand for health insurance and preferences for labor supply for females can be different from that of males for reasons related to childbirth, among other things, I check for heterogeneous effects between males and females within each type of self-employment but find no evidence for it using the SCM.

When it comes to age, I investigate the effect of the reform separately on those who are presumably more susceptible to having higher health care needs, which I define as those above 40 years old, versus those who are less susceptible, that is, individuals 40 years old or younger. I find that incorporated self-employment increased significantly only for individuals 40 or below and not for the older sub-group. To explore a mechanism that might explain why the effect was concentrated only among those 40 or below, I examine the effect of the reform on income levels of salaried workers a few months after the reform was passed compared to before the reform. I exploit the rotation pattern of the CPS to form a panel dataset by linking individuals observed in the ASEC data of the CPS in the periods just before and a few months after the reform. Using a fixed-effect DID panel data model, I infer that the reform led to a large average decline of $6,176, which is significant by RI for salaried workers 40 or below. Instead, I find a smaller and insignificant decline in income for those above 40. This shows that employers had shifted the burden of financing the mandated health insurance to be provided to workers disproportionately more toward younger

[4]Chetty, Looney and Kroft (2009) used RI in their DID regressions to tackle the problem of over-rejection of the null hypothesis of no effect due to serial correlation leading to biased standard errors.

workers who were more incentivized to leave their wage/salaried jobs and start their own businesses in the incorporated sector. Salaried workers are skilled workers with high education levels, so they transitioned into the incorporated self-employment sector, which requires high skills, innovation, and cognitive abilities, rather than into the unincorporated sector, which primarily represents menial labor. Thus, the MHCR indeed had an impact on young, self-employed, incorporated individuals, who are the actual entrepreneurs engaging in productivity-enhancing tasks. The incorporated self-employed, however, represent only about a third of the total self-employed population, and those 40 or below, in turn, represent only about 30.5% of the incorporated self-employed prior to the reform. This conclusion is different from previous studies, such as Niu's (2014), which concluded that self-employment on a whole increased due to the reform, and Heim and Lurie (2014), which found a decrease in self-employed individuals.

The results of the paper can help gather insights not just about the effects on MA, but more generally on the United States as a result of the implementation of the federal Affordable Care Act (ACA) later, which was very similar to the MHCR in terms of the individual mandate to acquire health insurance, the selling of health insurance through exchanges, the expansion of health care coverage through Medicaid, and the private health insurance market reforms, such as the elimination of medical underwritings and subsidization through tax credits to make health insurance more affordable.

## 1.2 Literature Review

Several studies have estimated the effects of the Tax Reform Act of 1986 (TRA86), which enabled self-employed individuals to deduct health insurance costs from their taxable incomes (Selden, 2009; Gurley-Calvez, 2011; Velamuri, 2012; Gumus & Reagan, 2013). The general consensus among these studies is that TRA86 significantly reduced the probability of individuals from exiting self-employment while the effect on the probability of entering has been insignificant. Holtz-Eakin et al. (1996), using DID models on Survey of Income and Program Participation (SIPP) and Panel Study of Income Dynamics (PSID) data, could not find statistically significant estimates of lesser likelihoods to transition into self-employment for insured salaried workers without spousal health insurance and insured workers with families in poor health than those with spousal health insurance and without family members in poor health. Fairlie et al. (2010) use matched CPS data from 1996–2006 and used DID models to conclude that employer-insured individuals with higher demands for health insurance are less likely to transition into self-employment than individuals without ESI.

Some have studied the impact of the MHCR itself on self-employment, and so far, the results have been mixed. Jackson (2010) found that new firm creation decreased after the reform. Heim and Lurie (2014) found that the reform led to a decline in the rate of taxpayers who earned a majority of their income from

self-employment. The analysis most closely related to this study is that of Niu (2014), who used DID models to find that, from the 1995–2011 files of the CPS, the reform led to a large and significant increase in health insurance coverage and increased the likelihood of self-employment by 0.71 percentage points — an 8.4% increase from the pre-reform average in MA compared to the rest of the United States or other north-eastern states. However, the study used robust standard errors clustered at the state level with only one treatment state: MA. The use of clustered robust standard errors (CRSE) with a small number of treatment clusters in a DID framework has been shown to lead to small standard errors and a consequent over-rejection of the null hypothesis (Conley & Taber, 2011). In the Appendix, I replicate this study and show how the significance of the coefficients disappear when using RI instead of CRSE. A working paper by Becker and Tüzeman (2014) also explores the effect of the MA reform on self-employment. However, like Niu (2014), their analyses suffer from the same issues of using CRSE and bootstrap for inference in a DID setting with just one treatment cluster of the state of MA. They also do a synthetic control analysis, but without carrying out any statistical inference for it. Furthermore, their characterization of the incorporated self-employed as salaried workers is highly debatable and in stark contrast to the literature on entrepreneurship (see Levine and Rubinstein, 2013).

This paper is also one of several studies that assess the internal and statistical validity of several research designs commonly used in applied microeconometric research. Peri and Yasenov (2017) revisited the labor market effects of the Mariel Boatlift, first studied by Card (1990). With an SCM, they reaffirmed the previous conclusion of no significant effect of the Mariel Boatlift on the wages of low-educated workers in Miami. Stephens and Yang (2014) revisited the issue of compulsory education laws in the United States, finding that the effect of these laws became insignificant on a variety of outcomes, such as wages, mortality, incarceration, and social returns to schooling, when they added region-specific year-of-birth effects to previously used specifications. Wolfers (2006) replicated Friedberg (1996) and showed that her widely accepted view, that is, that no-fault divorce laws accounted for one-sixth of the rise in divorce rates since the 1960s, was misleading and that there had been no persistent effect of the laws after about a decade of their adoption. Sommers, Long, and Baicker (2014) concluded that the MHCR decreased all-cause mortality. Kaestner (2016) replicated their study and showed that the significance of the estimates disappear with the use of RI.

This paper makes several contributions. First, it informs the debate on the broader literature of the relationship between health insurance and self-employment and whether ESI is indeed a barrier to individuals who want to be self-employed. Second, it adds to the conflicting literature about whether the MHCR significantly impacted self-employment generation. Third, it shows the importance of distinguishing between types of self-employed individuals based on incorporated and unincorporated self-employment, or between "entrepreneurship" and other types of self-employment, which has often been neglected in the prior job lock

literature. Fourth, it shows how using CRSE in a DID framework with only one treatment cluster can lead to erroneously obtaining significant estimates by replicating Niu's (2014) work. Fifth, it provides insights to whether the ACA, which expanded health insurance coverage at a federal level in similar ways as the MHCR, had any significant causal effect on self-employment. If a reform toward achieving universal health insurance coverage indeed generates self-employment, then a decline in self-employment will be another of the various harmful impacts of a repeal-and-replace policy, which former U.S. President Barack Obama has cautioned against (Obama, 2017).

## 1.3 The Massachusetts Health Care Reform (MHCR)

The Massachusetts Health Care Reform law was passed in Massachusetts on April 12, 2006. Its long form title is "An Act Providing Access to Affordable, Quality, Accountable Health Care." Since the governor of Massachusetts at the time was Mitt Romney, the reform is often colloquially termed as "Romneycare". The reform has several key features.

First, the expansion of "MassHealth", the state's Medicaid program, expanded eligibility for children, removed caseload caps for children and adults with disabilities, long-term unemployed and people with HIV.

Second, the introduction of programs like "Commonwealth Care", "Commonwealth Choice" and "Young Adult Plans" which subsidizes private insurance for people below 300% of the Federal Poverty Line (FPL)[5] who do not have access to MassHealth or employer provided health insurance.

Third, it substantially restructured the private insurance market by merging the state's non-group and small group insurance markets. The merging of the pool of about 50,000 MA residents in the non-group market without access to ESI to the small group market consisting of over 700,000 residents insured through small group plans under employers with up to 50 employees led to the creation of a large pool so that the participants of the non-group market could benefit from higher product choice availability.

Fourth, it established the Commonwealth Health Insurance Connector Authority or the "Connector," which serves as an exchange or portal for people to purchase health insurance plans like Commonwealth Care, Commonwealth Choice, and Young Adult Plans. The Connector also sets premium subsidy levels for Commonwealth Care and defines "affordability" for the individual mandate.

Fifth, it mandated that every individual obtain health insurance unless they are exempt on the basis of "affordability," as defined by the Connector.

Sixth, it required employers with more than 10 full-time employees to have at least 25% of their full-time employees on their health plans or pay 33% of the employees' insurance premiums or pay a penalty of

[5]In the ACA, subsidies for insurance extend to people below 400% of the FPL.

up to $295 per uninsured employee per year into the Commonwealth Care Trust Fund. Both the individual and employer mandates were implemented in July 2007.

Finally, the plan was funded by redirecting federal funds previously earmarked for safety net hospitals and from the "uncompensated care pool," which was set up in MA in the late 1980s as part of previous reforms to reimburse hospitals for treating low-income people. This pool had risen to over $500 million by 2005.[6]

It should be noted that this form of implementation of the health care reform was also adopted by the ACA to expand health insurance coverage on a nation-wide level. In ways similar to the MHCR, the ACA also expanded Medicaid eligibility to below 138% of the FPL, subsidized private insurance through premium tax credits and cost-sharing subsidies, introduced federal and state exchanges to enable people to access a wide variety of insurance plans and eliminate tedious application processes, imposed the individual mandate, the "employer mandate" that penalizes employers who do not pay their fair shares of their employees' health care plans, banned medical underwriting, and guaranteed the issue of insurance regardless of pre-existing conditions (a law that already existed in MA as a result of previous health care reforms). Thus, the results of this paper may lend insight into the effects of ACA (also called Obamacare) on self-employment generation as well. Caution should be exercised in using these results to make inferences about Obamacare expansions, however, as the experiences of the MA reform differ from those of the ACA in certain regards as well. First, it was relatively easy for MA to fund the expansion, as it already had a low uninsurance rate of about 9% for the non-elderly compared to 18% nationally. At the same time, it had the aforementioned uncompensated care pool to finance the expansion. Second, it had the largest number of physicians per capita of any state, which gave the state an advantage in providing health care to the influx of newly insured individuals (Mazumder & Miller, 2016). Third, under the ACA, states have the option to not expand their Medicaid,[7] unlike MA, which expanded its Medicaid program, MassHealth. As of May 2019, 37 states (including the District of Columbia) have expanded Medicaid and 14 states have not. Fourth, from a demographic point of view, even before the reform in 2006, MA had the third-highest per capita income [8] and consistently ranks in the top 10 states in terms of educational attainment. Thus, one should be careful about generalizing the results observed in the case of MA to each of the 37 states that expanded Medicaid under the ACA.

[6] See Raymond (2007) and Gruber (2008) for more details about the specifics of Romneycare and its implementation.

[7] The ACA enacted Medicaid expansions to people with incomes below 138% of the FPL. However, in 2012, the Supreme Court ruled that states have the option to not expand their Medicaid program (Frean, Gruber, and Sommers 2016).

[8] https://www.bea.gov/newsreleases/regional/spi/2007/spi0307.htm

## 1.4 Data

The source of the data used in this analysis is the Basic Monthly files and the ASEC (also known as the March files) of the CPS. The CPS is one of the oldest, largest U.S. surveys, interviewing approximately 50,000 households a month, and is representative of the civilian household-based population of the United States. In this analysis, the sample has been restricted to adults between 21 and 64 years old. When individuals turn 65, they become eligible for Medicare, which is a single-payer, federally funded medical insurance program. Individuals 65 and older have thus been dropped from this analysis, as they already have access to affordable health insurance outside their work and do not suffer from job lock. Veterans and the disabled have also been dropped from the analysis for similar reasons. Farm and agricultural workers have also been dropped because the problem of a potential barrier to self-employment due to ESI is not relevant for this population sub-group[9]. This analysis uses the years 1996–2011 of the CPS. The ASEC of the CPS records individual health insurance responses that were true for the previous calendar year. For this reason, the time for the health insurance variable in the graphs demonstrating health insurance coverage trends has been adjusted one year backward for true correspondence to the years. The ASEC files are the only files that contain information on individual health insurance coverage. This information cannot be found in the Basic Monthly files. Thus, the ASEC provides the only data that could be used to resolve whether the reform increased health insurance coverage. The analysis period has been stopped at 2011 to facilitate comparison with Niu (2014). Hawaii has been dropped from the analysis, just as in Niu (2014), because the state implemented an ESI mandate in the 1970s.

The primary variables of interest are "whether an individual has any health insurance coverage" and "whether the individual is a self-employed person." The health insurance coverage may be public or private. Public coverage can be Medicare, Medicaid, State Children's Health Insurance Program (SCHIP), or any other state-sponsored program. Private coverage can be employer-sponsored or individually purchased from the private market. For the regressions, for which the outcome of interest is whether the person is covered by any health insurance, health insurance weights created by the State Health Access Data Assistance Center at the University of Minnesota have been used. For self-employment, the individual can be self-employed in an incorporated or an unincorporated business. For regressions with this outcome of interest, the person-level supplemental weights have been used.

Table 1 provides the summary statistics for salaried and self-employed workers in the entire United States for the years 1995–2011. It also provides summary statistics for the self-employed individuals in MA and the Rest of the United States "before" and "after" the reform. Since the MHCR was implemented over a

[9]Note that Niu (2014) did not drop these observations. The results of the analyses by using the sample used in Niu (2014) are available upon request and provide the same overall conclusions.

span of time rather than on a specific day, the time period has been divided into "before" the reform, "during" the implementation period, and "after" the reform implementation, just like Niu (2014). The "before" period is defined as the months prior to May 2006, the "during" period as the months between May 2006 and June 2007 (inclusive), and the "after" period as the months after June 2007. As is apparent from Table 1, self-employed individuals tend to be male, white, married, and older when compared to salaried individuals. Figure 1 shows how the rate of health insurance coverage and self-employment evolved over time for MA and the rest of the United States. For health insurance coverage, there is a clear spike in the period immediately following the reform in MA, and this level change seems to be sustained over the course of the next few years. For self-employment, there seems to have been a spike in the years prior to the reform in MA and a decline in the years after.

## 1.5 Empirical Analysis

Following the previous discussion regarding why the SCM is more advantageous than DID for evaluating the effect of the MHCR on health insurance coverage and self-employment, I use the SCM in this section for analysis. The SCM is an econometric method for evaluating case studies and is generally better-suited than the DID method in case of violations of the assumption of parallel trends. In DID, there is usually a treatment state and one or more ad hoc control states, the treatment effect of the treated state being derived under the assumptions that the pre-trends of the treatment and control states are parallel and that the contemporaneous shocks after the treatment affected them similarly. The SCM, first used by Abadie and Gardeazabal (2003), creates a "synthetic" control state as a combination of all the available control states. This combination is achieved by optimally choosing the weights $W^* = (W_1, W_2, \ldots, W_J)$ to be assigned to each of $J$ available control states that will minimize the following function:

$$(X_1 - X_0 W)' V (X_1 - X_0 W)$$

where $X_1$ is a $(K \times 1)$ vector of pre-treatment values of the predictors of the outcome variable for the treatment state, $X_0$ is a $(K \times J)$ matrix of values of the same predictors for the $J$ control states and $V$ is a diagonal matrix of non-negative components where the values of the diagonal elements reflect the relative importance of the different predictors (Abadie & Gardeazabal, 2003).

The variables used in the SCM for the generation of the synthetic control state are state-level GDP growth, sex, nonwhite, Hispanic, urban, age, proportions of population in each of the four education, four

occupation, seven industry, and six marital status categories[10] as well as the outcome variable itself[11]. For generating the synthetic control unit for health insurance coverage as seen in Figure 2.1, the SCM attached weights to the six control states of Minnesota (0.615), District of Columbia (0.176), New York (0.141), Rhode Island (0.064), Pennsylvania (0.003), and California (0.002). The SCM attached weights to Pennsylvania (0.398), D.C. (0.218), Connecticut (0.169), Colorado (0.134), Vermont (0.056), and Maryland (0.026) and discarded all the other states for the construction of the synthetic control state for analyzing self-employment effects in MA, as seen in Figure 3.1. Appendix figures A1 and A2 show the trends of shares of health insurance coverage and self-employment of MA and the top two states getting the highest weights from the synthetic control analysis. As we can see, the pre-reform trends of MA and these states are fairly similar and thus explains, at least in part, why the synthetic control assigns the highest weights to these states for the respective outcomes.

The present study uses RI for statistical inference, the idea behind which is that, if the null hypothesis of no effect is true, then the estimation of the treatment effect does not depend on whether the unit has been given the label of "treatment status" or "control status." The label "treatment status" can be given to each available unit, and a treatment effect can be calculated for each of these units. Doing this for all the available units produces a distribution of treatment effects under the null of "no effect." The effect of the actual treatment unit (in this case, MA) can then be compared to the distribution obtained from all the other units to see if the effect is "surprising" or not (Kaestner, 2016). In practice, in this case, since there is one treatment unit and 49 control units, I assign treatment status to each of these 50 units individually and calculate the treatment effect for each of them. Then the one-sided p-value relevant for the inference of whether the treatment effect in MA is significant or not can be calculated as the rank of the treatment effect of MA as a proportion of the total number of available units. However, two-sided p-values are required for two-tailed inference testing. In case of a symmetric distribution of these obtained treatment effects, two-sided p-values for the parameters of interest could have been calculated as the ratio of the rank of the absolute values of the coefficient estimates (treatment effects) to the total number of available units. However, the distribution of the state-wise treatment effects of the reform is not symmetric. Hence, in this case, the two-sided p-values have been obtained by simply multiplying the one-sided p-values by 2.

The Appendix provides a full replication of Niu (2014) and shows how the significance of the estimates obtained in that study disappear when using RI, which suggests a lack of statistical validity in using CRSE

[10]The six marital status categories are married with spouse present, married with spouse absent, separated, divorced, widowed, and never married/single.

[11]Ferman et al., 2017, discuss how the lack of guidance in picking controls in SC analysis can lead to specification search opportunities. The controls included in my analysis have been chosen ex-ante in comparison with Niu, 2014. In addition, they show that false rejections are more likely for short pre-intervention periods and when using mean pre-treatment outcome values as predictors. My analysis uses a rather long time series (N=124) and does not include mean pre-treatment outcome values as predictors.

with one treatment cluster in DID. The result of a significant 0.71 percentage points or an 8.4% sustained increase in the aggregate self-employment level in MA, as found in Niu (2014), is not supported by the SCM with randomization inference, as shown in the following sections.

### 1.5.1 Effect of the MA reform on health insurance coverage

Since information on health insurance coverage is available only in the ASEC of CPS, the analysis of the effect of the reform on health insurance coverage has been done using yearly data. As can be seen in Figure 2.1, the synthetic control unit closely follows the health insurance coverage curve of MA [12]. The coefficient estimate of the effect of the reform on health insurance coverage in MA by the SCM can be deduced as the average of the differences in the share of individuals covered by health insurance between MA and the synthetic control state over the post-reform period. Mathematically,

$$Effect_{MA} = \frac{1}{N}\sum_{i=1}^{N}(HI\ cov.\ share\ of\ MA\ in\ year\ i - HI\ cov.\ share.\ of\ synthetic\ MA\ in\ year\ i)$$

where $N$ is the number of post-reform years, which is 5 in this case. For obtaining the RI p-values, the synthetic control method has to be applied separately to each of the 49 other U.S. states under the supposition that the MA reform took place in each of these states. The placebo effects for each state have to be calculated in a way similar to that described above. Once all 50 estimates of the effects of each state have been obtained, the two-sided RI p-value for the effect in MA can be calculated as twice the ratio of the rank of the effect of MA divided by total number of available treatment and control units. In other words, two-sided RI p-value $=2 \times \frac{Rank\ of\ effect\ in\ MA}{50}$. Figure 2.2 plots the yearly effects of the reform on health insurance coverage for each state in the United States. The black line refers to the effect on MA. When I average up the effects for all years after its implementation, I find that there has been an observably large effect of the reform on health insurance coverage in MA compared to the other U.S. states. The effect of the reform in MA is 4.99 percentage points which ranks 1 compared to all the other states. This implies an RI 2-sided p-value of $2 \times \frac{1}{50} = 0.04$. In the pre-reform years, 84.63% of individuals in MA were covered by health insurance. Thus, a 4.99 percentage point increase reflects a 5.9% increase in health insurance coverage in MA, that is significant at 5%.

### 1.5.2 Effect of the MA reform on self-employment

Figure 3.1 plots the monthly share of entrepreneurs in MA. It also presents the monthly share of entrepreneurs of the synthetic control state as generated by the SCM[13]. On the x-axis, the origin represents the month when the implementation of the reform started, that is, May 2006. The figure suggests that, in the months

[12]The mean square predicted error (MSPE) in the pre-reform period, which is used as a measure for goodness of fit, is 0.0001386.

[13]The synthetic control state is fitted to the treatment state of MA with an MSPE of 0.0000794.

immediately following the reform, there was a jump in self-employment in MA as opposed to synthetic MA. That, however, seems to have died down. Whether the apparent increase in self-employment in the months immediately following the reform is statistically significant needs to be evaluated. To this aim, I apply the same methodology used to assess the effect of the reform on health insurance coverage, with the only difference that in this case I can use monthly data and compute separate effects for the "during" and "after" period, as described in Section 4.

Figure 3.2 plots the monthly effects of each and every U.S. state and D.C.[14] The monthly effects of MA have been marked by the black line. The effect on MA immediately following the reform in the "during" period, although higher than most other states, with a rank of four is still not high enough for the RI to declare it as statistically significant. The effect of MA in the "after" period is highly insignificant with a rank of 23 as is evident from the SCM estimates provided in Table 2. The main analyses of this study have been done using monthly data to facilitate comparison with Niu (2014). However, in the appendix, I also show that the estimates remain quantitatively unchanged when the analyses are done using yearly data[15].

**Effects on incorporated and unincorporated self-employment**

Due to the important nature of the distinction between "entrepreneurs" and all other self-employed individuals, as discussed before, I investigate whether the MHCR affected the incorporated self-employed differently from the unincorporated. Table 2 presents the coefficients of the effect of the MHCR on self-employment among MA residents as obtained by the SCM (Panel A). It also details the effects of the reform separately for individuals in incorporated and unincorporated companies (Panels B and C respectively). The reform led to a significant, positive increase in the share of incorporated self-employed individuals during the months of the implementation of the reform. The effect of the reform on the share of incorporated self-employed is 0.0143 percentage points, which translates to a 38.6% increase during the implementation period; however, this does not seem to be a persistent effect, as it was no longer significant after the full implementation of the reform. On the other hand, the unincorporated self-employed did not see any significant effects due to the reform. At the same time, there is no evidence of heterogeneous effects between the male and female self-employed individuals within each type of self-employment, as shown in Table 3. This result could be explained from the notion that the more highly educated individuals with higher income and employed in jobs that provide ESI would be more sensitive to the reform than the group of individuals characterized by lower income and education levels who mostly specialize in manual labor intensive jobs where they often lack health insurance

[14]See appendix for the figures on fit and placebos of all the other SCM samples and sub-samples

[15]Appendix tables A1 and A2 provide synthetic control estimates and Appendix Figure A4 shows the effects of the reform using yearly data. For the incorporated self-employed, the two-sided p-value of the coefficient estimate for the "during" period changes slightly, from .08 (MA ranked second) to .12 (MA ranked third).

in the workplace. Thus, one can conclude that the MHCR did not affect aggregate self-employment generation in MA to the extent suggested by Niu (2014). It did not decrease self-employment either, as suggested in Jackson (2010) and Heim and Lurie (2014). It did, however, increase the share of incorporated self-employed individuals, that is, the entrepreneurs who generally engage in productivity-enhancing activities, create jobs by employing other workers, and drive economic growth by undertaking risky ventures that lead to the creation of new goods, services, and production processes (Levine & Rubinstein, 2017). This was, however, only a short-term effect and did not persist in the long term.

One explanation for the short run effect of the reform which does not sustain in the long run comes from the opposing forces of the reform. As Niu (2014) pointed out, the expansion of health insurance coverage occurred mainly through increased uptake of ESI and Medicaid with private market coverage increase being insignificant. An increase in Medicaid expansion is expected to increase the likelihood of self-employment, while both the individual and employer mandates are expected to have negative effects. An increase in ESI coverage rates implies that, due to the individual mandate, more individuals were taking up health insurance through their employers, while the employer mandate made starting up new businesses with more than 10 employees more costly. The negative components outweighing the positive component of state expansion of Medicaid after the initial few months of the reform makes even more sense when we take into account the fact that the MA health reform program was implemented in phases. At the initial phase of the reform, the state subsidization of Medicaid was implemented which is expected to increase self-employment. The individual and employer mandates which are expected to decrease self-employment were implemented later on in July 2007. These negative effects outweighed the positive effect of the reform starting July 2007 from which time we see the effect of the reform become insignificant. However, it is also noteworthy that businesses with more than 10 employees consist of a very small proportion of the total. According to a more recently launched survey by the U.S. Census Bureau, the Annual Survey of Entrepreneurs, only about 22% of businesses with paid employees in their payrolls have 10 or more employees. Another explanation comes from the potential immigration that could have taken place into MA from neighboring states. It could be the case that, during the initial months of the reform, residents from nearby states were attracted to move to MA due to the opportunity created by the reform to start new businesses. Over time, this immigration of people wanting to open up new businesses slowed down, especially with the implementation of the individual and employer mandates in July 2007. These explanations are, however, speculative in nature and are difficult to test.

The importance of investigating heterogeneity in the effects of the reform on younger and older age groups has been emphasized previously (see Section 1). There is no clear definition to what constitutes old and young working people, and my characterization of individuals aged 40 and above as the older group may seem ad-hoc. However, the analysis can be done by changing this cut-off in either direction in small

increments without the results changing qualitatively. Table 4 shows synthetic control estimates of the effect of the MA reform on aggregate, incorporated, and unincorporated self-employment separately for individuals aged 21–40 and 41–64. The results suggest that the reform had a significant, positive effect of 1.8 percentage points on individuals aged 21–40 during the implementation period but had no significant effect on the 41–64 age group. Although the coefficient estimate of incorporated self-employment for the 21–40 group is insignificant, it is important to notice that it is very marginally insignificant. An RI 2-sided p-value of 0.12 implies that the rank of the effect of MA was third-highest among the placebo effects of all 50 states. A rank of 2 would have rendered the coefficient significant. Overall, highly insignificant RI 2-sided p-values of unincorporated self-employment and the previous synthetic control analyses revealing that the reform increased only incorporated self-employment indicate that the significant effect of the reform among the 21–40 age group was due to incorporated self-employment. This raises the question why the effect of the reform was concentrated only among the younger working individuals in the incorporated self-employment sector. One possible explanation – investigated in the next subsection – lies in the way employers had shifted the cost burden of the newly mandated health insurance for its employees.

**Heterogeneous income effects of the reform among the 21-40 and the 41-64 age groups using matched Current Population Survey (CPS) data**

The MHCR mandated that employers with more than 10 full-time employees provide at least partial health insurance coverage to their employees or pay penalties of up to $295 per employee each year. One might expect that this increased cost to employers of providing the newly mandated health insurance was probably transferred to its workers in the form of lowered wages or salary cuts. Since the previous sections indicated that only younger individuals aged 21–40 saw a statistically significant increase in incorporated self-employment, in this section, I investigate whether the burden of financing the newly mandated health insurance was shifted more to the younger age group than to the older one. Toward this end, I form matched CPS panel data that range from just before to one year after the start of the reform with individuals that remained in salaried jobs. The CPS follows a 4-8-4 rotation pattern that implies that individuals are interviewed for four months, left alone for eight months, and then interviewed for another four months. It is thus possible to track cohorts of individuals who were interviewed just before and some months after the reform had started to take effect. Only the ASEC of the CPS provides data on income of the surveyed individuals. This ASEC is also called the "March component" of the CPS, as it takes place in the month of March each year. Therefore, the ASEC provides only yearly data for the month of March. The total personal income in the ASEC reflects the personal income of an individual over the past 12 months. Thus, using a panel of individuals interviewed in March 2006 and March 2007, I can examine whether there had been a significant decrease in income among

these individuals for the financing of the health insurance mandated by the MA reform and whether this decrease was significantly larger for the younger age group (21–40). The individuals in this matched dataset consist of those who were employed in salaried jobs before the reform and remained in salaried jobs as of March 2007. Utilizing a panel-data approach to a dataset with a fixed pool of relevant individuals allows me to mitigate self-selection into job types (employees vs. self-employed). Table 5 reports some summary statistics for this matched dataset for the 21–40 and 41–64 age groups separately for the treatment group of MA and the control group of the rest of the United States. The table suggests that there was a decrease in the mean income of individuals in the 21–40 age group in MA. It is also notable that the salaried workers are primarily workers with high levels of education, about 73% of the 21–40 age group in MA having some college education as of March 2007. Also, a big fraction (76%) of these workers are engaged in managerial, professional, sales, and administrative positions, which are more cognitively demanding than services and operations sector occupations.

For this exercise, I use the following fixed effect DID model:

$$y_{it} = \alpha \cdot MASS_{it} + \delta \cdot Post + \tau' \cdot MASS_{it} \times Post + X_{it}\beta + c_i + \varepsilon_{it}$$

Here, $y_{it}$ represents personal income. $MASS_{it}$ is a dummy variable that takes a value of 1 if the state is MA, $Post$ is another dummy that takes the value 1 for March 2007 and $c_i$ represents the individual effect, which does not vary with time. The covariates included in the $X$ vector are age, age squared, marital status, married gender interaction, urban, education, occupation, and industry. The fixed effect regression model estimates are reported in Table 6. The coefficient of interest, $\tau'$ to be a significant -$6,176 with an RI 2-sided p-value of 0.08 for the 21-40 age group. The decline in income of the 41-64 group was an insignificant -$1,333 with an RI 2-sided p-value of 0.72, and the aggregate decline in income among the salaried workers in MA was an insignificant -$3,078 with a 2-sided p-value of 0.32 by RI. This explains why the reform affected self-employment primarily among the lower age group individuals. The employers in MA seem to have transferred the burden for financing the new health insurance coverage disproportionately more towards the younger salaried workers as compared to the older ones and consequently we see them leaving their salaried jobs to open up their own businesses in the incorporated sector. The wage/salaried jobs constitute mostly of individuals with relatively high levels of education working in primarily managerial, professional, sales and administrative fields as evident from Table 5. So it does not come as a surprise that they became self-employed in the incorporated sector, which is the true form of entrepreneurship, requiring cognitively demanding tasks on a day to day basis as opposed to being self-employed in the unincorporated sector which represents more subsistence level employment which individuals often engage in for lack of better options.

## 1.6 Robustness Checks

Following Abadie, Diamond, and Hainmueller (2010), I also study whether the significance of the effect of the reform on self-employment in MA is affected by dropping control states that the SCM could not fit well as measured by the MSPE in the pre-reform periods. Abadie, Diamond, and Hainmueller (2010) redid the SCM by eliminating control states with a pre-reform MSPE of more than 20 times, then 5 times, and then 2 times that of the treatment state. I repeat the same exercise here but without the case of 20 times, as it is too lenient. In the pre-reform periods, MA had an MSPE of 0.0000794. It also had a rank of 4 in the "during" period and 23 in the "after" period among the 49 other states and D.C. Considering states with pre-MSPEs of no more than five times that of MA leads to the dropping of only two states: California and Montana. California had a higher placebo treatment effect in both the "during" and "after" periods, whereas Montana had a lower effect in both periods. Therefore, the two-sided RI p-values of the effect of the reform in MA now become 0.125 and 0.917 in the "before" and "after" periods, respectively, which are still insignificant at the 10% level. Considering states with no more than twice the pre-MSPE of MA leads to dropping 19 states. MA now ranks number 2 in the "during" period and number 14 in the "after" period. Since there are only 31 states left, however, the p-values for the coefficients of MA in the "during" and "after" periods are $2 \times (2/31) = 0.129$ and $2 \times (14/31) = 0.903$ respectively. These are, again, still insignificant at the 10% level.

These exercises can be repeated for the incorporated and unincorporated sectors as well. However, as one can see from Table 2, the two-sided RI p-values for the insignificant coefficients are very large. This implies that MA is so far down the ranking of the state-wise effect of the reform (or fake reform) that even dropping the high pre-MSPE states would not lead to insignificant coefficients becoming significant for MA. The same exercises have not been repeated for the sake of brevity.

## 1.7 Conclusions

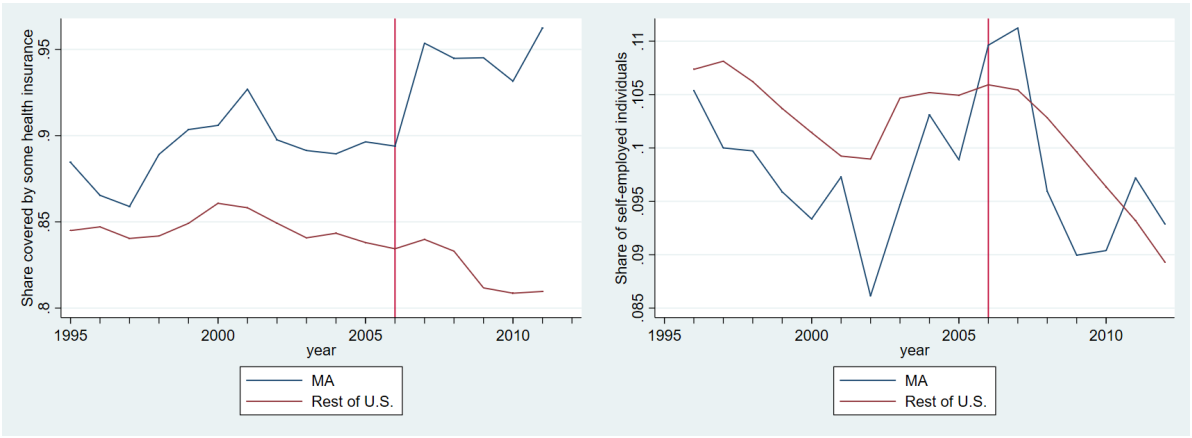
This study uses the synthetic control approach to answer the research question of whether the MHCR indeed increased self-employment. If we consider the entire population of self-employed individuals in MA, the MHCR had no significant causal effect in increasing (or decreasing) self-employment. There is, however, strong evidence that the reform did have a significant, positive effect on entrepreneurs in the incorporated sector. According to the SCM, the effect was restricted only to individuals aged 40 years or below, and the increase was short-lived, becoming insignificant months after the full implementation of the reform. Thus, the evidence from the MHCR suggests that ESI is indeed a barrier to self-employment for entrepreneurs. In this regard, this study emphasizes the need to segregate entrepreneurs from other types of self-employed

persons, which previous papers analyzing the job lock effect of ESI on self-employment have rarely done.

This study disagrees with the results of Heim and Lurie (2014) and Jackson (2010), who argued that the MHCR led to a decrease in entrepreneurship. This paper also provides probable explanations of why some previous papers found significant effects of the MHCR on self-employment by providing evidence that previous estimates were probably the results of over-rejecting the null hypothesis of no effect due to the usage of CRSE, which was often clustered at the state level. Since the ACA is structured very similarly as the MHCR, this paper suggests that the ACA has probably also not managed to stimulate an increase in all kinds of self-employment in the country after its implementation, although it might have had potentially large effects in incorporated self-employment, especially among those below 40. However, caution should be exercised in generalizing the results of this paper to every other U.S. state, as MA already had a low uninsurance level with high levels of income and educational attainments relative to the rest of the United States and is thus fundamentally different from many other states.

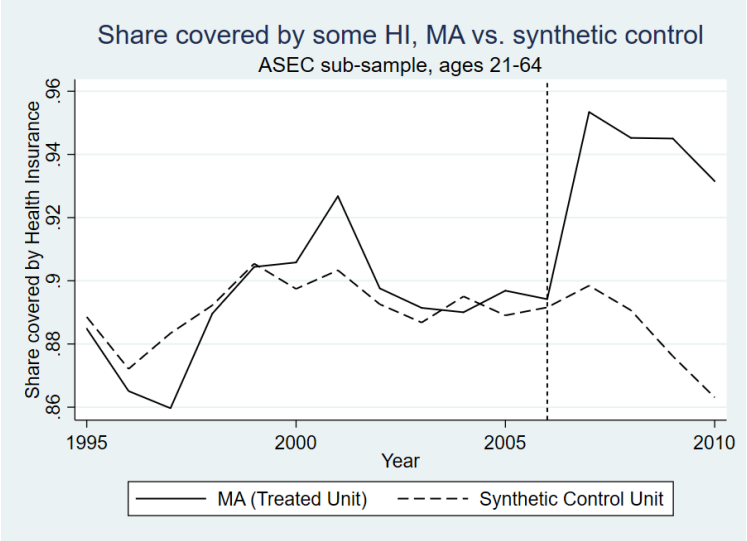
# Figures and Tables

Figure 1: Evolution of Health Insurance Coverage and Self-Employment Rates in MA vs. the Rest of the United States



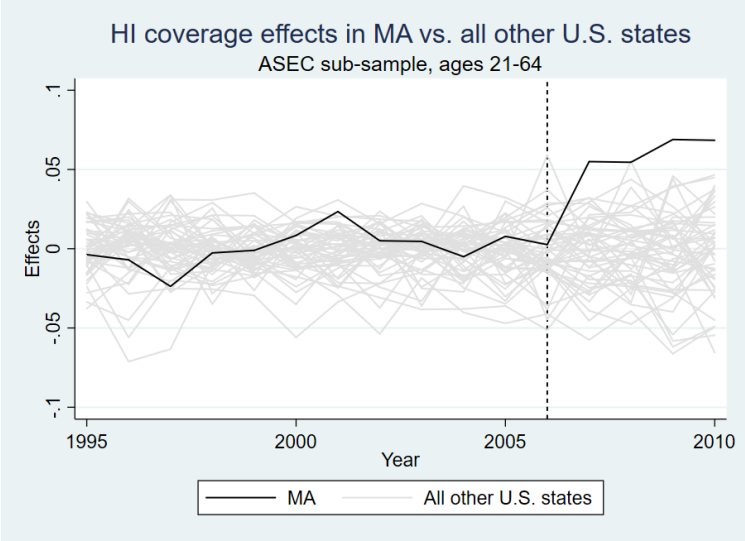

*Notes: Yearly health insurance coverage and self-employment rates have been plotted in the left- and right-hand side panels, respectively. Health insurance coverage data is available only on a yearly basis in the March Current Population Survey (CPS) files, the responses indicating whether individuals had some sort of health insurance coverage in the previous calendar year. Thus, the year variable has been adjusted one year backward to show true one-to-one correspondence between time and health insurance coverage. Self-employment data are available in both the Basic Monthly and March files, so the figure on yearly self-employment rates is based on many more observations. The red vertical line indicates the year 2006 when the reform was passed.*

Figure 2.1: Trends in Health Insurance Coverage: MA vs Synthetic MA



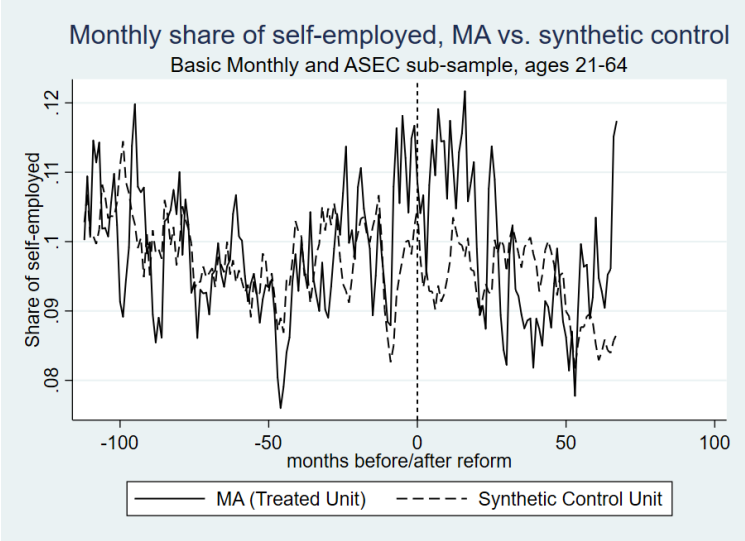

*Notes: The share of individuals covered by some form of health insurance has been shown on a yearly basis. Since the responses of individuals reflect whether or not they had health insurance in the previous year, the "Year" variable has been adjusted one year backward to show true one-to-one correspondence between time and health insurance coverage. The solid line represents Massachusetts, and the dashed line represents the synthetic control unit. The variables used to construct the synthetic control are health insurance coverage share, GDP growth, sex, nonwhite, Hispanic, Metropolitan Statistical Area (MSA), age, and the categories of education, occupation, and marital status.*

Figure 2.2: Effect of Romneycare on Health Insurance Coverage in Each U.S. State by Synthetic Control Method



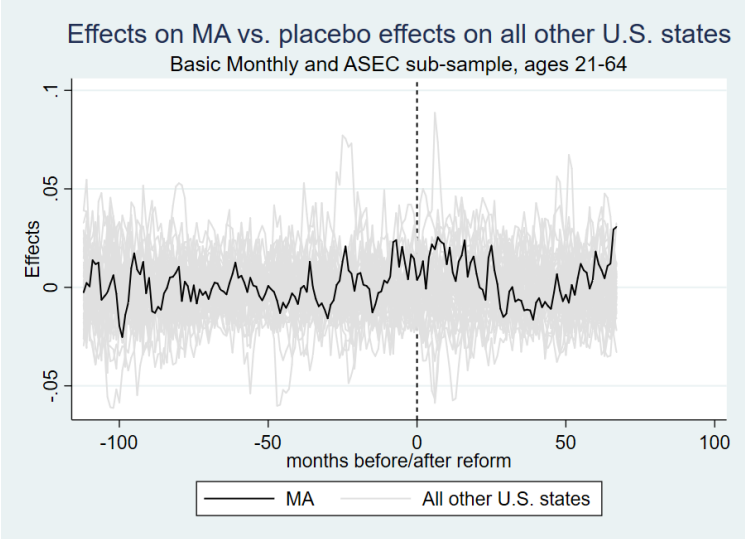

*Notes: The effects of the reform according to the synthetic control method have been plotted on a yearly basis for each U.S. state. The black line represents the effect on Massachusetts, while the gray lines represent the placebo effects on every other U.S. state (except Hawaii) and D.C. The effects on the states in each month are the differences between the actual share and the synthetic control share of individuals covered by health insurance.*

Figure 3.1: Trends in Self-Employment: MA vs Synthetic MA




*Notes: The share of self-employed individuals, which includes both the incorporated and unincorporated self-employed, has been shown on a monthly basis. The solid line represents Massachusetts, and the dashed line represents the synthetic control unit. The variables used for constructing the synthetic control are share of self-employed, GDP growth, sex, nonwhite, Hispanic, MSA, age, and the categories of education, occupation, and marital status.*

Figure 3.2: Effect of Romneycare on Self-Employment in Each U.S. State by Synthetic Control Method




*Notes: The effects of the reform according to the synthetic control method have been plotted on a monthly basis for each U.S. state. The black line represents the effect on Massachusetts, while the gray lines represent the placebo effects on every other U.S. state (except Hawaii) and D.C. The effects on the states in each month are the differences between the actual share and the synthetic control share of the self-employed.*

Table 1: Descriptive statistics

| Variable | Salaried worker | Self-employed worker | Before | After | M.A | Rest of U.S. |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Self-employed | | | 0.1006 | 0.0958 | 0.0967 | 0.0995 |
| | | | (0.3008) | (0.2944) | (0.2956) | (0.2993) |
| Female | 0.4928 | 0.3586 | 0.4785 | 0.4819 | 0.4881 | 0.4793 |
| | (0.4999) | (0.4796) | (0.4995) | (0.4997) | (0.4999) | (0.4996) |
| Married | 0.5949 | 0.7300 | 0.6176 | 0.5894 | 0.5880 | 0.6088 |
| | (0.4909) | (0.4439) | (0.4860) | (0.4919) | (0.4922) | (0.4880) |
| Nonwhite | 0.1825 | 0.1190 | 0.1700 | 0.1883 | 0.1052 | 0.1779 |
| | (0.3863) | (0.3238) | (0.3756) | (0.3909) | (0.3068) | (0.3825) |
| Hispanic | 0.1242 | 0.0848 | 0.1104 | 0.1388 | 0.0572 | 0.1218 |
| | (0.3299) | (0.2787) | (0.3134) | (0.3457) | (0.2323) | (0.3271) |
| Age | 40.1674 | 44.9373 | 40.1792 | 41.5320 | 41.1320 | 40.6297 |
| | (11.3637) | (10.3421) | (11.1023) | (11.7886) | (11.2654) | (11.3582) |
| MSA | 0.8393 | 0.8253 | 0.8260 | 0.8592 | 0.9636 | 0.8349 |
| | (0.3673) | (0.3797) | (0.3791) | (0.3478) | (0.1873) | (0.3713) |
| Education | | | | | | |
| <High school | 0.0876 | 0.0747 | 0.0908 | 0.0761 | 0.0642 | 0.0867 |
| High school | 0.3067 | 0.2827 | 0.3140 | 0.2846 | 0.2776 | 0.3048 |
| Some college | 0.1942 | 0.1895 | 0.1971 | 0.1872 | 0.1444 | 0.1948 |
| College and above | 0.4115 | 0.4531 | 0.3981 | 0.4521 | 0.5137 | 0.4136 |
| Employed, occupation | | | | | | |
| Managerial and professional | 0.3588 | 0.4271 | 0.3596 | 0.3794 | 0.4355 | 0.3643 |
| Sales and administration | 0.2574 | 0.2262 | 0.2594 | 0.2432 | 0.2406 | 0.2545 |
| Services | 0.1410 | 0.1167 | 0.1317 | 0.1528 | 0.1299 | 0.1387 |
| Operation | 0.2427 | 0.2299 | 0.2494 | 0.2245 | 0.1939 | 0.2424 |
| Employed, industry | | | | | | |
| Mining | 0.0068 | 0.0027 | 0.0061 | 0.0070 | 0.0006 | 0.0065 |
| Construction | 0.0649 | 0.1888 | 0.0757 | 0.0792 | 0.0670 | 0.0777 |
| Manufacture | 0.1480 | 0.0517 | 0.1490 | 0.1169 | 0.1348 | 0.1383 |
| Sales | 0.0765 | 0.0503 | 0.0747 | 0.0074 | 0.0609 | 0.0741 |
| Transportation | 0.2549 | 0.2668 | 0.2569 | 0.2544 | 0.2497 | 0.2563 |
| Services | 0.3918 | 0.4397 | 0.3874 | 0.4168 | 0.4449 | 0.3957 |
| Public administration | 0.0597 | | 0.0501 | 0.0533 | 0.0422 | 0.0513 |
| Sample size | 11,175,617 | 1,273,095 | 8,063,338 | 3,475,415 | 258,645 | 12,190,067 |

Notes: Estimates are based on the Current Population Survey (CPS) Basic Monthly files for January 1995 to December 2011 and the Annual Social and Economic Component (March) files for responses corresponding to 1995 to 2011. The sample includes civilians ages 21-64. Military personnel, disabled individuals, and agricultural and farm workers have been dropped. Also, just as in Niu (2014), the state of Hawaii has been dropped because it implemented an ESI mandate in the 1970s. The column "Rest of U.S." includes all states except Massachusetts and Hawaii. The mean values of each variable have been reported and the standard deviations are in parentheses. The "Before" period implies all time periods before May 2006, and the "after" period implies all the time periods after June 2007, with "during" representing all time periods in between.
The estimates have been weighted by the corresponding Basic Monthly and ASEC weights of the CPS.

Table 2: Synthetic control estimates of effects of Romneycare on all types of self-employment

| | Basic Monthly and ASEC sub-sample ages 21–64 | |
|---|---|---|
| Panel A: All Self-Employed | Coefficient | RI two sided p-value |
| Mass x During | 0.0137 | 0.160 |
| Mass x After | 0.0021 | 0.920 |
| Panel B: Incorporated Self-Employed | | |
| Mass x During | 0.0143 * | 0.080 |
| Mass x After | 0.0013 | 0.760 |
| Panel C: Unincorporated Self-Employed | | |
| Mass x During | 0.0006 | 0.840 |
| Mass x After | 0.0001 | 1.000 |

Notes: Data for the years 1996–2011 has been used. The predictor variables included in the synthetic control model are GDP growth, sex, nonwhite, hispanic, urban, age, and proportions of population in each of the four education, four occupation, seven industry and six marital status categories. The BM and ASEC sub-sample 21–64 is constructed by dropping military, agricultural and farm workers from the sample of 21–64 year old individuals in both the Basic Monthly and ASEC files of the CPS.

The "before" period is defined as the months prior to May 2006, the "during" period as the months between May 2006 and June 2007 (inclusive), and the "after" period as the months after June 2007

***p<0.01, **p<0.05, *p<0.10

Table 3: Synthetic control estimates of effects of Romneycare on all types of self-employment by gender

| | Basic Monthly and ASEC sub-sample 21–64 | | | |
|---|---|---|---|---|
| | Male | | Female | |
| Panel A: All Self-Employed | Coefficient | RI two sided p-value | Coefficient | RI two sided p-value |
| Mass x During | 0.0109 | 0.480 | 0.00975 | 0.280 |
| Mass x After | -0.0007 | 0.960 | 0.00456 | 0.560 |
| Panel B: Incorporated Self-Employed | | | | |
| Mass x During | 0.0103 | 0.280 | 0.0080 | 0.160 |
| Mass x After | -0.0045 | 0.680 | 0.0044 | 0.400 |
| Panel C: Unincorporated Self-Employed | | | | |
| Mass x During | 0.0032 | 0.640 | 0.0023 | 0.680 |
| Mass x After | 0.0027 | 0.840 | 0.0029 | 0.720 |

Notes: Data for the years 1996–2011 has been used. The predictor variables included in the synthetic control model are GDP growth, sex, nonwhite, hispanic, urban, age, and proportions of population in each of the four education, four occupation, seven industry and six marital status categories. The BM and ASEC sub-sample 21–64 is constructed by dropping military, agricultural and farm workers from the sample of 21–64 year old individuals in both the Basic Monthly and ASEC files of the CPS.

The "before" period is defined as the months prior to May 2006, the "during" period as the months between May 2006 and June 2007 (inclusive), and the "after" period as the months after June 2007

***p<0.01, **p<0.05, *p<0.10

Table 4: Synthetic control estimates of the effect of Romneycare on all types of self-employment by age, 40 or below vs over 40

| | Basic Monthly and ASEC sub-sample | | | |
|---|---|---|---|---|
| | Ages 21–40 | | Ages 41–64 | |
| All Self-Employed | Coefficient | RI two sided p-value | Coefficient | RI two sided p-value |
| Mass x During | 0.0180 * | 0.080 | 0.0020 | 0.880 |
| Mass x After | -0.0012 | 1.000 | -0.0018 | 0.880 |
| Incorporated Self-Employed | | | | |
| Mass x During | 0.0098 | 0.120 | 0.0119 | 0.320 |
| Mass x After | -0.0014 | 0.960 | 0.0005 | 0.880 |
| Unincorporated Self-Employed | | | | |
| Mass x During | 0.0056 | 0.640 | -0.0029 | 0.840 |
| Mass x After | -0.0006 | 0.920 | -0.0003 | 0.840 |

Notes: Data for the years 1996–2011 has been used. The predictor variables included in the synthetic control model are GDP growth, sex, nonwhite, hispanic, urban, age, and proportions of population in each of the four education, four occupation, seven industry and six marital status categories. The BM and ASEC sub-sample 21–64 is constructed by dropping military, agricultural and farm workers from the sample of 21–64 year old individuals in both the Basic Monthly and ASEC files of the CPS.

The "before" period is defined as the months prior to May 2006, the "during" period as the months between May 2006 and June 2007 (inclusive), and the "after" period as the months after June 2007

***p<0.01, **p<0.05, *p<0.10

Table 5: Summary statistics of matched wage/salary workers, Annual Social and Economic Component (March CPS), 2006 and 2007

| | MA | | Rest of the U.S. | |
|---|---|---|---|---|
| Ages 21–40 | 2006 | 2007 | 2006 | 2007 |
| Income | 49,072 | 46,854 | 39,855 | 43,425 |
| | (51038.68) | (35131.31) | (41010.38) | (45479.18) |
| Education | | | | |
| Some college and above | 0.676 | 0.731 | 0.643 | 0.652 |
| Employed, occupation | | | | |
| Managerial, professional, sales and administrative | 0.759 | 0.759 | 0.613 | 0.615 |
| No of obs. | 108 | 108 | 7,189 | 7,189 |
| Ages 41–64 | | | | |
| Income | 67,688 | 68,866 | 51,574 | 54,162 |
| | (70280.71) | (78869.71) | (49919.55) | (51960.22) |
| Education | | | | |
| Some College and above | 0.732 | 0.705 | 0.628 | 0.631 |
| Employed, occupation | | | | |
| Managerial, professional, sales and administrative | 0.690 | 0.690 | 0.613 | 0.615 |
| No of obs. | 190 | 190 | 9,837 | 9,837 |

Notes: Data for the years 2006 and 2007 for the month of March from the Annual Social and Economic Component (ASEC) of the Current Population Survey (CPS) have been used. Military workers, farm workers, and disabled individuals have been dropped. Only wage/salaried individuals who did not transition to other forms of employment during this time have been used. Since the ASEC is a retrospective survey, the income reported at a point in time represents the total personal income of the individual in the past year. For income, mean values have been reported with standard deviations in parentheses. For education and occupation, percentage shares have been reported.

Table 6: Fixed effect regression model estimates of the effect of Romney Care on income levels in Massachusetts from March 2006 to March 2007

| | Coefficient | RI two sided p-value | |
|---|---|---|---|
| All individuals | -3,078 | 0.320 | |
| Individuals 21–40 | -6,176 | 0.080 | * |
| Individuals 41–64 | -1,333 | 0.720 | |

Notes: The table shows fixed effect difference-in-difference estimates of the effect of Romney Care on income levels of indivduals who had wage/salaried jobs before the reform implementation as of March 2006 and remained employed in wage/salaried jobs after the reform implementation as of March 2007. The sample includes 21–64 year olds in the ASEC files of the Current Population Survey. Control variables include age, age squared, marital status, married gender interaction, urban, four levels of education, four levels of occupation, and seven levels of industry.

***p<0.01, **p<0.05, *p<0.10

# Appendix

Figure A1: Trends in Health Insurance Coverage: MA vs. MN and D.C.

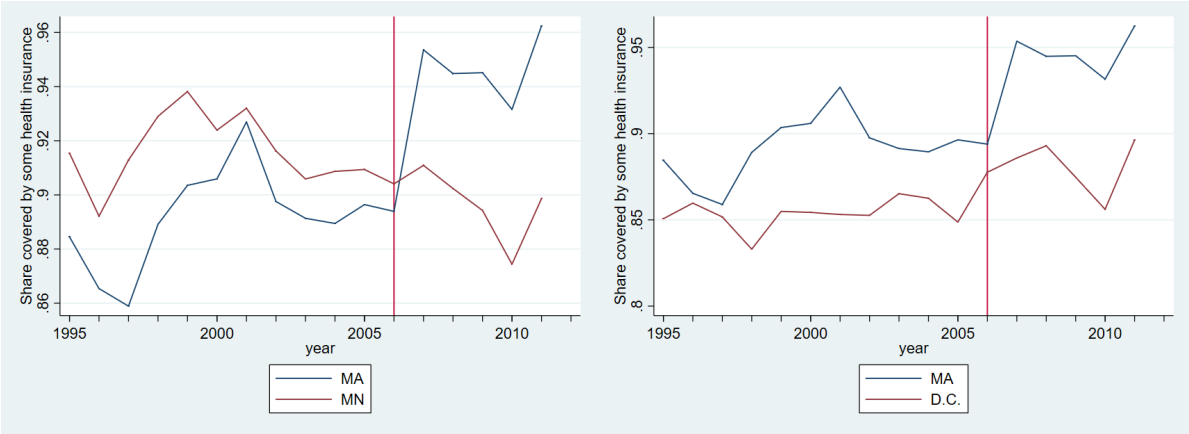



Figure A2: Trends in Self-Employment Coverage: MA vs. PA and D.C.

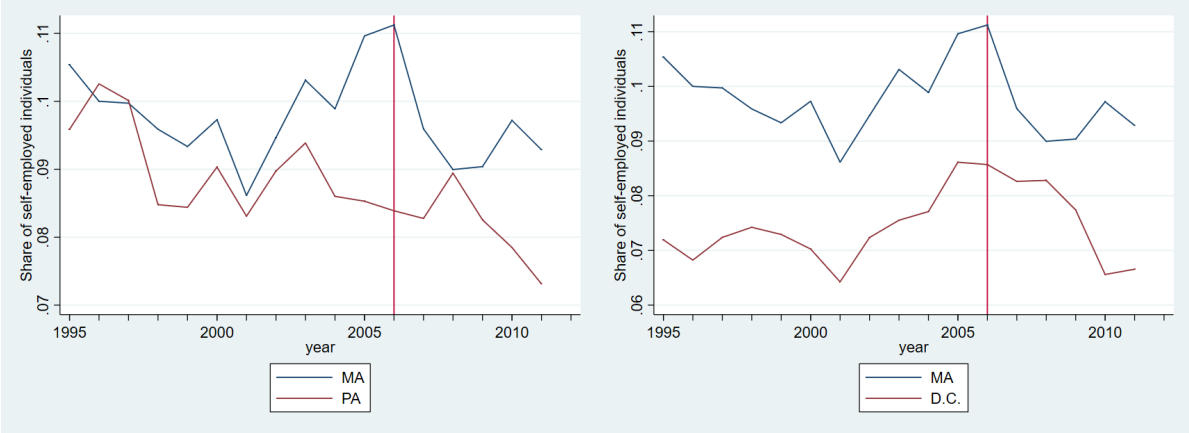


Figure A3: Monthly effect of RomneyCare on Incorporated and Unincorporated Individuals by Synthetic Control Analysis, Basic Monthly and ASEC sub-sample, ages 21-64

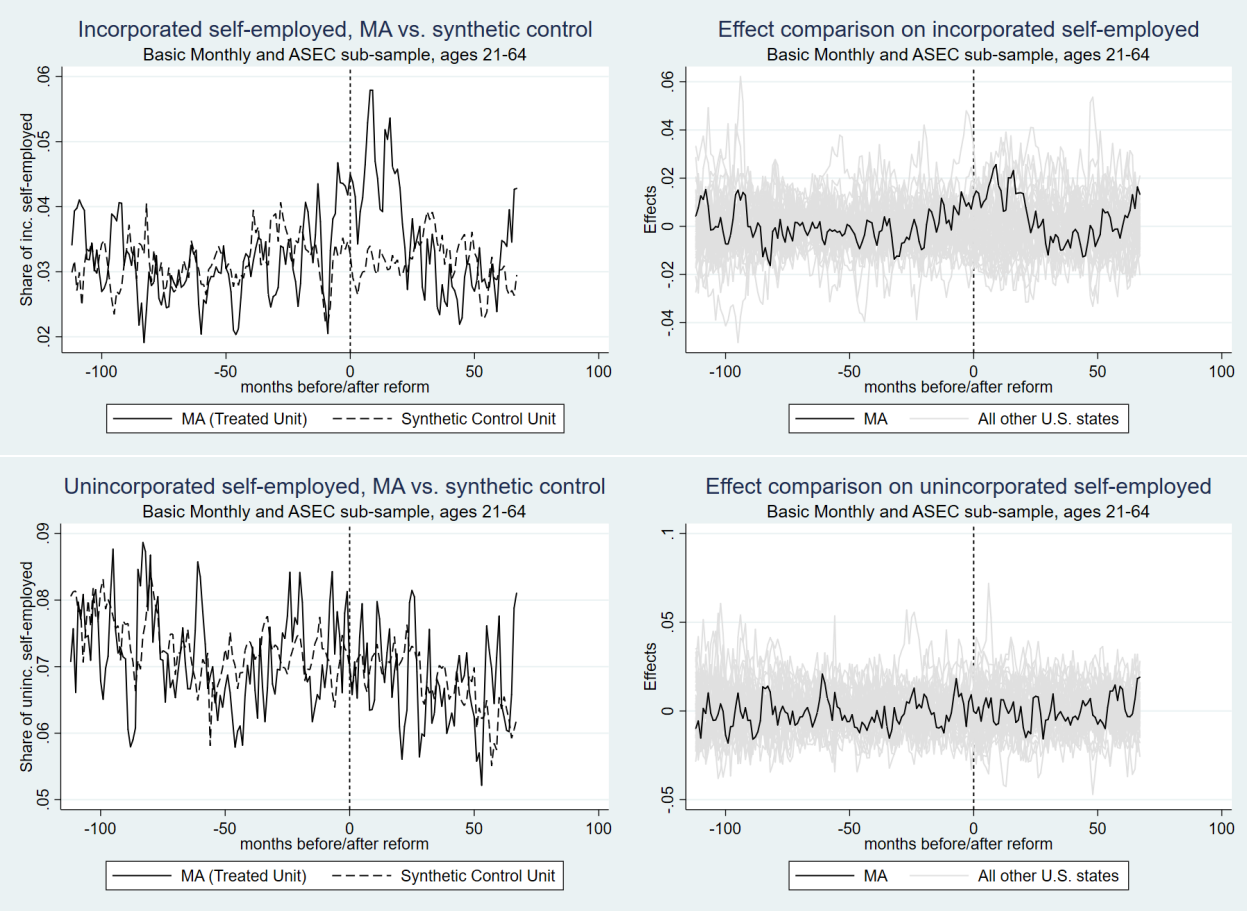


Figure A4: Yearly effect of RomneyCare on Incorporated and Unincorporated Individuals by Synthetic Control Analysis, Basic Monthly and ASEC sub-sample, ages 21-64

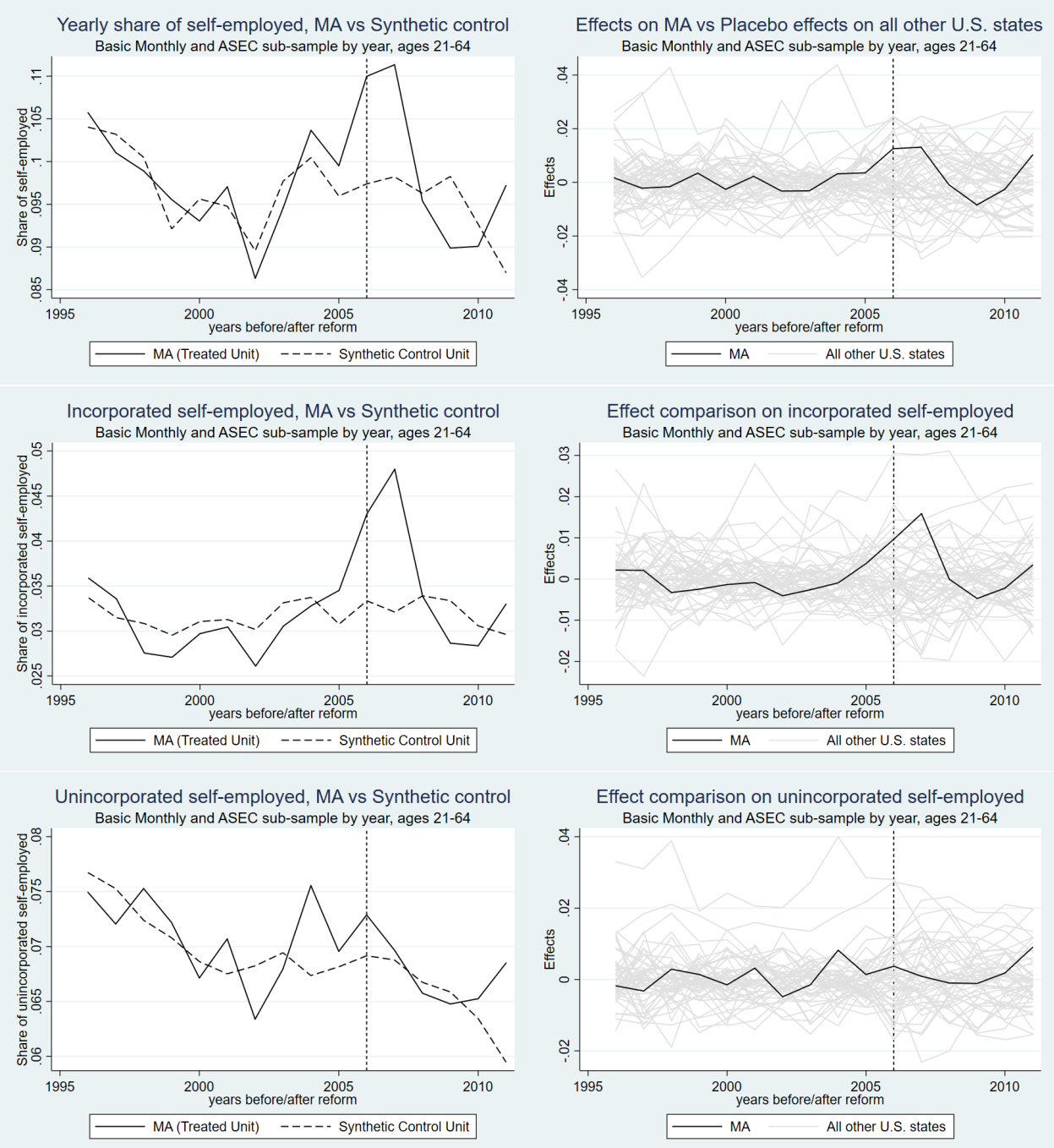


Table A1: Yearly synthetic control estimates of effects of Romneycare on all types of self-employment

| | Basic Monthly and ASEC sub-sample ages 21–64 | |
|---|---|---|
| Panel A: All Self-Employed | Coefficient | RI two sided p-value |
| Mass x During | 0.0130 | 0.240 |
| Mass x After | 0.0022 | 0.920 |
| Panel B: Incorporated Self-Employed | | |
| Mass x During | 0.0115 | 0.120 |
| Mass x After | 0.0027 | 0.560 |
| Panel C: Unincorporated Self-Employed | | |
| Mass x During | 0.0027 | 0.720 |
| Mass x After | 0.0019 | 0.880 |

Notes: Yearly data for the years 1996–2011 has been used. The predictor variables included in the synthetic control model are GDP growth, sex, nonwhite, hispanic, urban, age, and proportions of population in each of the four education, four occupation, seven industry and six marital status categories. The BM and ASEC sub-sample 21–64 is constructed by dropping military, agricultural and farm workers from the sample of 21–64 year old individuals in both the Basic Monthly and ASEC files of the CPS.

The "before" period is defined as the months prior to May 2006, the "during" period as the months between May 2006 and June 2007 (inclusive), and the "after" period as the months after June 2007

***p<0.01, **p<0.05, *p<0.10

Table A2: Yearly synthetic control estimates of effects of Romneycare on all types of self-employment by gender

| | Basic Monthly and ASEC sub-sample 21–64 | | | |
|---|---|---|---|---|
| | Male | | Female | |
| Panel A: All Self-Employed | Coefficient | RI two sided p-value | Coefficient | RI two sided p-value |
| Mass x During | 0.0190 | 0.240 | 0.00589 | 0.600 |
| Mass x After | 0.0029 | 0.680 | 0.00744 | 0.320 |
| Panel B: Incorporated Self-Employed | | | | |
| Mass x During | 0.0139 | 0.160 | 0.0070 | 0.200 |
| Mass x After | -0.0014 | 1.000 | 0.0060 | 0.280 |
| Panel C: Unincorporated Self-Employed | | | | |
| Mass x During | 0.0120 | 0.400 | -0.0014 | 0.800 |
| Mass x After | 0.0099 | 0.320 | 0.0035 | 0.600 |

Notes: Yearly data for the years 1996–2011 has been used. The predictor variables included in the synthetic control model are GDP growth, sex, nonwhite, hispanic, urban, age, and proportions of population in each of the four education, four occupation, seven industry and six marital status categories. The BM and ASEC sub-sample 21–64 is constructed by dropping military, agricultural and farm workers from the sample of 21–64 year old individuals in both the Basic Monthly and ASEC files of the CPS.

The "before" period is defined as the months prior to May 2006, the "during" period as the months between May 2006 and June 2007 (inclusive), and the "after" period as the months after June 2007

***p<0.01, **p<0.05, *p<0.10

# Replication of Niu (2014)

The following table presents a replication exercise of Niu (2014). Column (1) shows the actual estimates from Niu (2014) while column (2) shows the replication results. Column (3) shows the replication results with the sample used in this study, which is a preferable sample.

Table A3 : DID estimates of the effect of Romneycare on self-employment in MA with rest of U.S. as control

| | Niu (2014) | Niu replication | BM and ASEC sub-sample, 21-64 |
|---|---|---|---|
| | (1) | (2) | (3) |
| Effect of Romneycare on self-employment | | | |
| During | -0.0020 * | -0.0017 | -0.0014 |
| | (0.0011) | (0.0013) | (0.0014) |
| After | -0.0026 * | -0.0025 * | -0.0029 |
| | (0.0013) | (0.0014) | (0.0021) |
| MAxDuring | 0.0121 *** | 0.0117 *** | 0.0070 *** |
| | (0.0021) | (0.0019) | (0.0020) |
| MAxAfter | 0.0071 *** | 0.0071 *** | 0.0047 ** |
| | (0.0023) | (0.0019) | (0.0021) |
| Sample size | 10,950,187 | 10,742,252 | 12,448,712 |
| R square | 0.0832 | 0.0888 | 0.0651 |

Notes: Niu (and Niu replication) estimates are based on the Current Population Survey (CPS) Basic Monthly (BM) files from January 1995 to December 2011. The sample includes civilians from 25–54 years old. Specifications include age, age squared, gender, marital status, race, Hispanic status, veteran status, urbanity, education, occupation, industry, state GDP growth rate, calender-month fixed effects, year fixed effects and state fixed effects. In column (3), military personnel, farm workers, people out of the labor force and disabled workers have been dropped. Also, individuals aged 21-64 have been used. Robust standard errors clustered at the state level have been used. The control group for the difference-in-difference estimation is the rest of the United States, which consists of all other states of the United States except for Massachusetts and Hawaii. The estimates are weighted by the respective BM and ASEC weights provided by CPS.

The "before" period is defined as the months prior to May 2006, the "during" period as the months between May 2006 and June 2007 (inclusive), and the "after" period as the months after June 2007

***p<0.01, **p<0.05, *p<0.10

The following table shows that the significance of the coefficients obtained in Niu (2014) become insignificant when the inference test is done by randomization as opposed to robust standard errors clustered at the state level.

Table A4: Effect of MA health reform program on self-employment, comparison of cluster robust standard error and randomization inference p-values

| BM full sample, ages 25–54 (Niu replication) | Coefficient | CRSE p-values | RI p-values |
|---|---|---|---|
| Effect on self-employment | | | |
| MA x During | 0.0117 | 0.000 | 0.160 |
| MA x After | 0.0071 | 0.001 | 0.200 |
| No of obs | 10,742,252 | | |
| BM and ASEC sub-sample ages 21-64 | | | |
| Effect on self-employment | | | |
| MA x During | 0.0070 | 0.001 | 0.360 |
| MA x After | 0.0047 | 0.033 | 0.440 |
| No of obs | 12,448,712 | | |

Notes: Two sided RI p-values are obtained as twice the ratio of the rank of the effect of the reform in MA among all the other placebo effects of the other states to the total number of available treatment and control units.

***p<0.01, **p<0.05, *p<0.10

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# Chapter 2

# Italian MDs' location choices: A Stated Preference Experiment

## 2.1 Introduction

The term "brain drain" refers to the emigration of high-skilled workers (usually individuals with a college degree (Docquier and Marfouk, 2006)) from their home country to a foreign nation in search of better jobs and other social opportunities. For many decades, economics research has primarily focused on the brain drain of the high-skilled workers from developing countries to developed countries. The earliest theoretical papers on brain drain express a neutral opinion on international migration of high-skilled workers and highlight the benefits of free labour movement to the world economy (Grubel and Scott, 1966; Johnson, 1967). An alternative school of thought is of the view that brain drain affects the developing source country negatively by getting rid of the best and the brightest, and also contributes to the increasing inequality between rich and poor nations (Bhagwati and Hamada, 1974; McCoulloch and Yellen, 1977). Recent empirical evidence, however, shows that the international migration of high-skilled can promote higher educational attainment in developing countries and foster business creation by returning migrants (Beine et al., 2011; Batista et al., 2012; Docquier and Rapoport; 2012). The literature on high-skilled emigration from middle-income and developed countries is much more scarce and new in comparison. Issues like the mass exodus of PhD holders and researchers in science and technologoly from Europe to the U.S. (Docquier and Rapoport, 2012), the brain drain from southern European countries like Italy, Spain and Greece hit hard by the financial crisis of 2008 (Theodoropoulos et al., 2014; Anelli and Peri, 2017) and large scale migration from eastern to western Europe due to free labour mobility provisions since the accession of the European Union (Mayr and Peri,

2009) have received great attention lately. This paper contributes to this growing body of literature by studying the special case of brain drain of medical doctors from Italy to foreign countries.

More than 18,000 Italian health professionals left Italy to work abroad between 2005 and 2015, the most popular destinations being the United Kingdom (33%) followed by Switzerland (26%). Most emigrants are young, in the age range of 28-39 and the northern Italian region of Veneto saw the highest emigration rate. One of the contributing factors for this emigration of physicians is a bottleneck for specialisation spots in Italy. Although, there are about 10,000 medical students graduating every year, there are only about 5,000 seats for specialisation. This large scale emigration of Italian MDs has fiscal implications - it costs Italy an estimated €150,000 to train a medical student and €350,000 to train a surgeon and it may be the foreign countries mostly benetting from these investments. It also raises important concerns aboout the sustainability of the Italian healthcare system. It is estimated that 38,000 doctors (45,000 including general practitioners) will retire by 2025 (The Local News Report, 2019)[1] and Italy will be short 16,700 medical specialists by 2025 if the current trend continues (Paterlini, 2019). Regional health care authorities have urged the Italian government to allow them to recruit retired doctors and retain those who are working until they are 70.[2] The recent Covid-19 crisis has revamped the political attention on the consequences of this shortage. In the absence of high quality secondary data on migration intentions and outcomes, and of (quasi) experimental variation of physician job characteristics in Italy and abroad, we perform a Discrete Choice Experiment (DCE) with medical students at the University of Padova in Italy for generating such data and we study the relationship between physician job characteristics and emigration preferences. A DCE is a survey experiment where respondents are presented with a series of hypothetical but realistic choice sets (job choices in this case) with each alternative described by a bundle of attributes. Respondents are then asked to choose their most preferred option which subsequently allows for the inference of trade-offs between job attributes. In our DCE, each student chooses their most preferred job sixteen times between two hypothetical jobs that vary in terms of 6 attributes - professional development opportunity, income, job security, working conditions, match of skill with job requirements and country of the job. Respondents trade off these job attributes by choosing one of the two jobs or opting out from either in each of the sixteen hypothetical scenarios.[3]

Our findings can be summarized as follows. First, we find that students are willing to give up €11,657 on average to stay in Italy. There is, however, large heterogeneity behind this mean value: 18% of the students are willing to pay an average of €6,758 to go to their favorite foreign European country. We collect data on a wide range of socio-demographic, cognitive and non-cognitive characteristics of the students. We

[1] https://www.thelocal.it/20190201/italy-loses-ten-thousand-doctors-in-ten-years-to-emigration/

[2] https://www.ansa.it/canale_saluteebenessere/notizie/sanita/2019/02/01/diecimila-medici-via-dallitalia-in-dieci-anni_2e1f4dbb-4a37-42cc-bbbb-c75dd90ca623.html

[3] They actually face seventeen hypothetical scenarios where one of the scenarios is a test of rationality where one job strictly dominates the other. We drop the students who fail this rationality test.

find that younger students (those in the second and third years of med school), students who do not want to specialize at the Univeristy of Padova and students who have personal ties in their favorite European country are more predisposed to moving abroad. In terms of personality traits, we find that students with higher levels of internal locus of control, lower levels of external locus of control, higher willigness to take risks and higher levels of altruism are more inclined to move abroad. This is consistent with previous literature that find an increased likelihood of migration among people with higher self-assessed risk and higher internal locus of control (Jaeger et al., 2010; Caliendo et al., 2019). Second, we find that students trade off job location against other job attributes, i.e., their willingnesses to pay (WTPs) for job features are significantly different between Italy and abroad. Specifically, they care for good personal development opportunities more in Italy than abroad. They also have a very high WTP for permanent contracts in Italy and for temporary contracts with renewal possibility abroad. We also find that they do not like lacking skills for the jobs abroad but don't mind it in Italy.

## 2.2 Related literature

Our study is related to many different branches of economic literature. First, it is related to the growing body of research that studies the effect of emigration from developed countries. Docquier and Rapoport (2012) document that high-skill emigration from Europe to the U.S. is strongly biased towards workers with top qualifications like PhD holders and researchers employed in science and technology. They explain that this mass exodus is primarily due to low investments in research and development in European countries that translate into low wages and unattractive jobs for scientists based on results from opinion surveys of European researchers and previous research (Tritah, 2008). We contribute to this literature by offering a special case study of the emigration of Italian doctors.

Second, our study is related to the literature on physician emigration. African countries are one of the largest suppliers of medical doctors into developed countries and numerous papers study the causes and effects of this brain drain. Awases et al. (2003) survey physicians in six African countries and find that 50 percent of them desired to move abroad to get access to better wages, lifestyles and working conditions with a decreased risk of caring for HIV/AIDS patients. There is evidence that the high scale emigration of African doctors does not create a shortage of doctors in Africa due to the positive effect of emigration on enrollment to medical schools (Clemens, 2007; Bhargava, Docquier and Yasser, 2011). However, this brain drain has been found to be associated with significant deterioration of child health indicators and increase in adult deaths from AIDS suggesting that it is the most talented physicians that emigrate abroad (Clemens, 2007; Bhargava and Docquier, 2008). Our present study, however, focuses on the determinants of physician emigration rather

than the consequences. Existing studies which investigate the determinants of physician brain drain look mostly at macro level push and pull factors of emigration. Botezat and Ramos (2020) estimate a gravity model of migration flows using the 2000-2016 Organisation of Economic Co-operation and Development (OECD) health worker migration module and find that the main drivers of physician emigration include lower unemployment rate, good remuneration of physicians, an aging population and a high level of medical technology at the destination countries. Adovor et al. (2020) identify economic characteristics at source and destination countries, dyadic factors like linguistic and geographical proximity and lax immigration policies towards high-skilled immigrants to be significant determinants of physician brain drain. Our study, on the other hand, contributes to this literature by investigating micro level determinants like the job characteristics that physicians weigh in their home country versus abroad while making migration decisions. Our findings deliver policy implications for designing jobs to help retain physicians in the source country and for designing incentives to capture back the ones already emigrated.

We also make contributions to the very limited literature on how non-cognitive abilities determine migration. Jaeger et al. (2010) finds that individuals in the German Socioeconomic Panel with higher self-assessed risk attitudes are more likely to migrate. Bütikofer and Peri (2020) use military enlistment data of 20 year old Norwegian men to show that higher adaptability levels predict a higher likelihood of international migration over one's lifetime. Caliendo et al. (2019) find that individuals with an internal locus of control show a higher propensity to migrate internally across domestic labour markets. Our results on the effects of non-cognitive abilities on the international migration of physicians are consistent with these findings, and we also present additional novel results on the significance or lack thereof on many different non-cognitive characteristics.

There are papers in the medical migration literature that use DCEs to answer questions about job characteristics that are most important to doctors. A branch of DCE studies are dedicated to the retention of medical workforce in rural areas (Rockers et al., 2012; Gallego et al, 2015). Some DCEs also explore job characteristics that attract medical students to certain specialities (Sivey et al., 2012; Mandeville et al., 2016) or jobs (Cleland et al., 2017). Although these DCEs are informative about the relative importance of job characteristics to doctors and other health professionals, to our knowledge, there are no DCEs that explore how the relative preferences of job attributes change by home and foreign countries. In other words, the existing DCE literature does not use country as one of the attributes that define a job and thus does not explicitly answer how valuations of different job characteristics change by home and foreign countries. Thus, we contribute to the DCE literature as well with a novel experimental design that captures job attribute valuation heterogeneities by home and abroad and also willingness to pay estimates for staying back in the home country or going abroad to a desirable foreign country.

## 2.3 Methods

### 2.3.1 Data

We conducted an online survey (in Italian) with second to sixth year medical students at the University of Padova. The online questionnaire consisted of two parts. In the first part, we asked them to choose their favorite foreign European country. While making this choice, they were instructed not to think about the aspects of the work they would like to do in this country (such as wages, working conditions, training and research opportunities etc.) , but other aspects of the country that attract them (such as climate, culture, the functioning of institutions, etc.). They were asked to keep this choice in mind while completing the 17 choice tasks for the DCE that followed where they had to choose between two hypothetical jobs each time. An opt-out option was also included, and the selection of this option signifies that neither of the job offers meets the student's reservation level of utility. It is to be noted that in one of these choice sets, one job option strictly dominated the other. This was included as a check for whether the student was paying sufficient attention while participating in the experiment and/or whether the student understood the instructions provided to complete the DCE tasks. Students who did not select the strictly dominant job option were excluded from the final sample. The second part of the questionnaire collected information on the socio-demographic and personality characteristics of the students. We used three different versions of the questionnaire that varied on the basis of the order of the presented attributes within each DCE choice set. Whenever a student clicked the link to enter the experiment, they were randomly assigned to any one of the three versions. This was done to even out any possible effects from the order of appearance of the job attributes in the choice sets. We have usable data on 162 Italian medical students who want to go for further specialisation. Since each respondent has to complete 16 job scenarios and there are 3 possible responses – Job A, Job B and opt-out, this implies a total of $162 \times 16 \times 3 = 7,776$ observations. We outline the experimental design of the DCE and the measurement of the personality characteristics in the following sub-sections. Descriptive statistics on social-demographic characteristics are presented in Table 3.

### 2.3.2 Discrete Choice Experiment

A Discrete Choice Experiment is a stated preference method used to elicit individuals' preferences for alternatives. These alternatives (jobs, in this case) are defined on the basis of attributes and unique alternatives are formed by varying the attributes. The respondents are then posed with multiple scenarios where they have to choose between two (or more) alternatives each time. The resulting observations can then be used to determine the relative importance of these attributes and how people trade-off between them. One of

these attributes, usually is a continuous monetary or time variable which allows the researcher to calculate measures like Willingness to Pay (WTP) or Willingness to Wait (WTW). DCEs are based on two key theories – Lancaster's characteristic theory of value and the random utility theory (RUT) (Cleland, Porteous and Skåtun 2018). The characteristic theory of value says that individuals obtain utility or value from the characteristics (attributes) that make up the good. Thus, if a good has $K$ attributes, and $X_k$ represents the utility derived from the $k$th attribute (where $k = 1, 2, \ldots K$), then, the utility function of the individual can be written as:

$U = U(X_1, X_2, \ldots X_K)$

The RUT says that individuals make choices based on both observable and unobservable factors. Thus, the utility function of individual $n$ choosing alternative $j$ out of $J$ alternatives can be represented as:

$U_{nj} = V_{nj} + \varepsilon_{nj}$ ,

where $j = 1, 2, \ldots J; V$ is the observable part and $\varepsilon$ is the unobservable random component of the utility function. We decided on the attributes and levels from previous literature on specialty choice as well as literature on retention of medical staff in rural areas which inform the comprehension of job attributes that are important to doctors. We also had detailed discussions with medical students who were student representatives from the fifth and sixth years of the medical school at the University of Padova for the consideration and eventual settlement upon these attributes. Table 2 shows the attributes considered in the DCE along with their corresponding levels.

Professional development opportunity is an important indicator of the intellectual content and learning opportunities in the job. Multiple studies have provided evidence that the intellectual content of the job is an important determinant of specialty choice (AMWAC, 2005; Horn et al., 2008). We included 3 different levels of this attribute – limited, some and good in order to capture a wide range of scenarios. Income is the numeraire variable which allows for the calculation of the marginal WTP for changes in the levels of all the other attributes that have been considered. In other words, we can deduce how much income a student is willing to sacrifice as they go from one level of an attribute to a more preferred level. We presented Purchasing Power Parity (PPP) adjusted net income levels and instructed the students that if the work refers to a foreign country where the cost of living is higher (lower) than in Italy, they should assume to earn proportionally more (less) in order to maintain their purchasing power equal to what they would have in Italy with that sum. We also asked them to assume that the salary is representative for the first two years after the starting of the job and would increase at 5% every 2 years thereafter. As for the decision of the actual income levels, we obtained OECD (2019) data on the average specialist's income levels in 23 European countries. After adjusting for PPP between Italy and the other European countries, we observed the average Italian doctor's salary to be about €45,500 per year. The lowest was Norway, with an average

salary of €31,600 and the highest was Belgium with €115,400 per year. The limitation with the OECD data is that they do not represent starting salaries of medical school graduates immediately after finishing their specialisations. They include income earned from private practice which is not a part of their job contracts and they also do not represent income heterogeneities from years of experience after graduation which is a significant determinant of yearly income earnings. A recent policy brief out of Bocconi University (Anello, 2019) that used more detailed Social Security (INPS) data shows an upward trajectory of gross income that starts at about €24,000 3 years after graduating from medical school and goes up to about €95,000 20 years after graduation in Italy. The average income 7 years after graduation is about €40,000. Since 7 years is the average length of time required by medical students to complete a specialisation and start working after graduation, we think this is a good representation of a starting gross income offer for an average specialist in Italy. The average gross income of a specialist, under the assumptions of constant cohorts each year, a 35-year career after graduation and a flat income profile 20 years after graduation is about €60,000-€70,000 at the 13-14-year mark after graduation. Thus, we see that one needs to deduct roughly a third from the average salary of a doctor at the mid-point of his career to arrive at the starting job offer of €40,000. In the absence of better data regarding the starting salaries of specialists in the different European countries, we use this principle to deflate the average salaries found in the OECD data to arrive at reasonable starting salaries offered to newly specialized doctors. Thus the lower bound of €20,000 represents the starting salary of a doctor in a country like Norway with an average doctor's salary of about €30,000 and the upper-bound of €75,000 that of a country like Luxembourg or Belgium with the average doctor's salary of about €115,000. The salary levels in between are also representative of the starting salaries in many European countries (assuming the one-third deflation principle) like Czech Republic, Finland and the Netherlands where the average doctor earns about €60,000, Austria and Finland with an average doctor's salary of 75,000 and Germany with an average salary of almost €90,000 for the average doctor.[4] Job security is an important attribute that represents the length of the contract offered to the doctor. This attribute can be expected to influence the choice of the doctor not only by itself but also through an interaction effect with the country of work. For example, if the individual wants to work abroad only for a few years for the experience of work and living abroad but wants to settle in Italy in the long term, then the length of the job contract would not be as important to him at the beginning of his career living abroad as compared to having a stable and permanent job in Italy. We include three levels of this attribute – 2-year fixed term contract, 2-year temporary contract with a 50% chance of renewal and a permanent contract. Working conditions or workload is a highly relevant attribute considered by doctors making a job choice and has been used by many studies on specialty choice and medical staff preferences (Kolstad, 2011; Sivey et al., 2012). The two levels of

[4]These salary levels are all PPP adjusted for Italy.

this attribute are high workload with frequent overtime work and nightshifts; and adequate workload with little overtime work and nightshifts. Doctors often have to engage in work that are different from what they specialize in for their jobs and this creates a mismatch between the actual specialized skill of the doctor and the other things which he might need to learn in order to adapt to his job environment. For this reason, we included another attribute called match of skill with job content which has three possible levels – the skills of the doctor are higher than that required by the job, the skills are exactly matched to the job and some of the skills are lower than required by the job and need further development. The final attribute which is the primary focus of this paper for investigating the migration preferences of doctors is the country of work. We restricted the analysis to be within European countries even though many Italian doctors migrate to North American or middle eastern countries as there are severe heterogeneities between these countries. These unobserved characteristics specific to these countries may drive the WTP coefficient estimates and it would be hard to account for the source of these variations. Thus, to make the analysis more tractable, we use only two levels of the country attribute – Italy and the student's favourite European country to live in. Table 1 shows the distribution of the students' favorite European countries. A full factorial design using these six attributes and their defined levels would lead to $(2^2 \times 3^3 \times 6) = 648$ different job profiles and ${}^{648}C_2 = 209,628$ possible choices between any two jobs. Since this is clearly not feasible to be implemented, we used a D-efficient design to restrict the number of choice sets to 16. A design is referred to as more "efficient" when it has smaller standard errors of the estimated model parameters. The efficiency of a design can be improved even before undertaking a survey by assuming prior parameter estimates and estimating an asymptotic variance-covariance (AVC) matrix of these parameter estimates (usually by simulation methods, but analytical methods can also be used). The D-error is given by $det(\Omega)^{1/K}$ where $\Omega$ is the AVC matrix and $K$ is the number of model parameters to be estimated. A D-efficient design is the design that minimizes the D-error. We obtained the D-efficient design by specifying the most complex version of our models that we were interested in estimating which included up to a cubic income term, interaction between country and job security and interactions between country and income polynomials up to the third degree. We conducted a pilot survey with senior medical students and agreed that the 17-choice set module with 16 efficient design choice sets and one strictly dominant choice set for quality check would not be cognitively fatiguing for the average student.

### 2.3.3 Measurement of personality characteristics

We collect detailed information on the socio-demographics of the students like age, gender, specialisation area of interest, GPA, whether they have a partner, whether they have done an Erasmus program, family income,

parents' occupations etc. We have also collected the following personality characteristics all collected on a five-point scale where 1 indicates "strongly disagree" and 5 indicates "strongly agree":

*Self-Efficacy*: We use three questions from Chen et al. (2011):

1. I will be able to achieve most of my goals that I have set for myself
2. Compared to other people, I can do most tasks very well
3. I try to avoid competition with others (reversed)

The original scale consists of 14 items. However, following Non et al. (2019) we use the three items as they did to reduce survey length. Non et al (2019) exploit data collected on the full scale from university students (N=240) in a separate, unrelated laboratory experiment and select three items that jointly have the highest correlation with the full scale (0.94 for the three mentioned items).

*Competitiveness*: We use three items from the Revised Competitiveness Index, which is again, a 14-item scale and three items have been chosen using the same methodology mentioned above as in Non et al. (2019):

1. I try to avoid competition with others (reversed)
2. I don't like competing against other people (reversed)
3. I like competition

*Locus of control*: We use a six-item scale as described in Lumpkin et al. (1985)

1. When I make plans, I'm almost sure that I'm going to make them work
2. Getting people to do the right thing is a matter of skill, luck has nothing to do with it
3. What happens to me depends only on my choices
4. Many of the sad things in people's lives depend in part on bad luck
5. Getting a good job mostly depends on being in the right place at the right time
6. Many times, I feel that I have little influence on the things that happen to me

*Big-5 personality traits*: We use an 11-item scale as used in the Survey of Health, Ageing and Retirement in Europe (SHARE). I see myself as a person...

1. ... reserved
2. ... who usually trusts
3. ... who usually tends to be lazy
4. ... relaxed, who handles stress well
5. ... who has few artistic interests
6. ... extroverted, sociable
7. ... who tends to be laughed at by others
8. ... who works accurately
9. ... who gets nervous easily

10. ... who has an active imagination

11. ... caring and kind to almost everyone

*Intrinsic and extrinsic motivation*: We framed the following 7 questions after a detailed literature review on intrinsic and extrinsic motivation (Ryan and Deci, 2000; Kingston et al., 2006 Tung et al., 2019) What is your motivation for becoming a doctor?

1. Sense of calling
2. Personally rewarding work
3. For doing well to others
4. Intellectual curiosity
5. Financial rewards
6. Social status
7. Family tradition
8. Others: Please specify_____

*Risk attitude*: We used the following four items as used by the MABEL survey: Please indicate your willingness to take risks... (1 representing "not at all willing" and 5 "very willing")

1. ...in general
2. ...in the financial sector (e.g. investing with uncertain results)
3. ... professionally (e.g. publicly doubting a colleague)
4. ... clinically (e.g. recommending controversial treatment)

*Altruism*: We used the following two questions from Falk et al. (2016)

1. "Are you inclined to donate to a good cause without expecting anything in return?" (1 represents "not at all inclined" and 5 "very inclined")

2. "How much would you be interested in working as a doctor in a developing country?" (1 representing "not at all interested" and 5 "very interested")

3. Suppose you unexpectedly received €1,000. How much would you give to charity? We framed a third question to see the extent to which the respondent would be willing to go to a developing country. Going to a developing country generally entails giving up on creature comforts and acceptance of lower income compared to a developed country and could thus capture aspects of altruism which might not necessarily be captured by the above two questions. We, however, did not use it in our final atruism construction due to a scale mismatch with the other two questions.

Finally, we also asked a question to see how much the Covid-19 pandemic affected the students' decision to move abroad. We used the following question: What was the impact of the Covid-19 epidemic on your choice to moving abroad?

- No impact
- Everything else equal, now I have a stronger preference to stay in Italy
- Everything else equal, now I have a weaker preference to stay in Italy

## 2.4 Econometric Framework

We analyze the DCE data using a mixed logit model. We utilize the random utility framework where individual $i$ obtains utility from choosing a job alternative $j$ in a choice set $t$. Thus, the utility function of the individual can be represented as:

$$U_{ijt} = ASC + \alpha_i Income_{ijt} + X_{ijt}\beta_i + \varepsilon_{ijt} \tag{2.1}$$

where $i = 1.2, ..162$; $t = 1, ..16$; $j = 1, 2, 3$. $ASC$ is the alternative specific constant that captures the mean value of the error term $\varepsilon_{ijt}$. $X_{ijt}$ is a vector of non-monetary job attributes which are personal development opportunity, job security, working conditions, match of skill with job content and country of the job whereas $\beta_i$ is a vector of individual level parameters attached to these job attributes. This form of representation is called modelling in a "preference space". The separation of the income attribute from the other attributes in the equation is for ease of representation. We are primarily interested in the calculation of willingness-to-pay (WTP) of the non-monetary job attributes which are given by:

$WTP_A = -MRS_{A,Income} = \frac{\beta_{i,A}}{\alpha_i}$

where $A$ represents the above mentioned non-monetary job attributes and $Income$ is the numeraire used for the calculation of these WTPs.

A mixed logit model overcomes many of the limitations of the standard logit model like the assumptions of independence of irrelevant alternatives and identically and independently distributed errors by estimating individual level parameters. However, it requires the parametric imposition of distributions for the parameters to be estimated. The standard practice is to assume a normal distribution for each of the non-monetary attributes and keep the income parameter constant. That implies that the WTPs would simply follow normal distributions. However, this can be a strong assumption in case the income parameters are highly heterogeneous in reality. An alternative practice is to assume a log-normal distribution for the parameter attached to income which is done to avoid getting unralistic negative values of the parameter. It, however, requires one to deal with distributional issues of the WTP function which would be a ratio of a normal and a log-normal distribution. Preference space WTP estimates are often also large and unrealistic (Train and Weeks, 2005). A workaround to these limitations of the preference space is to model in a WTP-space. More

specifically, equation (1) is written in terms of attribute WTPs by factoring out the income parameter and distributions are assumed for the WTPs attached to the job attributes instead of the parameters. Thus, we use the WTP-space method of modeling, which can be represented as:

$$\begin{aligned} U_{ijt} &= \alpha_i[Income_{ijt} + X_{ijt}(\frac{\beta_i}{\alpha_i}) + ASC] + \varepsilon_{ijt} \\ &= \alpha_i[Income_{ijt} - X_{ijt}.WTP_i + ASC] + \varepsilon_{ijt} \end{aligned} \tag{2.2}$$

We assume normal distributions for the WTPs of the job characteristics and a log-normal distribution for the income parameter $\alpha_i$. This model estimates individual level WTPs. Therefore, one can estimate first and second order moments like mean and standard deviation (SD) and plot the entire distribution of WTPs for each job attribute which depicts the unobserved heterogeneity between individuals. However, we are also interested in explaining the heterogeneity of the WTPs of the job attributes between the respondents in terms of observable characteristics. We are particularly interested in investigating how WTPs for going abroad change due to observable socio-demographic, cognitive and non-cognitive characteristics that we described in the previous section. To do this, we estimate the following equation:

$$U_{ijt} = \alpha_i[Income_{ijt} - X_{ijt}.WTP_i - WTP_{i0} \cdot Country \times (1 - T_i) - WTP_{i1} \cdot Country \times T_i + ASC] + \varepsilon_{ijt} \tag{2.3}$$

where $Country$ is a dummy variable representing job location. It takes a value of 0 if the location is Italy and 1 if abroad. $T_i$ is a dummy variable representing an observed characteristic of individual $i$. For example, $T_i$ could represent the gender variable "Female" which takes a value of 1 if the individual is a female and 0 if male. We can subsequently estimate the distributions of WTPs for going abroad for both male and female. Thus, this specification allows for heterogeneous distributions across the two groups that $T_i$ represents (for example, male vs female). The caveat of this specification is that the income parameter $\alpha_i$ remains homogeneous in its distribution across the two groups. We, however, adopt this specification to facilitate hypothesis testing of whether the distributions of the two groups represented by $T_i$ are significantly different or not in terms of means and SDs. Finally, we are also interested in seeing how the distributions of WTPs for job characteristics change by job location. How doctors value job characteristics differently by home and abroad has important policy implications as it would help design jobs in Italy to incentivize doctors to stay back or even emigrated doctors to return. For this, we estimate the equation:

$$U_{ijt} = \alpha_i[Income_{ijt} - X_{ijt}.WTP_i - Country \times X_{ijt}.WTP_i' + ASC] + \varepsilon_{ijt} \tag{2.4}$$

where the vector $X_{ijt}$ contains the four job characteristics - personal development opportunity, job security, working conditions and match of skill with job content. The WTP term attached to the $Country \times X_{ijt}$ represents the additional amount of money an individual is willing to sacrifice in order to have a higher level of a job characteristic abroad. We incorporate a job characteristic once at a time in this interaction term and estimate the WTPs by job location for that job attribute each time. Thus, we have a different set of estimates of the $ASCs$ each time which we do not report.

## 2.5 Results

### 2.5.1 Willingness to pay to go abroad

#### Baseline results

Table 4 shows the baseline results of the mixed logit model outlined in equation (2). ASC1 and ASC2 show the mean values of the error terms associated with the Job A and Job B with respect to the opt out option. Italian students have a WTP of -€11,657 to go abroad as compared to the baseline of staying in Italy. This means that they are willing to pay €11,657 every year on average to stay and work in Italy as opposed to going abroad. There is significant heterogeneity due to unobservable factors in this result. Column (2) reports the SDs of the distribution of job attribute WTPs and going abroad has the highest SD of €14,630 amongst all the attributes. This heterogeneity can be classified into two groups of people - those who want to pay to stay in Italy and those who want to pay to go abroad. Figure 1 shows the distribution of the post-estimation individual level WTPs for going abroad. It shows that 82% of the students have a WTP of €15,344 to stay back in Italy and 18% of the students have a mean WTP of €6,758 to move to their favorite European country.

#### Heterogeneity by observed factors

In Figure 2, we show coefficient plots of WTPs to go abroad by groups of observable socio-demographic, cognitive and non-cognitive factors of the medical students obtained from estimating equation (3). The variables in the left panel of the figure are the socio-demographic variables and also the Grade Point Average (GPA) which is the only cognitive measure of the students we have collected. These observed socio-demographic factors are coded in terms of dummy variables that take the value of 1 if it signifies the group implied by the variable name and 0 otherwise. The figure plots the WTP means and their 95% confidence intervals for the groups taking the value of 1 ("Yes") in red and the groups taking the value of 0 ("No") in blue. The WTPs are all in the negative quadrant implying that students are all willing to sacrifice money on average to stay

back in Italy. Of all the variables for which we report WTPs in this panel, the ones that are significant are "Grade 4-6 (vs. 2-3)", "Wants to specialise in Padova" and "Has personal ties in favorite country". Senior students in grades 4-6 have an €8,127 higher WTP to stay in Italy than junior students in grades 2-3. We believe this represents an evolution of preferences over the years in medical school. Students who want to specialise in the University of Padova have a €9,299 higher WTP to stay in Italy compared to those who want to specialise in other Italian or foreign universities. Personal ties is defined by those who have relatives or acquaintances in their favorite foreign European country. Unsurprisingly, we find those with no personal ties to their favorite country to have a €4,998 higher WTP to stay in Italy than those who do.

In the right panel, we plot the WTPs for going abroad by non-cognitive personality traits. The scores of the traits are calculated as the standardised sums of the 1-5 point ratings to the questions asked. The mean WTP coefficient and confidence interval for the students below the median score in the personality trait measures are plotted in blue and those above the median score in red. Those with above median internal locus of control are more predisposed to go abroad with a €5,761 lower WTP to stay in Italy than those below median. This result is consistent with the external locus of control WTPs where students below the median are more likely to emigrate with a €9,320 lower WTP to stay in Italy than those above median. The figure also shows that the students with a higher risk tolerance are more likely to emigrate with a €6,121 higher WTP for going abroad compared to the more risk-averse students. The final trait with a significant difference across groups is altruism. We find that students with above median levels of altruism have a €5,283 higher WTP to go abroad than those below median. We don't find significant effects of any other non-cognitive characteristics that we consider in our analysis like the big 5 personality traits, competitiveness, self-efficiency, intrinsic and extrinsic motivations to become a doctor on the probability of emigration. Our analyses contribute novel findings to the literature in terms of analyzing the effects of a wide variety of personality characteristics on emigration likelihood and bringing to light which of these traits are most important. One surprising result is that individuals with above median GPA are no more likely to emigrate than those with below median GPA unlike some studies which find that individuals with higher cognitive abilities are more likely to emigrate (Malamud and Wozniak, 2012; Molloy et al., 2011). However, it should be noted that our sample is highly homogeneous in terms of cognitive skills as the school of medicine in the University of Padova is a highly esteemed medical school in all of Italy which selects students meticulously on the basis of entrance examinations and previously acquired grades in high school. Thus, we do not expect the respondents to have large variations in terms of cognitive skills. The SDs of the WTPs to go abroad for these classifications of observable characteristics are reported in Appendix Figure 1. The WTP distributions for the classifications with significant mean differences between groups have been shown with Kernel density plots in Appendix Figure 2.

### 2.5.2 Willingness to pay for other job attributes

**Baseline results**

In this subsection, we discuss the WTP estimates for the job characteristics - personal development opportunities, contract, skill match with the job and working conditions as obtained from equation (2) and reported in Table 4. Students have a WTP of €4,760 for having some development opportunities and a much higher WTP of €10,664 for having good development opportunities with respect to the baseline of poor development opportunity jobs. A temporary two-year contract with a 50% renewal chance has the highest valuation of all job attribute levels amongst the students with a mean WTP of €13,225 and €8,857 for that of a permanent contract compared to the reference level of a temporary 2-year job contract with no renewal chance. Our skill match attribute captures how much extraneous work doctors have to do that are not quite exactly related to their field of specialisation. This also captures hospital facilities and staff levels which determine how much doctors will have to adapt to their work environment. We see that students are only willing to pay a relatively small sum of €2,373 to be exactly skill matched to their job. Finally, we see that working conditions is a highly valued attribute and students are willing to pay a high sum of €11,445 to have a job with adequate workload with little overtime work and night shifts as opposed to having a high workload with frequent overtime work and night shifts. We also find a positive and significant coefficient of 0.100 on income which suggests that the probability of choosing a job increases with higher salary. The distributions of these WTPs are visually represented with Kernel density plots in Figure 2.

**WTPs by home and abroad**

We want to investigate the WTPs of the non-monetary job attributes deeper as we want to further our understanding of the unobserved heterogeneities of these attributes, especially the permanent job security attribute which seems to have a wide range of WTPs amongst the students. We believe that dissecting these job attributes into WTPs by home and foreign countries will explain much of these heterogeneties. It will also help us understand how students value certain job characteristics differently between home and abroad. Thus, in Table 5, we report the WTP estimates of job characteristics by Italy and abroad and we also report whether these WTP differences are significant by estimating equation (4). Apart from good working conditions which is valued equally in home and foreign countries, we find significant WTP differences between home and abroad in every job attribute level. We see that development opportunities are highly valued in Italy but not so much in the foreign country. We also see that they have a very high WTP for a temporary job contract with renewal possibility abraod and a high WTP for a permanent job contract in Italy. And finally, we see that they do not mind being low skill-matched to their jobs at home but are really averse to

it in foreign countries. We interpret these results as Italian medical students being averse to permanently settling down in their favorite foreign European country. They are willing to go abroad only for a short period of time to explore the life and work conditions there but are not predetermined to settling there for the long-term. This is an important finding as this can help policy makers design jobs for the retention of doctors in Italy with attractive job features that they do not find in Italy and thus look for abroad.

## 2.6 Discussion

In this study, we investigate the migration intentions of medical students in Italy after finishing their specialisations. In the absence of reliable secondary data on physicians' migration intentions and (quasi) experimental variation in job characteristics in home and foreign countries, we undertake a Discrete Choice Experiment to generate data on the same and we study how emigration decisions are affected by job characteristics. We find that personal development opportunities, job contract terms, skill match with job content, income, working conditions and country of the job are all important job characteristics that medical students consider diligently while evaluating their decision to stay or leave their home country. We estimate the willingness to pays of students for these job characteristics by their home country and their favorite foreign European country. We find that they are willing to pay substantially more for job charcteristics like good personal development opportunities, a permanent contract and exact skill match with the job in Italy than abroad. Yet, we notice a common trend for Italian doctors to emigrate to foreign countries over the years which suggests that they do not find jobs with these desirable characteristics in Italy. At the same time, we find that they have a very big average willingness to pay for a temporary contract with renewal chance abroad and no statistically significant willingness to pay for a permanent contract abroad. This suggests that they do not intend to permanently move abroad while making their job choices. Thus the policy recommendation of this paper is to design jobs with good personal development opportunities, good job security, income and working conditions in Italy. It is also recommended to design jobs in Italy at graduation of medical students that offer them the opportunity to go and work abroad temporarily while somehow binding them to return and continue working in Italy. Policy makers can also consider giving tax breaks upon return to the doctors who have already emigrated to foreign countries in addition to designing desirable jobs. Our paper contributes to several strands of the brain drain literature and makes novel findings in the literature on the effects of non-cognitive abilities on emigration decisions. The finding that students with an internal locus of control, higher risk tolerance and altruism levels are more likely to emigrate suggests that it is the pool of high quality students that emigrate and this leaves behind a relatively inferior pool of doctors in the home country. With the recent occurence of the global Covid-19 pandemic and a projected shortage in medical personnel in Italy

in the near future, this paper offers important guidelines for framing policy in order to retain medical doctors in Italy and also incentivise those who have already emigrated to return.

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# Tables and figures

Table 1: Foreign countries of preference

| Country | % |
|---|---|
| United Kingdom | 25.31 |
| Germany | 17.9 |
| Spain | 12.35 |
| France | 7.41 |
| Switzerland | 7.41 |
| Netherlands | 4.94 |
| Norway | 4.32 |
| Ireland | 3.7 |
| Austria | 3.09 |
| Sweden | 3.09 |
| Belgium | 2.47 |
| Portugal | 2.47 |
| Denmark | 1.85 |
| Greece | 1.23 |
| Croatia | 0.62 |
| Finland | 0.62 |
| Luxembourg | 0.62 |
| Slovenia | 0.62 |
| No. of Obs. | 162 |

Table 2: Attributes and levels used to define job choices

| Job Attributes | Levels |
|---|---|
| Professional development Opportunity | Limited opportunities for further research and training<br>Some opportunities for further research and training<br>Good opportunities for further research and training |
| Income (PPP adjusted) | € 20,000<br>€ 30,000<br>€ 40,000<br>€ 50,000<br>€ 60,000<br>€ 75,000 |
| Job security | 2 year fixed term contract<br>2 year temporary contract with 50% chance of a permanent position afterward<br>Permanent position |
| Working conditions | High workload with frequent overtime work and night shifts<br>Adequate workload with little overtime work and night shifts |
| Match of skill with job content | Your skills are higher than required by the job<br>Your skills are exactly matched to what is required by the job<br>Some of your skills are lower than required by the job and need further development |
| Country | Italy<br>Your most desirable country in the Rest of Europe |

Table 3: Descriptive Statistics

| Variable | Mean |
|---|---|
| Female | 0.519 |
| Veneto* | 0.731 |
| Both parents have secondary educ* | 0.663 |
| Family income above Padova's median | 0.660 |
| Partner | 0.531 |
| Grade 4-6 (vs 2-3) | 0.537 |
| GPA above median | 0.525 |
| Wants to specialise in Padova | 0.488 |
| Clinical (vs.) surgical specialty | 0.574 |
| Ever visited fav. Eur country | 0.704 |
| Knows lang. of fav. country | 0.321 |
| Has personal ties in fav. country | 0.272 |
| No. of respondents | 162 |

* Has 160 respondents

Table 4: WTP estimates from main effects model

| | Mean | SD |
|---|---|---|
| | (1) | (2) |
| ASC1 | -37,036 *** | 3,237 |
| | (2,141) | (1,597) |
| ASC2 | -38,381 *** | 556 |
| | (2,304) | (1,708) |
| Country (Reference level – Italy) | | |
| Abroad | -11,657 *** | 14,630 *** |
| | (1,140) | (1,303) |
| Development Opportunities (Reference level – Poor ) | | |
| Dev. Opp – Some | 4,760 *** | 6,224 *** |
| | (1,414) | (1,603) |
| Dev. Opp – Good | 10,664 *** | 7,094 *** |
| | (1,564) | (1,892) |
| Contract (Reference level – Temporary) | | |
| Contract: 2y – 50% renew | 13,225 *** | 4,772 ** |
| | (1,280) | (2,087) |
| Contract: Permanent | 8,857 *** | 14,033 *** |
| | (1,803) | (1,810) |
| Skill match with job (Reference level – Higher than needed) | | |
| Skills – Exactly matched | 2,373 * | 5,063 *** |
| | (1,383) | (1,920) |
| Skills – Some lower | 1,798 | 5,770 *** |
| | (1,268) | (2,186) |
| Working conditions (Reference level – Poor) | | |
| Working conditions – Good | 11,445 *** | 8,974 *** |
| | (1,140) | (1,186) |
| Income (coefficient) | 0.100 *** | 0.052 *** |
| | (0.008) | (0.004) |

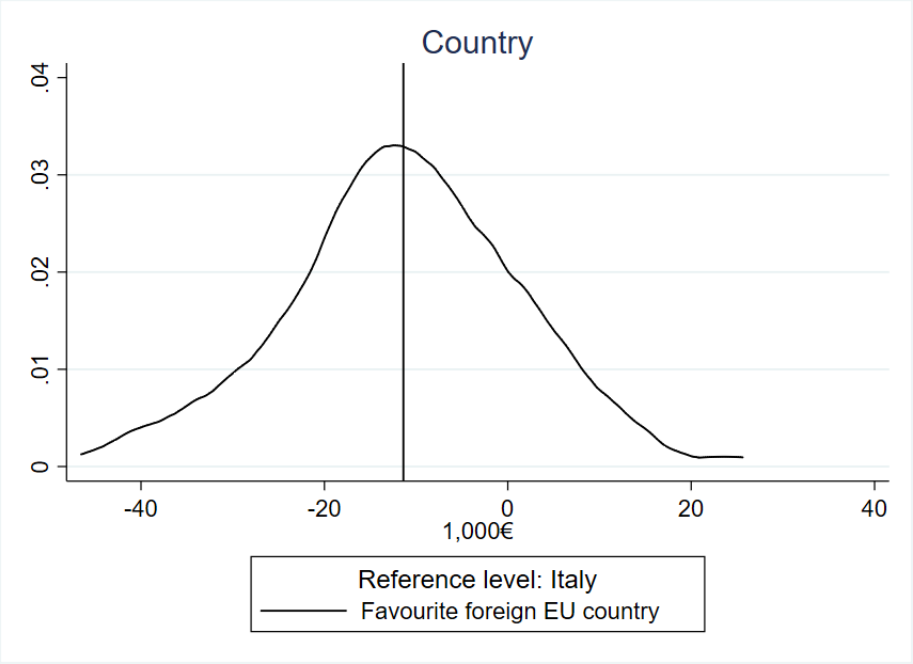
*Notes: This table reports estimates obtained from equation (2).*
*Standard errors in parentheses. * p<.10, ** p<.05, *** p<.01*
*Abbreviations: ASC1 and ASC2: Alternative specific constants of Job A and JoB respectively. SD: standard deviation*

Table 5: WTP estimates by home and abroad

| | Italy<br>(1) | Abroad<br>(2) | Difference<br>(3) |
|---|---|---|---|
| Development Opportunities (Reference level – Poor ) | | | |
| Dev. Opp – Some | 11,934 *** | 677 | -11,257 *** |
| | (2,355) | (2,414) | (3,685) |
| Dev. Opp – Good | 14,991 *** | 4,937 ** | -10,054 *** |
| | (2,260) | (2,217) | (3,599) |
| Contract (Reference level – Temporary) | | | |
| Contract: 2y – 50% renew | 4,821 ** | 23,026 *** | 18,205 ** |
| | (1,982) | (2,105) | (3,175) |
| Contract: Permanent | 12,891 *** | -113 | -13,004 *** |
| | (2,225) | (3,044) | (4,189) |
| Skill match with job (Reference level – Higher than needed) | | | |
| Skills – Exactly matched | 4,879 ** | -1,473 | -6,351 * |
| | (2,350) | (2,516) | (3,713) |
| Skills – Some lower | 8,202 *** | -5,949 ** | -14,150 *** |
| | (2,266) | (2,546) | (4,089) |
| Working conditions (Reference level – Poor) | | | |
| Working conditions – Good | 11,169 *** | 11,195 *** | 26 |
| | (2,024) | (2,042) | (3,504) |

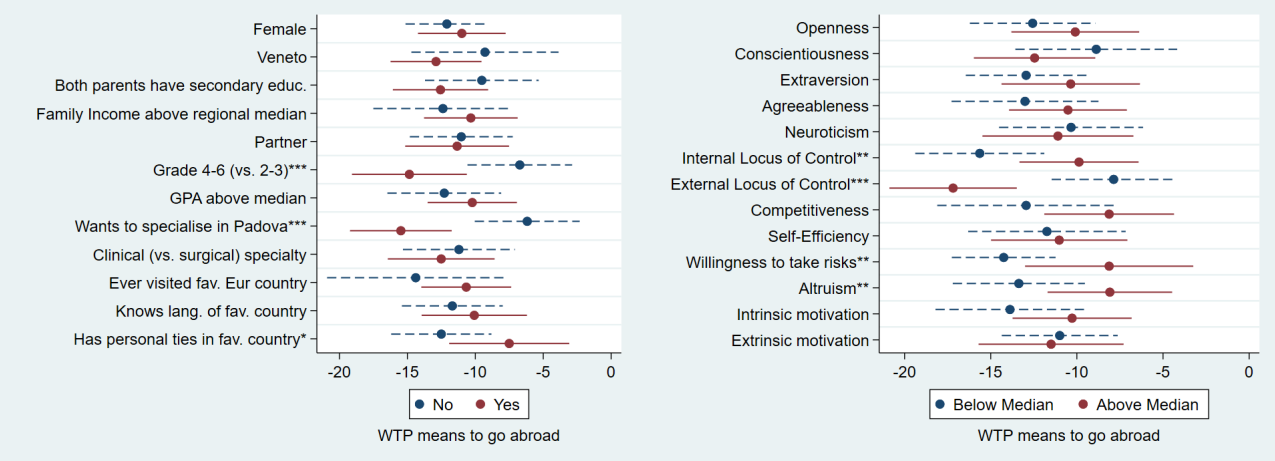
*Notes: This table reports estimates obtained from equation (4).*
*Standard errors in parentheses. * p<.10, ** p<.05, *** p<.01*
*Abbreviation: SD: standard deviation*

Figure 1: Kernel density plot of the WTP distribution for going abroad



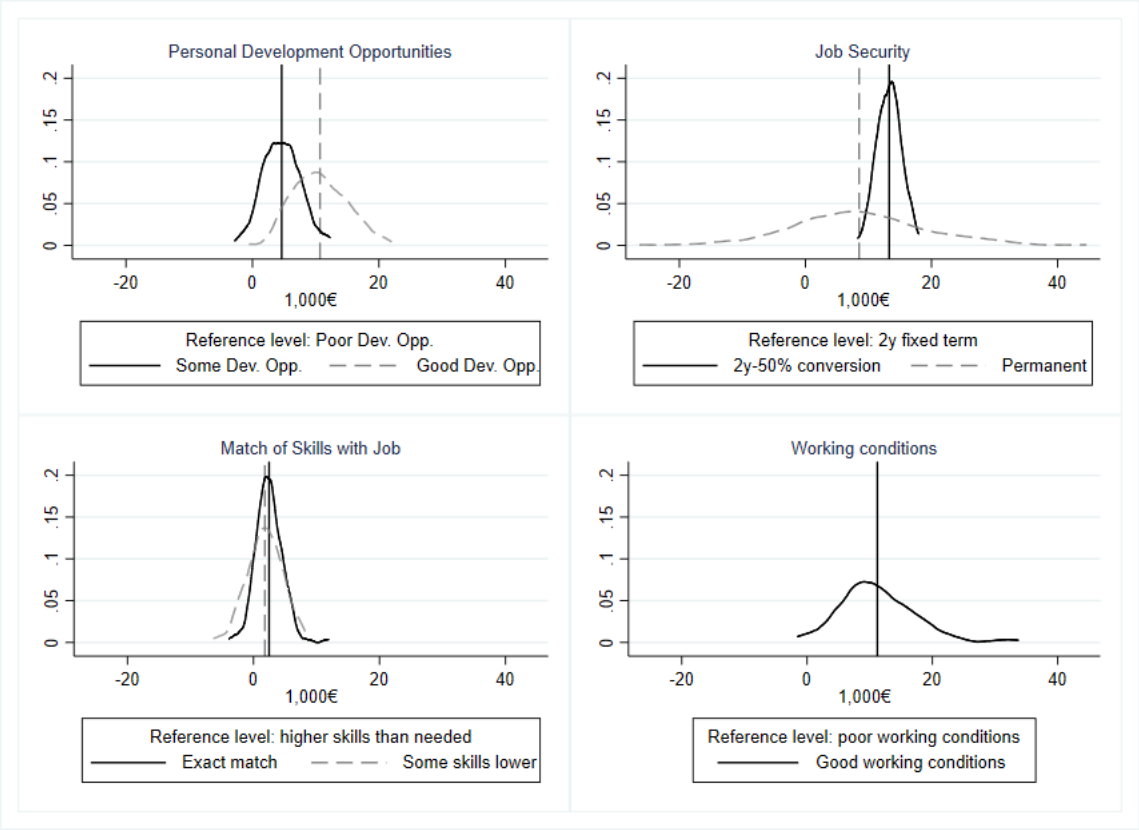

*Note: Individual level parameter estimates for this plot have been obtained from the mixed logit model in equation (2)*

Figure 2: Mean WTPs and their 95% confidence intervals to go abroad by individual characteristics




*Note: Estimates for this plot have been obtained from the mixed logit model in equation (3)*

Figure 3: Kernel density plots of WTP distributions for non-monetary and non-geographic job characteristics




*Note: Individual level parameter estimates for this plot have been obtained from the mixed logit model in equation (4)*

# Appendix

Figure 1: WTP SDs and their 95% confidence intervals to go abroad by individual characteristics

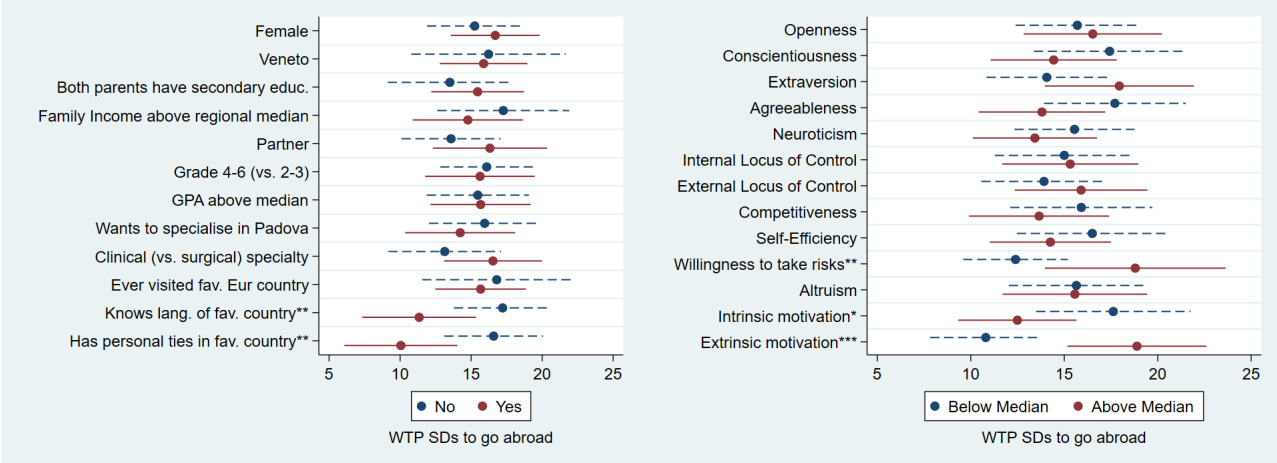
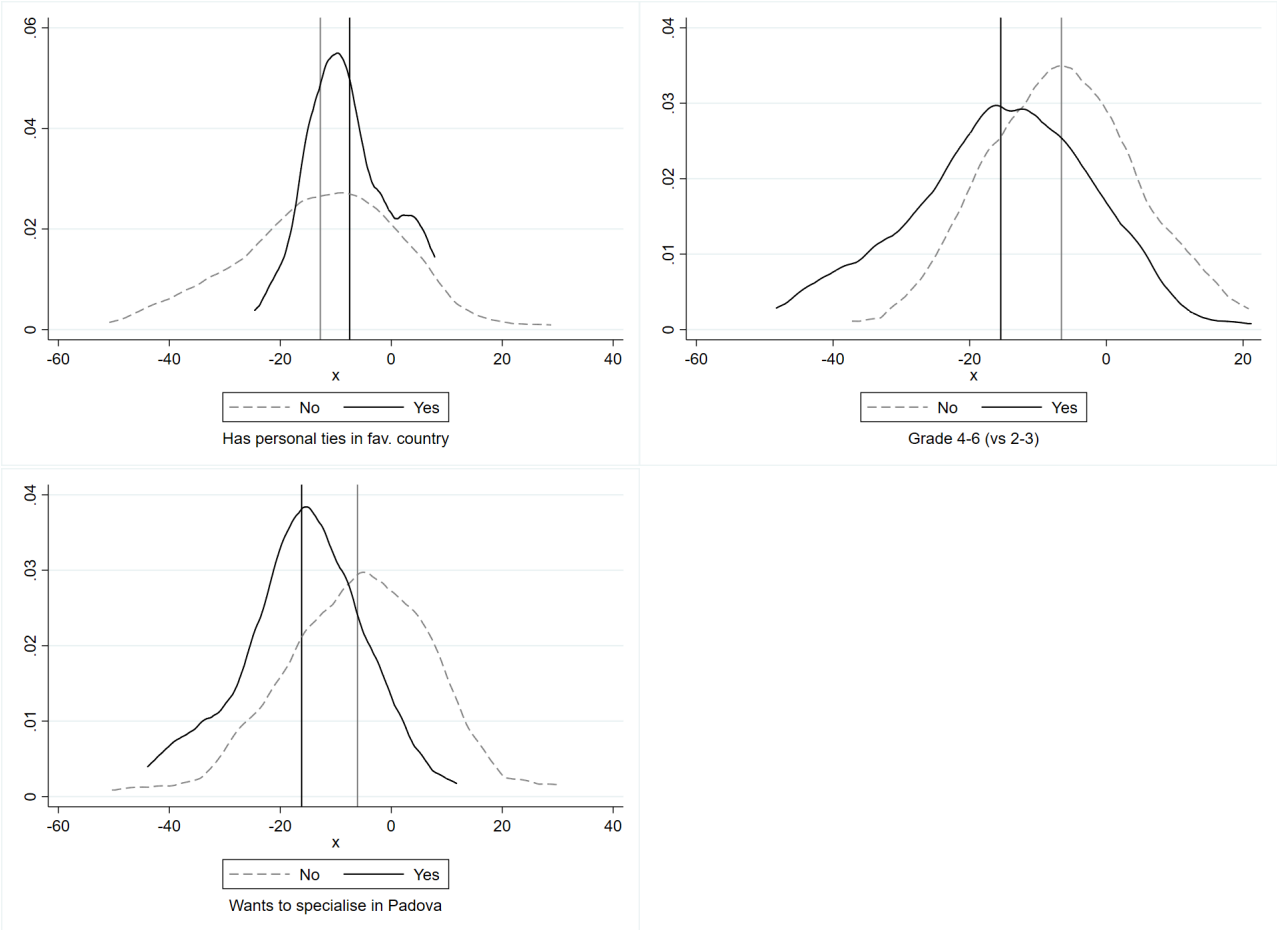
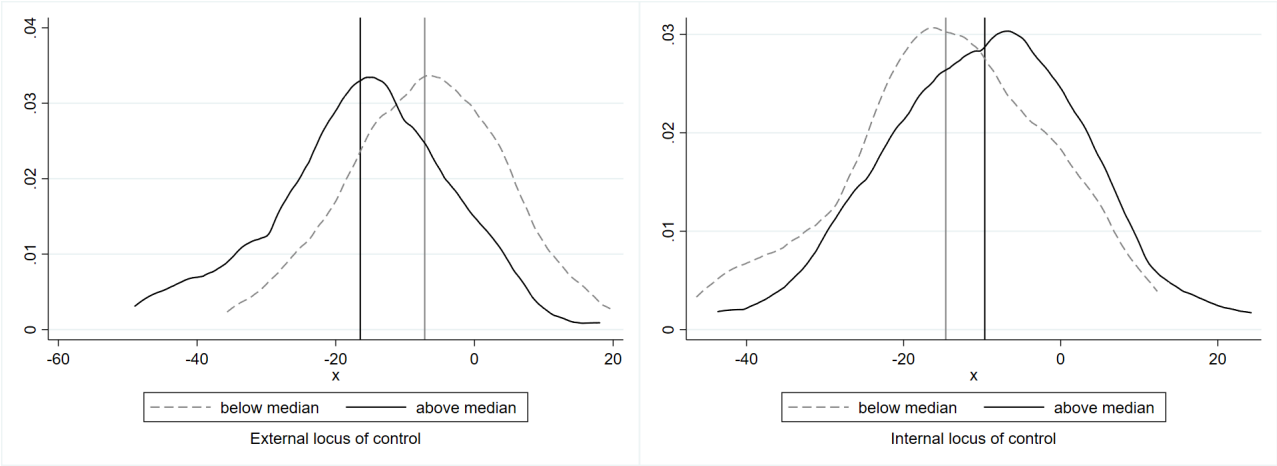



Figure 2: Kernel plots of WTPs to go abroad by observable characteristics with significant mean differences between groups

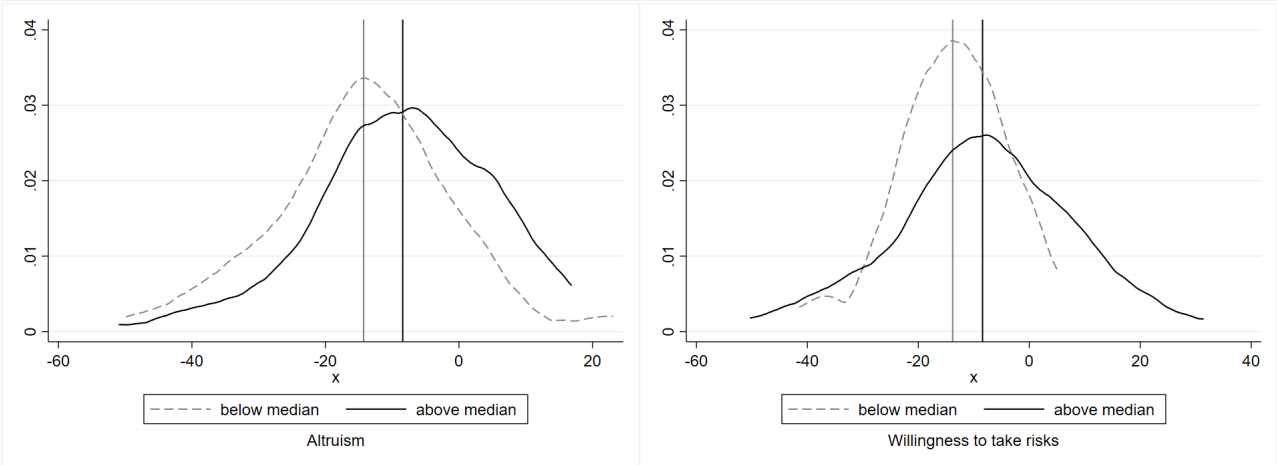





External locus of control




Internal locus of control




Altruism




Willingness to take risks

# Chapter 3

# Does a Longer Work Horizon Affect Offsprings' Labour Market Outcomes?

## 3.1 Introduction

With 23.1% of its population aged 65 or older as of 2020 (Istat, 2020), Italy has the largest share of elderly population in Europe. This, in combination with a declining fertility rate of 1.3 births per woman (World Bank, 2017), termed "lowest-low" fertility (Kohler, Billari and Ortega, 2002), has put tremendous pressure on the financial sustainability of the social security system of Italy over the past three decades. Additionally, Italy is also unique for the late entrance of its youth into adulthood. Compared to other European countries, Italians stay in school longer, enter the labor market later, coreside with parents longer, marry and have children later (Billari and Tabellini, 2010). As of 2018, 23.4% of the Italian youth aged 15-29 are NEET (not in education, employment or training) as opposed to the European Union (EU) average of 12.9% (Istat, 2019). The average school-to-work transition duration in Italy is 2.88 years for 18-34 year olds as of 2017 which is the highest in the EU (Pastore et al., 2020). The long school-to-work transition durations in Italy can be attributed to labour market rigidities brought about by the "two-tier reforms" which liberalised the use of temporary contracts for new hires while protecting the job security of already existing employees with permanent contracts. It is also a result of the sequential nature of the schooling system which puts off development of work related skills until after the completion of formal education (Pastore, 2019). Late entrance into adulthood, particularly, the labor market further reduces the time horizon and tax-base for pension contributions.

Since the 1990s, the Italian government has implemented numerous pension reforms aimed at easing

the burden on the pension system. This has mostly been done by increasing the pension eligibility age which increased the working horizon of individuals, by reducing replacement rate (that is, the percentage of the pre-retirement income paid out as compensation by the pension system) and by shifting from a defined benefit to a defined contribution system.[1] While most of the existing research has centered around the effects of pension reforms on older workers who would have been retired in the absence of the reforms (*direct effect*), some papers have studied its effects on younger workers who have been affected by the reforms but are not at the verge of retirement (*perspective effect*). Recently, Carta and De Philippis (2021) have shown that the pension reform of 2012 in Italy (called the Fornero reform) which increased the Minimum Retirement Age (MRA) to be eligible for pension benefits, has led to positive and significant increases in the labour participation and employment rates for women aged 45-59. For men aged 45-64, these outcomes did not see a significant increase. However, since monthly pension income after retirement is usually lesser than the monthly income earned during the last few years under employment, this increase in work horizon due to the reform can be viewed as an increase in the disposable income and job security of the affected individuals.

In this paper, I investigate the effect of changes in the pension eligibility rules on the education and labour market outcomes of the offsprings of the affected parents. An increase in income of parents due to delayed retirement could impact offsprings' education and employment decisions through many channels. Since schooling is a normal good, an increase in lifetime earnings of parents could lead them to invest in higher education of their offsprings so that the offsprings can reap the returns to higher education achievement. This would also be consistent with the Italian culture characterised by strong cultural ties where parents prefer coresiding with their children. Previous evidence suggests that if coresiding is viewed as a "good" for parents and a "bad" for young adult children, then Italian parents are willing to "bribe" their children by trading off a part of their consumption to have them stay longer at home (Manacorda and Moretti, 2006). Italian parents also experience negative effects on health and life satisfaction as a result of children leaving the parental home (Mazzuco, 2006). Thus, an increase in parental lifetime earnings could lead them to incentivising their offsprings to stay at school longer in order to delay their nest leaving. On the other hand, if the returns on higher education is low, offsprings might want their parents to sponsor their first job search which is costly and time consuming. In Italy, as of 2011, the transition time from school to work for individuals with a high school education was 2.57 years whereas for those with tertiary education it was 1.77 years (Pastore et al., 2020). Since returns to higher education is low in Italy as opposed to other comparable EU countries (De Palo, 2017), the increase in lifetime earnings due to the longer work horizon could increase the probability of parents bearing the additional costs of sponsoring their offsprings' first job search at a lower level of

[1]The defined benefit system calculates the worker's pension benefit as an average of his last five years' gross income, whereas the defined contribution system calculates the benefit as a percentage of the average earnings over the entire working career of the worker.

educational attainment and help them transition from school to work early. Thus, the effect of a longer work horizon of parents on education and labour market outcomes of offsprings is ambiguous.

To examine the effect of an increase in parental work horizon on offsprings' education and labour market decisions, I exploit the Fornero reform of 2012 which increased the MRA of Italian workers by an average of four years. Since the reform was implemented by the Italian government independent of offsprings' education and labor market decisions, it provides a quasi-experimental variation in parental labour supply that can be exploited to estimate causal effects of an increase in parental work horizon on offsprings' outcomes. The pension eligibility requirements are defined on the basis of several factors like age, years of contribution to the social security system, gender and sector of employment (private, public or self-employed). The Bank of Italy's Survey of Household Income and Wealth (SHIW) provides detailed individual level data on each of these variables which allows for the precise calculation of an individual's increase in MRA. Using data from the 2006-2016 cohorts, I study how the increase in the work horizon of the parents due to the reform has affected education and employment outcomes of their offsprings aged 15-29. The age band of 15-29 is motivated by the definition of NEET which is usually defined for this age group and in Italy, one also becomes legally eligible to work at the age of 15. I use a continuous difference-in-differences technique similar to Bertoni, Brunello and Mazzarella (2018) and Carta and De Philippis (2021) that exploits variation in the increase in MRA within cells defined on the basis of age, gender, years of contribution and sector of employment. I show that a 1-year increase in maternal work horizon increases the probability of coresiding offsprings aged 15-29 to be a first job seeker by 1.85 percentage points (17.13 percent). Since the average maternal work horizon increased by 5.2 years, this translates to a 9.62 percentage point (89%) total increase in the average offsprings' first job seeking probability. Evidence from the south of Italy shows that there has been a 3.89 percentage point (6.84 percent) decrease in the likelihood for offsprings of being a student due to a 1-year increase in their mothers' MRA. This translates to a 20.23 percentage point (35.57%) total decrease in the probability of the average offspring to be a student. This suggests that the offsprings of the affected mothers have been leaving schooling to engage in their first job search. The effect of affected fathers on their offsprings' educational labour market outcomes has been largely insignificant. I perform simulations of lifetime earnings increases of affected working mothers and fathers due to the reform and show that the mean increase in lifetime earnings of mothers is €79,710 which is more than twice that of fathers which is €33,858. I also show that mothers anticipate a significant increase in their working horizons on average, while fathers do not. Thus, the likely mechanism through which the main results can be explained is that due to the low returns to education in Italy, offsprings start looking for their first jobs instead of continuing with schooling. This job search being costly and risky is helped by the increase in lifetime earnings of mothers who successfully anticipate this increase in future earnings.

## 3.2 Related literature

This paper is related to the literature on the 'perspective effect' of pension reforms on middle-aged workers who are not at the brink of retirement. This literature is relatively new as compared to the literature on the 'direct effect' of pension reforms on old workers who would have retired in the absence of the pension reforms. Hairault et al. (2010) show that distance to retirement matters for workers' employment with employment rates for 55-59 year old increasing due to a French social security reform of 1993 that increased minimum retirement age from 60 to 65. Montizaan et al. (2010) exploit a Dutch pension reform of 2006 which abolished generous early retirement pension benefits and created incentives to postpone retirement for many workers to show that it increased their participation in training programs. In a similar vein, Brunello and Comi (2015) use Italian data to show that increases in MRA due to the pension reforms of late 90's and early 2000's increased training participation of Italian workers. De Grip, Lindeboom and Montizaan (2012) show that the aforementioned Dutch reform of 2006 led to a significant decrease in the mental health of workers affected by the reform. Bertoni, Brunello and Mazzarella (2018) show that an increase in MRA due to a 2004 Italian social security reform increased health-promoting behaviours in the form of an increased likelihood of regular exercise, a decrease in the probability of being obese and an increase in the probability of reporting a high satisfaction with own health among a cohort of 41-54 year old Italian workers. Carta and DePhilippis (working paper, 2021) show that the Fornero reform of 2012 significantly increased labor market participation, employment and unemployment rates of 45-59 year old Italian women. Although these effects were mostly insignificant for 45-64 year old Italian men, they find that an increase in the wife's working horizon has led to a positive and significant effect in the husband's labour market participation within the family.

This paper also relates to the literature on the late entry of Italians into adulthood. Pastore et al. (2020) show that the average duration of school-to-work transition for Italians aged 18-34 was 2.88 years (34.56 months) in 2017 with the duration being 46 months shorter for the highly educated compared to those with compulsory education. Bertoni and Brunello (2020) estimate that, for any 1,000 local senior workers locked into employment by the Fornero reform, local youth and prime age employment declined by 273 (-0.86%) and 199 (-0.12%) workers, and senior employment increased by 833 (+2.70%) individuals. Manacorda and Moretti (2006) argue that Italian parents are willing to transfer part of their consumption to their offsprings in order to incentivise them to stay at home. They use the 1992 Italian pension reforms which increased the retirement age of workers to show that a 10% increase in annual father's income increases the proportion of 18-30 year old men living with their parents by 10%. Mazzuco (2006) finds negative correlations between children leaving home and satisfaction indices of parents' satisfaction with their main

activity, financial situation, household situation and self-reported health. Becker et al. (2010) find evidence based on 12 European Union (EU) countries including Italy that an increase in perceived job insecurity by the youth and a decrease in parental perceived job insecurity are correlated with higher youth cohabitation with their parents. Billari and Tabellini (2010) provide an overview of the literature that investigate the role of culture and economic factors on why Italians enter adulthood late.

There is a branch of literature on the intergenerational effects of increased MRA. Battistin, De Nadai and Padula (2015) find negative effects of Italian pension reforms that increased the MRA of the grandparental generation on informal childcare supply for the next generation. They find that one additional granparent in early child-bearing years increases the number of children by 5% in close-knit families. Bratti, Frattini and Scervini (2016) also exploit Italian pension reforms to find that grandparental availability for child care has a positive effect on the labour force participation of women with young children. They show that mothers of cohabiting children under 15 whose own mothers are eligible for retirement have a 13% higher probability of employment as opposed to those with mothers ineligible for retirement. To my knowledge, there is not any existing research on the 'perspective effect' of pension reforms on the next generation. This paper contributes to the literature by investigating and presenting novel estimates of the intergenerational perspective effects on school to work transition of the Fornero reform. With Italy having the longest school to work transition time in the EU which has been worsening over the years, the paper brings to light new evidence on how an increased in parental work horizon could lead to early school-to-work transitions of offsprings.

The paper is organized as follows: Section 3 provides an overview of the Fornero reform and how it affected minimum retirement ages. Section 4 describes the data, Section 5 presents the empirical methodology, Section 6 presents the results and Section 7 concludes.

## 3.3 The Italian pension system and the Fornero reform

The Italian public pension system offers two major schemes of retirement and claiming full pension benefits - the old age scheme and the seniority scheme. Under the old age scheme, people can retire after having achieved a certain age whereas under the seniority scheme, people can retire after having achieved a certain number of years of contribution into the pension system. Before 1992, under the old age scheme, Italians could achieve pension eligibility at the age of 60 for private sector employees and the self-employed and at 65 for public sector employees with at least 15 years of contributions. Under the seniority scheme, they could retire if they had at least 35 years of contributions in the private sector and 25 years in the public sector (Angelini et al., 2009; Bertoni and Brunello, 2020). The Italian pension system underwent a series of reforms in the 1990s which aimed at better financial systainability of the system by delaying the minimum retirement

age and by making pension benefits less generous. In 1995, the pension benefit calculation system changed from a defined benefit to a definded contribution system.

As of 2011, the pension eligibility requirement under the old age system was an age of 60 for women and 65 for men with at least 20 years (5 years) of contributions for individuals who started working before (after) January 1, 1996. Under the seniority scheme, individuals needed to have accrued at least 40 years of contributions to be eligible for full pension benefits. A third scheme, called the 'quota system' also existed which characterised pension eligibility in terms of a combination of age and years of contribution - for example, as of 2011, a regular employee would be eligible for retirement under the quota system if the sum of her age and years of contribution would be 96 if she was a public or private sector employee and 97 if she was self-employed (she had to be at least 60 years old if an employee, 61 if self-employed and have at least 35 years of contribution). The Fornero reform was introduced in December 2011 and became effective on 1st January, 2012. The reform increased the old age retirement eligibility for all workers (both male and female) to 67 years by 2020 with at least 20 years of contributions. It also raised the minimum years of contributions required to retire under the seniority scheme from 40 to 42 for men and to 41 for women in 2012. This was further raised to 43 and 42 years of contributions for men and women in 2013 and to 44 and 43 years of contributions for men and women in 2014. The reform abolished the quota system of retirement (Carta and DePhilippis, 2021). Thus, the Fornero reform induced a sudden unexpected increase in MRA that affected different individuals differently depending on age, gender, sector and accrued years of contribution. This allows for the distinction between treatment and control groups that differ on the basis of treatment intensities. Table 1 outlines the pension eligibility rules under the seniority and quota systems for private sector, public sector and self-employed individuals for the years before and after the reform.

## 3.4 Data

The data for the analysis comes from the Survey of Household Income and Wealth (SHIW) which is a biannual survey conducted by the Bank of Italy which comprises about 8,000 households (20,000 individuals), distributed over 300 Italian municipalities. I use data for the most recent years, from 2006 to 2016 for women aged 45-59 with at least one coresiding child and men 45-64 with at least one coresiding child. Thus, I use the terms women and mothers or men and fathers interchangeably throughout the paper. The age band selection has been motivated by the fact that these individuals are middle aged who are not at the margin of retirement and thus allows for the estimation of a 'perspective effect', that is the effect of foreseeing a longer working horizon due to an increased MRA. The use of the SHIW dataset is advantageous because it contains detailed information on age, gender, sector of employment and the years of contributions of

individuals and thus facilitates calculations of the MRA in presence and in absence of the reform under certain assumptions. It also contains useful information about expected retirement age of the individuals and whether they have children residing outside the household which are necessary to test the identifying assumptions. It also provides information on individuals' expected replacement ratios after retirement which I utlise for the lifetime income change calculations due to the reform.

The change in MRA due to the reform is calculated as $T_q = MRA_{q,2014} - MRA_{q,2010}$ where $q$ is a cell defined on the basis of 4 factors - age, gender, years of contribution and sector of employment (private, public or self-employed). $MRA_{q,2014}$ is the minimum retirement age of an individual belonging to cell $q$ in 2014 in the presence of the Fornero reform and $MRA_{q,2010}$ is the minimum retirement age of the same individual in the absence of the reform according to the 2010 rules that existed just before the introduction of the reform. Thus the difference between the two represents the increase in the work horizon of the individual because of the reform. However, for the calculation of the MRAs, an important assumption that needs to be made is that the individuals work continuously without having periods of not being employed and therefore make continuous future contributions until the time they become eligibile for pension benefits. For this reason, following Carta and De Philippis (2021), the sample has also been restricted to those who are well attached to the labour market. Specifically, for the women, the sample has been restricted to those with at least 10 and less than 40 years of contributions. For the men, the sample has been restricted to those with at least 20 and less than 40 years of contribution. Carta and De Philippis (2021) argue that Italian Social Security Institute records show that the discontinuous spells in individuals' careers are concentrated before the age of 35 (because of maternity leave periods or longer study paths) and after the age of 60, and the possible error generated by the assumption of continuous future contributions is minimized under this mode of sample restriction. Thus, I refer to the sample of 45-59 year old mothers with at least 10 and less than 40 years of contribution as the sample of 'eligible mothers' and the sample of 45-64 year old fathers with at least 20 and less than 40 years of contributions as the sample of 'eligible fathers'. Fig 1 shows histograms of the distribution of MRA increase for mothers and fathers. The vast majority of mothers experienced a 7-year increase in MRA while the majority of fathers a 3-year increase.

Table 2 shows some descriptive statistics of the eligible mothers and fathers in the sample for the period of 2006-2016 in terms of their demographic characteristics throughout the sample period. Mothers are about 51 years of age with 25 years of contributions and experienced an average increase of 5.2 years in their work horizon due to the Fornero reform. About 85% are married and 56% have a high school diploma. 90% are active in the labour market with 86% being employed and 4% unemployed. Fathers are 53 years old on average with 30 years of contributions and experienced an average increase of 3.7 years in their MRA due to the reform. 97% are married, 48% have a high school diploma, almost all are active in the labour market with

95% employed and 5% unemployed. Histogram plots in Figure 1 shows the increase in MRA for fathers and mothers in this sample. The majority of fathers (about 36%) experienced a 3 year increase in work horizon because of the raising of required years of contributions from 40 to 43 under the seniority scheme whereas the mothers (about 43%) experienced a 7 year increase owing to the raising of the old age retirement eligibility from 60 to 67 years for women.

For the offsprings sample, I consider the offsprings of the above mentioned parents in the age group of 15-29 as this is a suitable age range for them to decide to be students or to be in the labour market. Table 3 provides descriptive statistics on these offsprings. They are about 21.5 years old, almost always unmarried, 55% are students and 25% are employed.

There is a panel component in the SHIW database. However, since it only consists of about 44% of the households in the sample of interest and only 14% of the households in this sample of interest are observed both before and after the reform, I do not use the panel component for my analyses.

## 3.5 Empirical methodology

I use a continuous difference-in-difference strategy to estimate the effect of the exposure of the parents to the reform on their offsprings. Specifically, I estimate the following model:

$$Y_{itq} = \beta_1 T_{q,parent} \times post2011_t + \beta_2 X_{itq} + \alpha_{q,parent} + \epsilon_{itq} \tag{3.1}$$

where $T_q$ is the increase in the minimum retirement age of a parent due to the reform belonging to cell $q$ defined as $MRA_{q,2014} - MRA_{q,2010}$ which is a time invariant measure of treatment intensity; $post2011_t$ is a dummy that takes the value of 1 if time period $t$ is post reform, *parent* represents either father or mother, $Y_{itq}$ represents different outcomes for child $i$ (students status, first jobseeker, employed, not employed), $\alpha_{q,parent}$ is the parent's cell fixed effect, $X_{itq}$ is a vector of controls for the child which includes marital status of the parent, region-year interaction which controls for region effects over time, age-year interaction which controls for cohort effects over time, age-region interaction controlling for cohort effects by region and a $T_{q,parent} \times year$ interaction which controls for the variable effects of macro shocks over time that can affect parents belonging to different cells differently and $\epsilon_{itq}$ is a random error term. The standard errors are clustered by cell of the parent.[2] The model is run separately to estimate the effect of the sample of eligible mothers (45-59 years old with at least 10 and less than 40 years of contribution) on their offsprings and the effect of the sample of eligible fathers (45-64 years old with at least 20 and less than 40 years of contribution) on their offsprings.

[2]The significance levels of the coefficients remain unchanged if robust standard error are used instead of clustering by cell of parent.

Note that in the regression estimating the effect of eligible mothers on their offsprings, the husbands of these mothers may or may not be eligible fathers. Similarly, in the regression estimating the effect of the sample of eligible fathers on their offsprings, the corresponding wives may or may not be eligible mothers.

## 3.6 Results

### 3.6.1 Effect of the Fornero reform on offsprings

In this subsection, I discuss the results of the effect of the Fornero reform on the co-residing offsprings of the affected workers. The results are presented in Table 4 and are obtained from estimating equation (1) separately for the sample of 15-29 year old offsprings with affected mothers (Panel A) and the sample of offsprings with affected fathers (Panel B). Note that these two samples are not mutually exclusive as for many offsprings, both parents have been affected by the reform. A separate regression using equation (2) has been estimated to present the results just for the offsprings with both an affected mother and an affected father.

From Panel A of Table 4, we see that mothers did not have a statistically significant effect on their offsprings' student status, likelihood of being employed or not employed. However, there has been a significant increase of 1.85 ppt in the probability of the offsprings searching for their first job due to a 1-year increase in their work horizon. Since only 10.8% of the offsprings were first jobseekers in the pre-reform period, this is a large effect which translates to an 17.13% increase. Also, since the average mother experienced a 5.2 year increase in their work horizon, the total increase in the probability of the average offspring to be a first jobseeker is 9.62 percentage points (89%) due to the Fornero reform. From Panel B, we see that fathers did not affect their offsprings' likelihood of being a student, searching for their first job, being employed or unemployed. This can be accounted for by the fact that fathers did not change their labour supply significantly either in the extensive or in the intensive margin (Carta and DePhilippis, 2019). The validity of the underlying parallel trends assumption of these regressions has been discussed later.

### 3.6.2 Heterogeneous effects

In the previous section, I discussed that only mothers had a significant effect on their offsprings as a result of their increased work horizon due to the Fornero reform. In this section, I dig deeper into this effect by exploring some heterogeneities in the effects experienced by the offsprings in terms of gender and north versus south of Italy.

**Effects by gender**

I examine whether the effects of the Fornero reform on the offsprings of the affected workers have been different for male offsprings as opposed to the female ones. In Italy, the labour force participation of females is lesser compared to males. For the age group of the offsprings under consideration which is 15-29, in the pre-reform period, 52% of the males were active in the labour market as compared to 38% of the females. Thus, there is reason to expect that the effect could be different between the two genders. In Table 6, I separate mothers' effects of the reform on offsprings by gender. The table shows that the effect of the reform in terms of an increase in first job seeking has been concentrated mostly to the male offsprings due to an increase in mothers' working horizons. Since 10.7% of male offsprings were seeking for their first job before the reform, a 3.27 percentage points increase equates to a 30.6 percent increase in first job seekers due to a 1-year increase in maternal work horizon. Therefore, the total increase in job seeking likelihood of male offsprings due to a 5.2 year average increase in maternal MRA is 17 percentage points (159.1 %). The effect of the reform on male offsprings due to fathers is still insignificant while that on female offsprings is insignificant from both parents' side.

**Effects by north vs. south of Italy**

Previous evidence has shown that the cost of living in the south of Italy is about 16% lower than the northern regions of Italy (Cannari and Luzzolini, 2009). Thus, one could expect the reform to have a higher effect in the south compared to the north because a per unit increase in lifetime earnings is accompanied by a relatively higher increase in purchasing power in the south. Table 7 shows that the effect that mothers had on their offsprings due to an increase in their work horizons has been significantly more in the south than in the north. We see a 4.4 percentage point (37%) increase in the likelihood of the offspring to be a first job seeker in the south of Italy due to a 1-year increase in maternal work horizon which is equivalent to a total increase of 22.88 percentage points (192.4%). A 1-year increase in maternal work horizon has also led to a 3.89 percentage point (6.84%) decrease in the likelihood of being a student in the south which translates to a total decrease of 20.23 percentage points (35.6%). This implies that the reform has led to an increase in the transitions of offsprings from education to their first job search.

## 3.7 Mechanisms

### 3.7.1 Effect of the reform on lifetime earnings

In this subsection, I discuss a potential mechanism to explain the effect of the reform on offsprings only through the mother's side but not through the father's. I calculate how much of an increase in income is implied by an increase in the work horizon induced by the Fornero reform for the average mother and the average father under certain assumptions and show that this increase is more than double for the mother compared to the father.

As supported by sample averages shown in Table 2 and rounding up to the nearest integer, I assume that the representative mother is 51 years old, has 25 years of contributions, would have retired at 60 in the absence of the reform and experienced a 7-year increase in MRA due to the reform (due to the increase in old age retirement from 60 to 67). Similarly, I assume that the representative father is 53 years old, has 30 years of contributions, would have retired at the age of 63 in the absence of the reform (reaching 40 years of contributions at retirement) and experienced a 3-year increase in MRA due to the reform (because of the increase in required years of contributions from 40 to 43). It should be noted that this lifetime simulation is done for the average mother and father and not for their average increase in MRAs. I also assume that they are observed in the year 2011, just before the implementation of the reform.[3] Since SHIW data is available every other year and the latest pre-reform year that I observe is 2010, I use the values of this year for the necessary parameters in the lifetime income change simulations. The mean male income in the sample in 2010 is €22,014 and the mean female income €16,969 and that is what I assume as income earned by the representatives as of 2010. I assume that real wage increases at the rate of 2.23% annually (Japelli and Padula, 2014), that there is no inflation in the economy and a 2% discount rate. I further assume that the representative has a probability of death every year and these survival probabilities by age are obtained from the mortality.org database which provides probabilities for each gender by cohort until the age of 110. I report all monetary amounts in 2011 values.

The lifetime income of the representative individuals starting from 2011 until death can be calculated as:

*Net annual income from 2011 onward growing at a 2.23% real rate until retirement + part of the severance pay received due to contributions from 2011 till retirement + pension income after retirement*

This lifetime earning can be calculated with different parameter values under the assumption of an absence of the reform and a presence of the reform. The differential between the two gives the change in

[3] An advantage of assuming that the male and female representatives are observed in the year 2011 is that I circumvent the issue of distinguishing private or public sector employment as the formula for severance pay calculation is the same for both sectors 2011 onwards. Prior to 2011, the severance pay calculation formula varied between public and private sector employees.

lifetime earnings due to the Fornero reform. The severance pay is calculated according to the following formula: *Years of contributions*$\times$*0.0691*$\times$*yearly salary*. The contributions for severance pay are capitalised using a $0.015+0.75\pi$ accrual rate where $\pi$ is the rate of inflation. Since I assume a zero inflation rate, this capitalisation simply happens at a factor of 0.015. I calculate pension as the final year's salary times the expected replacement ratio. This pension is received until the time of death which in this simulation is until the age of 110 with a probability of survival every year conditional on having survived the previous years. For the expected replacement ratio, I use the average pre-2011 values for each gender (67.87% for females and 70.32% for males) for lifetime income calculations under the assumption of an absence of the reform and the average post-2011 values for each gender (64.82% for females and 67.19% for males) for the calculations under the assumption of a presence of the reform. Additional notes about the details of the simulation including the the exact formula used to calculated each component of the lifetime earnings can be found in the Appendix. Table 8 presents the figures for income until retirement, severance pay and pension income for each gender under the assumptions of an absence and a presence of the reform and the differences between the two. As we can see, the lifetime earnings increase for women due to the reform is €79,710, while for men, it is €33,858.[4] Thus, the lifetime earnings of the average working mother increased €45,852 more than the average working father. It is to be noted that this differential of €45,852 is a lower bound estimate because the simulation has been done by assuming average parameter values of only employed individuals. It disregards the increase in lifetime earnings achieved due to an increased participation of women who were previously out of the labour force and became active due to the introduction of the reform (see Carta and DePhilippis, 2021). Since the reform induced an increase in labour force participation only in the part of females but not males, the true differential increase in lifetime earnings can be expected to be even higher between the two genders.

### 3.7.2 Effect of the reform on present income and expected retirement age

To further delve into potential mechanisms for observing an effect of the reform on offsprings only through the mother's side but not through the father's side, I estimate the effect of the reform on the current income and expected retirement age of the parents. The estimations has been done using a similar continuous difference-in-difference strategy using the following equation:

$$Y_{itq} = \beta_1 T_q \times post2011_t + \beta_2 X_{itq} + \alpha_t + \alpha_q + \epsilon_{itq} \tag{3.2}$$

where $T_q$ is the increase in MRA of a parent belonging to cell $q$, $X_{itq}$ is a vector of control variables for parent $i$ which are marital status and a region-year interaction, $\alpha_t$ are year fixed effects that control

[4] If median incomes are considered instead of means, the increase in lifetime earnings for the mother is €78,883 and for the father, it is €29,991.

for cyclical fluctuations in the economy over time, $\alpha_q$ are cell fixed effects that control for age, years of contribution and sector of employment and $\epsilon_{itq}$ is a random error term. $\beta_1$ is the parameter of interest that captures the effect of the intensity of the reform.

$Y_{itq}$ represents the outcome variables of interest which are present income and expected retirement age. Table 9 shows that the reform did not have any effect on the present income levels of either gender. However, the table also shows that females expect that their retirement age would increase significantly as a result of the reform whereas males do not.

The results of the last two subsections are important findings which suggest the following. Females are cognizant of the fact that they would be working for a much longer time period until they retire. The increase in working horizon is large (7 years for the vast majority) and the subsequent increase in lifetime earnings is also large and anticipated. This in turn affects their interaction with their coresiding offsprings and they can offer their offsprings to stay back at home and invest time in better job search rather than continuing with their studies. The fathers, on the other hand, experience a much smaller increase in lifetime earnings due to the reform and more importantly, do not even anticipate this increase as suggested by the fact that they do not expect an increase in their working horizons due to the reform. This provides an explanation why the increase in lifetime earnings from their side does not significantly affect their offsprings' labour market decisions.

## 3.8 Robustness checks

### 3.8.1 Sample selection concern

The analysis done in this study provides estimates for the effect of the Fornero reform on the student status and labour market outcomes of offsprings aged 15-29 co-residing with their parents who have been affected in various degrees due to the reform. It, however, does not take into account the offsprings of the affected parents living outside the household due to a lack of information on the income and years of contribution of the parents of the offsprings residing independently. Thus, a natural concern that arises is whether the reform induced a change in the living patterns of these offsprings with their parents. If this were the case, it would threaten the internal validity of the estimates due to endogenous selection into or out of the sample. However, as shown in Table 10, the reform did not affect the number of offsprings living within or outside the household from either parents' side.

### 3.8.2 Parallel trends assumption of difference-in-difference

The estimation strategy used in the study is a difference-in-difference which relies on the assumption of parallel trends of the treatment (more exposed individuals) and control groups (less exposed individuals) before the introduction of the treatment (reform). To test whether this assumption holds, I do some placebo regressions using the pre-reform years of 2006-2010 where I fictitiously introduce the reform in the years 2008 and 2010. Since the reform did not actually take place in these years, the fictitious effect of the reform should be insignificant if parallel trends hold. A significant coefficient estimate would imply a violation of the parallel trends assumption. Tables 5.1 and 5.2 show the results for the offsprings' outcomes of interest as a result of the fictitious treatment experienced by mothers and fathers respectively. The estimation has been done in the same fashion as in equation (1) with the reform being fictitiously assumed for the years 2008 and 2010 and the regression being run separately each time. As we can see, almost all the coefficients are insignificant, implying that parallel trends hold. The only significant coefficient is the one of the effect of fathers on offsprings' student status for the year 2008. However, since this coefficient of interest is insignificant in the main analysis, it is not a threat to the interpretation of the final results.

### 3.8.3 Effect on offsprings in households where both parents have been affected by the reform

In the main specification (1) outlined in section 5, the regressions considered offsprings who had either an eligible mother or an eligible father or both. Specifically, for estimating the effect of the affected mothers on the offsprings, the fathers may or may not have been 'eligible' (see section 4). Similarly, in the regression estimating the effect of the sample of eligible fathers on their offsprings, the corresponding wives may or may not have been eligible mothers. A reasonable concern that arises in this regard is the possible omitted variable bias due to the correlation between the increases in MRAs of mothers and fathers. To address this concern, in this section, I restrict the sample only to those households that have both an elible mother and an eligible father which allows me to jointly control for the MRA increases of both parents. This sample is comparable to the original one in terms of parents' and offsprings' characteristics. A slightly higher proportion of the parents in this sample are highly educated and employed with comparable increases in MRAs while a higher percentage of the offsprings are students compared to the original sample. Detailed descriptive statistics of this sample have been reported in Appendix tables A1 and A2 for the parents and the offsprings respectively. I estimate the mothers' and fathers' effects of the reform on the offsprings separately using specification (1) and report the results in Panels A and B of Table 11. I also jointly estimate the effects of both parents exposed to the reform on offsprings' outcomes using the following model:

$$Y_{itq} = \beta_1 T_{q,mother} \times post2011_t + \beta_2 T_{q,father} \times post2011_t + \beta_2 X_{itq} + \alpha_{q,mother} + \alpha_{q,father} + \epsilon_{itq} \quad (3.3)$$

where symbols retain their usual meanings and standard errors have been clustered at both the cells of mothers and fathers simultaneously. I report the results in Panel C of the table.

The results show that the effect on first job seeking remains stable and so does the absence of effects from fathers. In the joint specification in Panel C, we also see mothers having a negative effect on their offsprings' likelihood of being 'not employed'. Placebo tests for the parallel trends assumption of the joint specification have also been presented in Table A3 in the appendix. Thus, we see that the main results are qualitatively robust to changes in sample selections and do not suffer from omitted variable biases.

## 3.9 Conclusions

This paper investigates the effects of the increase in the working horizon of the Fornero reform on cohabiting offsprings aged 15-29 of the affected workers. Exploiting the increase in the work horizon induced by the reform which affected workers of different ages, genders, sectors of employment and years of contributions differently, I use a continuous difference-in-difference strategy to show that the increase in work horizon of mothers significantly increased the probability of their offsprings to seek their first jobs. I also find that this effect is concentrated mainly on male rather than female offsprings and the effect is more pronounced in the south rather than in the north of Italy. At the same time, fathers did not affect any student or labour market outcomes of their offsprings. Using some lifetime earnings simulations from the point of the reform till death, I show that mothers experienced a substantially higher increase in lifetime earnings than fathers. I also find that only mothers successfully anticipate an increase in their work horizons due to the reform while fathers do not. Considering the relatively low returns to a mid-high level education in Italy with respect to comparable European Union nations (De Palo, 2017), I infer that offsprings persuade their mothers who experienced an increase in lifetime earnings due to the Fornero reform to sponsor their job search as they leave or take time off from schooling. The possible explanation to the concentration of this effect to male offsprings is the much higher labour force participation of males compared to females in Italy. The effect is much more pronounced in the south of Italy where purchasing power of parents in real terms increased more than that in the north due to the lower cost of living. The paper provides one of the first evidences on the intergenerational perspective effects of pension reforms that increase workers' work horizons.

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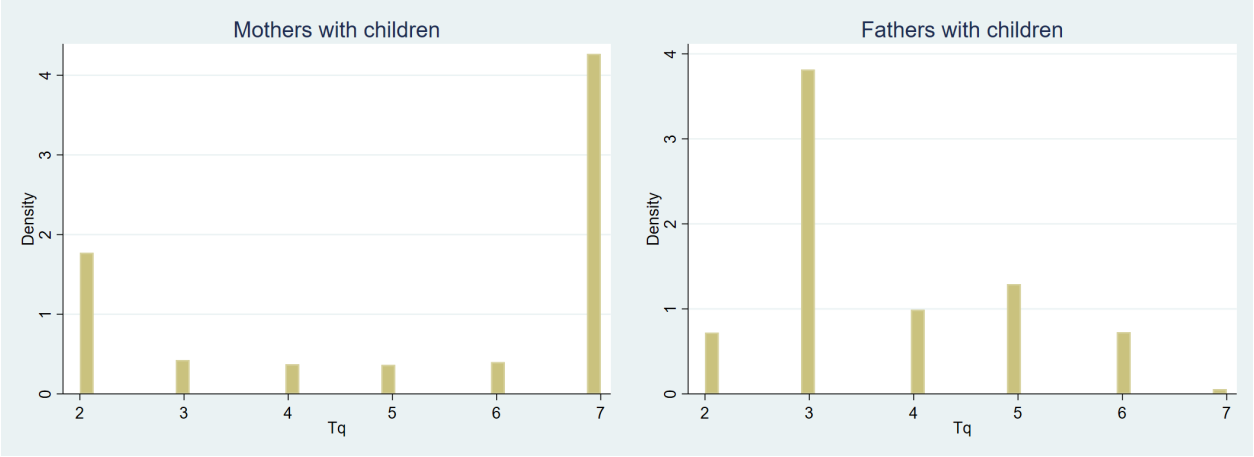
# Figures and tables

Figure 1: Effect of the Fornero reform on increase in the years of minimum retirement age of mothers (left) and fathers (right)




Notes: The figure shows the distribution of increase in working horizon for mothers (in the left) in the age group of 45-59 with at least 10 and less than 40 years of contributions. To the right, the figure shows the same for fathers aged 45-64 with at least 20 and less than 40 years of contributions.

Table 1: Seniority pension eligibility rules

| | Private and Public | | Self-employed | |
|---|---|---|---|---|
| Year | A, C, Q | only C | A, C, Q | only C |
| *Before Fornero reform* | | | | |
| 2007 | 57, 35 | 39 | 58, 35 | 40 |
| 2008 | 58, 35 | 40 | 59, 35 | 40 |
| 2009-2010 | 59, 35, 95 | 40 | 60, 35, 96 | 40 |
| 2011 | 60, 35, 96 | 40 | 61, 35 97 | 40 |
| 2011-2012 | 60, 35, 96 | 40 | 61, 35, 97 | 40 |
| 2013 onwards | 61, 35, 97 | 40 | 62, 35, 98 | 40 |
| *After Fornero reform* | | | | |
| 2012- (men) | | 43 | | 43 |
| 2012- (women) | | 42 | | 42 |

Notes: A stands for age, C for number of years of contribution, Q = A + C is the so-called "quota", the sum of age and years of contribution must be larger or equal than Q to reach retirement eligibility. Independently from actual age, retirement eligibility is also granted when the number of accrued years of contribution is sufficiently high (39 in 2007, 40 in the following years, 42 or 43 after the reform). Table taken from Carta and De Philippis, 2021.

Table 2: Descriptive statistics of parents

| | Mothers 45-59 | Fathers 45-64 |
|---|---|---|
| Age | 51.248 | 52.813 |
| | (3.757) | (4.285) |
| Years of contribution | 24.546 | 29.602 |
| | (7.745) | (5.195) |
| Increase in MRA | 5.214 | 3.704 |
| | (2.167) | (1.239) |
| Married | 0.848 | 0.967 |
| | (0.359) | (0.179) |
| Highly educated | 0.557 | 0.474 |
| | (0.497) | (0.499) |
| Active | 0.897 | 0.999 |
| | (0.304) | (0.031) |
| Employed | 0.856 | 0.952 |
| | (0.351) | (0.213) |
| Unemployed | 0.040 | 0.047 |
| | (0.196) | (0.211) |
| Full time | 0.602 | 0.726 |
| | (0.490) | (0.446) |
| Part-time | 0.165 | 0.018 |
| | (0.371) | (0.133) |
| N | 4,054 | 5,195 |

Standard deviations are in the parentheses.

Table 3: Descriptive statistics of offsprings

| | Offsprings 15-29 |
|---|---|
| Age | 21.556 |
| | (3.986) |
| Married | 0.006 |
| | (0.079) |
| Student | 0.555 |
| | (0.497) |
| First Jobseeker | 0.153 |
| | (0.360) |
| Employed | 0.253 |
| | (0.435) |
| Not Employed | 0.039 |
| | (0.193) |
| N | 11,318 |

Standard deviations are in the parentheses.

Table 4: Effects of change in mothers' and fathers' MRA due to the Fornero Reform on offsprings aged 15-29

| | Student | First jobseeker | Not Employed | Employed |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| *Panel A* | | | | |
| Mother's TxPost2011 | -0.0162 | 0.0185 ** | 0.0018 | -0.0037 |
| | (0.0124) | (0.0084) | (0.0047) | (0.0114) |
| N | 6,114 | 6,114 | 6,114 | 6,114 |
| *Panel B* | | | | |
| Father's TxPost2011 | -0.0040 | -0.0046 | -0.0008 | 0.0105 |
| | (0.0123) | (0.0101) | (0.0047) | (0.0095) |
| N | 8,028 | 8,028 | 8,028 | 8,028 |

Notes: The table shows the effects of the change in the Minimum Retirement Age of parents induced by the Fornero Reform of December 2011 In Italy on the several labor market outcomes of offsprings aged 15-29 years. The data spans the years 2006-2016 of the SHIW. In the above analyses, mothers are eligible to be in the sample if they are of the ages 45-59 with at least 10 and less than 40 years of contribution. Fathers are eligible to be in the sample if they belong to the age group 45-64 and have at least 20 and less than 40 years of contribution. Control variables include marital status of the parent, the cell the parent belongs to, region-year interaction, region-age interaction, age-year interaction and a trend for the change in the MRA over time. Robust standard errors have been generated by clustering at parents' cell level and are reported in the parentheses. In Panel A, the sample of children is consisted of those who have an eligible mother, regardless of the eligibility of the father. Similarly, Panel B consists of the sample of children who have an eligible father regardless of the eligibility of the mother. "Not employed" includes the unemployed (except the first jobseekers), homemakers, well-off, job pensioners, non-job pensioners and voluntary workers.
***p<0.01, **p<0.05, *p<0.10

Table 5.1: Placebo effects due to mother's increase in MRA on offsprings aged 15-29

| | Student | First jobseeker | Not Employed | Employed |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| TxPost2008 | -0.002417 | -0.003588 | 0.007742 | -0.000932 |
| | (0.020759) | (0.015033) | (0.006253) | (0.019792) |
| TxPost2010 | 0.002421 | 0.003571 | -0.007734 | 0.000933 |
| | (0.020760) | (0.014959) | (0.006267) | (0.019802) |
| N | 3,017 | 3,017 | 3,017 | 3,017 |

Notes: The above table shows the placebo effects of the change in the Minimum Retirement Age of mothers induced by the Fornero Reform on different outcomes of offsprings. Data for the years 2006-2010 of the SHIW has been used. In this analysis, each of the years 2008 and 2010 has been fictitiously set as the year of the reform instead of the true reform year of 2011. A significant coefficient in the years 2008 or 2010 implies a violation of the parallel trends assumption of the difference-in-difference estimation strategy. Standard errors clusterd by cell are reported in the parentheses.
***p<0.01, **p<0.05, *p<0.10

Table 5.2: Placebo effects due to father's increase in MRA on offsprings aged 15-29

| | Student | First jobseeker | Not Employed | Employed |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| TxPost2008 | 0.0406 ** | -0.0231 | 0.0031 | -0.0206 |
| | (0.0186) | (0.0159) | (0.0093) | (0.0159) |
| TxPost2010 | -0.0177 | 0.0061 | -0.0068 | 0.0187 |
| | (0.0196) | (0.0154) | (0.0083) | (0.0149) |
| N | 4,106 | 4,106 | 4,106 | 4,106 |

Notes: The above table shows the placebo effects of the change in the Minimum Retirement Age of fathers induced by the Fornero Reform on different outcomes of offsprings. Data for the years 2006-2010 of the SHIW has been used. In this analysis, each of the years 2008 and 2010 has been fictitiously set as the year of the reform instead of the true reform year of 2011. A significant coefficient in the years 2008 or 2010 implies a violation of the parallel trends assumption of the difference-in-difference estimation strategy. Standard errors clusterd by cell are reported in the parentheses.
***p<0.01, **p<0.05, *p<0.10

Table 6: Effects of change in mothers' MRA due to the Fornero Reform on offsprings aged 15-29 by gender

| | Student | First Jobseeker | Not Employed | Employment |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Males | | | | |
| Mother's TxPost2011 | -0.0215 | 0.0327 ** | 0.0033 | -0.0154 |
| | (0.0174) | (0.0129) | (0.0074) | (0.0170) |
| N | 3,118 | 3,118 | 3,118 | 3,118 |
| Females | | | | |
| Mother's TxPost2011 | -0.0085 | 0.0041 | -0.0008 | 0.0064 |
| | (0.0212) | (0.0148) | (0.0075) | (0.0188) |
| N | 2,633 | 2,633 | 2,633 | 2,633 |

Notes: The table shows the effects of the change in the Minimum Retirement Age of mothers induced by the Fornero Reform of December 2011 In Italy on the several labor market outcomes of offsprings aged 15-29 years by gender. The data spans the years 2006-2016 of the SHIW. In the above analyses, mothers are eligible to be in the sample if they are of the ages 45-59 with at least 10 and less than 40 years of contribution. Control variables include marital status of the mother, the cell the mother belongs to, region-year interaction, region-age interaction, age-year interaction and work horizon increase interacted with year. Robust standard errors have been generated by clustering at mothers' cell level and are reported in the parentheses. The samples of children in both panels are consisted of those who have an eligible mother regardless of the eligibility status of the father.
***p<0.01, **p<0.05, *p<0.10

Table 7: Effects of change in mothers' MRA due to the Fornero Reform on offsprings 15-29 by macro region

| | Student (1) | First Jobseeker (2) | Not Employed (3) | Employment (4) |
|---|---|---|---|---|
| *Panel A: Northern Italy* | | | | |
| Mother's TxPost2011 | -0.0015 | 0.0057 | 0.0009 | -0.0052 |
| | (0.0179) | (0.0118) | (0.0059) | (0.0163) |
| N | 3,567 | 3,567 | 3,567 | 3,567 |
| *Panel B: Southern Italy* | | | | |
| Mother's TxPost2011 | -0.0389 * | 0.0440 ** | -0.0050 | -0.0003 |
| | (0.0235) | (0.0184) | (0.0092) | (0.0232) |
| N | 2,313 | 2,313 | 2,313 | 2,313 |

Notes: The table shows the effects of the change in the Minimum Retirement Age of mothers induced by the Fornero Reform of December 2011 in Italy on the several labor market outcomes of offsprings by macro regions. The data spans the years 2006-2016 of the SHIW. In the above analyses, mothers are eligible to be in the sample if they are of the ages 45-59 with at least 10 and less than 40 years of contribution. Control variables include marital status of the mother, the cell the mother belongs to, region-year interaction, region-age interaction, age-year interaction and a trend for the change in the MRA over time. Robust standard errors have been generated by clustering at parents' cell level and are reported in the parentheses. In both panels, the samples of children are consisted of those who have an eligible mother, regardless of the eligibility of the father.
***p<0.01, **p<0.05, *p<0.10

Table 8: Calculation of lifetime earnings changes due to the Fornero reform for a representative mother and a representative father

| | Mother | | | Father | | |
|---|---|---|---|---|---|---|
| | Pre-Fornero | Post-Fornero | Delta | Pre-Fornero | Post-Fornero | Delta |
| Income until retirement | 155,974 | 275,730 | 119,756 | 243,419 | 306,891 | 63,472 |
| Severance pay | 13,760 | 30,463 | 16,703 | 23,225 | 32,473 | 9,248 |
| Pension | 229,615 | 172,866 | -56,749 | 227,836 | 188,974 | -38,862 |
| **Total** | 399,349 | 479,059 | **79,710** | 494,480 | 528,338 | **33,858** |

Notes: The simulation assumes the mean pre-reform income for the representative individuals which is 16,969 for the mother and 22,014 for the father. Income is assumed to grow at the real rate of 2.23% and a zero inflation rate is assumed. The discount rate is assumed to be 2% per year. The representative mother and father are assumed to be 51 and 53 years old respectively and observed just before the reform, in the year 2011. The mother is assumed to have 25 years of contributions and the father 30. Therefore, the mother experienced a 7-year increase in the minimum retirement age and the father a 3-year increase. Severance pay is calculated according to the formula years of contributions × 0.0691 × yearly salary and is assumed to be capitalised at an accrual rate of 1.5% per year. The assumed replacement ratio is 67.87% (64.82%) for the mother and 70.32% (67.19%) for the father for the lifetime income calculation under the assumption of an absence (presence) of the reform. The representative individuals are assumed to survive up to the age of 110 with a probability of survival every year conditional on surviving the previous years. The survival probabilities are obtained from mortality.org for the respective cohorts by gender.

Table 9: Effects of the reform on income and expected retirement age of males and females with offsprings

| | Income | Expected retirement age |
|---|---|---|
| | (1) | (2) |
| Females | | |
| TxPost2011 | -155.413 | 0.236 *** |
| | (149.961) | (0.067) |
| N | 4,779 | 2,934 |
| Males | | |
| TxPost2011 | -398.982 | -0.049 |
| | (364.899) | (0.080) |
| N | 6,866 | 4,849 |

Notes: The table shows the effect of the Fornero reform on the present income and the expected age of retirement with full pension benefits for mothers between the ages 45-59 with at least 10 years and less than 40 years of contribution and for fathers between the ages 45-64 with at least 20 and less than 40 years of contribution. Data for the years 2006-2016 of SHIW have been used. The control variables include parent's marital status, parent's cell fixed effect, year fixed effect and region-year interaction. Robust standard errors clustered at the cell level have been used for inference.
***p<0.01, **p<0.05, *p<0.10

Table 10: Effect of the reform on the number of offsprings residing within and outside the household

| | No. of offsprings outside household | No. of offsprings within household |
|---|---|---|
| | (1) | (2) |
| Females | | |
| TxPost2011 | -0.0015 | 0.018 |
| | (0.0064) | (0.015) |
| N | 5,269 | 5,269 |

Notes: The table shows the effect of the Fornero reform on the number of offsprings residing outside and inside the household for mothers between the ages 45-59 with at least 10 years and less than 40 years of contribution. Data for the years 2006-2016 of SHIW have been used. The control variables include the mothers's marital status, the mother's cell fixed effect, year fixed effect and region-year interaction. Robust standard errors clustered at the cell level of the parent have been used for inference.
***p<0.01, **p<0.05, *p<0.10

Table 11: Effects of change in mothers' and fathers' MRA due to the Fornero Reform on offsprings aged 15-29 in households where both parents were affected

| | Student | First jobseeker | Not Employed | Employed |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| *Panel A* | | | | |
| Mother's TxPost2011 | -0.0225 | 0.0260 ** | 0.0002 | -0.0041 |
| | (0.0159) | (0.0107) | (0.0061) | (0.0148) |
| *Panel B* | | | | |
| Father's TxPost2011 | -0.0405 | 0.0194 | -0.0027 | 0.0267 |
| | (0.0304) | (0.0229) | (0.0095) | (0.0269) |
| *Panel C* | | | | |
| Both parents | | | | |
| Mother's TxPost2011 | -0.0111 | 0.0360 *** | -0.0133 * | -0.0119 |
| | (0.0168) | (0.0132) | (0.0070) | (0.0166) |
| Father's TxPost2011 | -0.0047 | 0.0202 | -0.0061 | -0.0079 |
| | (0.0421) | (0.0295) | (0.0148) | (0.0358) |
| N | 3,952 | 3,952 | 3,952 | 3,952 |

Notes: The table shows the effects of the change in the Minimum Retirement Age of parents induced by the Fornero Reform of December 2011 In Italy on the several labor market outcomes of offsprings aged 15-29 years. The data spans the years 2006-2016 of the SHIW. In the above analyses, the sample is consisted only of households that have both an eligible mother and an elible father. Mothers are eligible to be in the sample if they are of the ages 45-59 with at least 10 and less than 40 years of contribution. Fathers are eligible to be in the sample if they belong to the age group 45-64 and have at least 20 and less than 40 years of contribution. Control variables include marital status of the parent, the cell the parent belongs to, region-year interaction, region-age interaction, age-year interaction and a trend for the change in the MRA over time. Robust standard errors have been generated by clustering at parents' cell level and are reported in the parentheses. Panels A and B present the effects of mothers and fathers on offsprings' outcomes. Panel C presents the results from specification (3) where both the mothers' and fathers' MRA changes have been jointly incorporated in the regression. "Not employed" includes the unemployed (except the first jobseekers), homemakers, well-off, job pensioners, non-job pensioners and voluntary workers.
***p<0.01, **p<0.05, *p<0.10

# Appendix

## Calculation of lifetime earnings

The lifetime income of the representative individuals starting from 2011 until death is be calculated as:

*Net annual income from 2011 onward growing at a 2.23% real rate until retirement + part of the severance pay received due to contributions from 2011 till retirement + pension income after retirement*

The net annual income of the individual from 2011 until the point of retirement (with 2011 as the base year) assuming a 2% discount factor can be calculated according to the formula:

Probability of survival in 2011×Net annual income in 2011 + Probability of survival in 2012 conditional on survival in 2011 $\times(\frac{1}{1+\delta})$(Net annual income in 2012) + ...+ (Conditional probability of survival on year

of retirement)×(Discounted net annual income on year of retirement), where $\delta = 0.02$ is the discount factor

$= P(S_{2011})$(Net annual income in 2010)(1+ $r$) + $P(S_{2012}|S_{2011})(\frac{1}{1+\delta})$(Net annual income in 2010)(1+ $r)^2$+ ....+ (Conditional probability of survival on year of retirement)$(\frac{1}{1+\delta})^{N-1}$(Net annual income in 2010)(1+ $r)^N$,

where $r$ is the real growth rate of income (assumed to be 2.23% per year), $(N-1)$ is the number of years between retirement and 2011, $P(S_{2011})$ is the probability of survival in 2011 and $P(S_{2012}|S_{2011})$ is the conditional probability of survival in 2012.

The net annual income in 2010 is assumed to be the mean income of the average mother/father in the sample in the year 2010 in the simulation.

The severance pay is calculated according to the following formula: *Years of contributions*×*0.0691*×*yearly salary* capitalised using an accrual rate of $0.015+0.75\pi$ where $\pi$ is the rate of inflation which is zero by assumption.

Thus, the part of the severance pay received due to contributions from 2011 until retirement can be calculated as $(0.0691 \times 1.015)$ × *(Net annual income in 2011 + Net annual income in 2012 + ...+ Net annual income on the year of retirement).* This value can then be transformed into 2011 value by multiplying by $(\frac{1}{1+\delta})^{N-1}$.

Pension income after retirement till death (age 110 with a probability of survival each year) can be calculated using the exact same method used to calculated *net annual income from 2011 until retirement* explained above accounting for the replacement ratio.

Table A1: Descriptive statistics of parents of households with both parents affected by the reform

| | Mothers 45-59 | Fathers 45-64 |
|---|---|---|
| Age | 50.681 | 53.261 |
| | (3.578) | (3.917) |
| Years of contribution | 24.516 | 30.584 |
| | (7.429) | (4.968) |
| Increase in MRA | 5.120 | 3.643 |
| | (2.181) | (1.178) |
| Married | 0.982 | 0.982 |
| | (0.133) | (0.133) |
| Highly educated | 0.603 | 0.574 |
| | (0.489) | (0.495) |
| Active | 0.905 | 0.999 |
| | (0.293) | (0.028) |
| Employed | 0.865 | 0.962 |
| | (0.341) | (0.192) |
| Unemployed | 0.040 | 0.038 |
| | (0.196) | (0.190) |
| Full time | 0.592 | 0.708 |
| | (0.492) | (0.455) |
| Part-time | 0.162 | 0.015 |
| | (0.368) | (0.121) |
| N | 2,609 | 2,609 |

Standard deviations are in the parentheses.

Table A2: Descriptive statistics of offsprings with both parents affected by the reform

| | Offsprings 15-29 |
|---|---|
| Age | 21.156 |
| | (3.795) |
| Married | 0.003 |
| | (0.055) |
| Student | 0.639 |
| | (0.480) |
| First Jobseeker | 0.108 |
| | (0.310) |
| Employed | 0.227 |
| | (0.419) |
| Not Employed | 0.024 |
| | (0.154) |
| N | 3,952 |

Standard deviations are in the parentheses.

Table A3: Placebo effects due to mother's and father's increase in MRA on offsprings aged 15-29 in households where both parents have been affected by the reform

| | Student | First jobseeker | Not Employed | Employed |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Mother's TxPost2008 | 0.0346 | 0.0145 | -0.0076 | -0.0404 |
| | (0.0473) | (0.0359) | (0.0198) | (0.0418) |
| Father's TxPost2008 | 0.1091 | -0.0955 | 0.0498 * | -0.0660 |
| | (0.0838) | (0.0667) | (0.0293) | (0.0724) |
| Mother's TxPost2010 | -0.0322 | -0.0143 | 0.0068 | 0.0385 |
| | (0.0484) | (0.0362) | (0.0189) | (0.0421) |
| Father's TxPost2010 | -0.1155 | 0.0957 | -0.0476 | 0.0701 |
| | (0.0808) | (0.0650) | (0.0300) | (0.0740) |
| N | 1,698 | 1,698 | 1,698 | 1,698 |

Notes: The above table shows the placebo effects of the change in the Minimum Retirement Age of parents induced by the Fornero Reform on different outcomes of offsprings. Data for the years 2006-2010 of the SHIW has been used. In this analysis, each of the years 2008 and 2010 has been fictitiously set as the year of the reform instead of the true reform year of 2011. A significant coefficient in the years 2008 or 2010 implies a violation of the parallel trends assumption of the difference-in-difference estimation strategy. Standard errors clusterd by cell are reported in the parentheses.
***p<0.01, **p<0.05, *p<0.10