

Multigenerational Spillover Effects of Unemployment Insurance Reform: Grandparents' Labour Supply and Grandchildren's Educational Outcomes

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Abstract

The 2004 unemployment insurance reform introduced in the Netherlands increased the labour supply of individuals above 57.5 years old - age when individuals are likely to be grandparents (generation 1). Using unique administrative data covering three generations in families, we investigate the spillover effect of this reform on their grandchildren (generation 3). We implement an IV strategy which exploits exogenous variation yielded by the policy introduction date and the age eligibility criteria to instrument for grandparents being active on the labour market. We find a positive impact of grandfathers' activity on the grandchildren's educational outcomes. We provide evidence on potential *direct* mechanisms driving this relationship - i.e. going directly from grandfathers to grandchildren - as well as potential *indirect* mechanisms - i.e. mediated by changes in mothers' (generation 2) labour supply and fertility.

Keywords: Intergenerational effects, Labour supply, Unemployment insurance, Child care, Child development.

JEL Classification: J13, J14, J22, J26, J65.

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1 Introduction

Until the late 1990s, many OECD countries provided generous options to retire early (Gruber and Wise, 1998). Due to aging populations and lower fertility rates in these countries, the financial sustainability of these generous programs became a major concern. As a result, as of the early 2000s, most OECD countries have introduced reforms aimed at stimulating old-age labor supply by reducing the generosity of various welfare provisions (OECD, 2011). These reforms are known to have increased employment of older workers, although they also led to a substantial amount of substitution between different social insurance programs (e.g. Staubli and Zweimüller 2013; Atav et al. 2019). Although the direct effects of reforms on the targeted population have been studied extensively, any intergenerational effects on subsequent generations have been largely unstudied.¹ However, changes in the labor supply of older individuals may have a strong impact on their children and grandchildren, for example, due to the fact that they are now less able to provide informal care to any grand-children. This paper focuses on these multigenerational effects and studies potential channels driving these effects.

In particular, we study how an unemployment insurance reform targeted at older workers affect their children and grandchildren. We exploit the introduction of mandatory job search requirements for unemployment benefit recipients aged 57.5 and above which came into effect on January 1st 2004 in the Netherlands. Earlier work by Hullegie and Van Ours (2014), Lammers et al. (2013), and Been and Knoef (2017) has shown that this reform significantly reduced the inflow from older workers into unemployment and increased the outflow from unemployment to employment for the targeted population, and as such significantly reduced the popularity of unemployment insurances as an exit route to retirement. According to studies analyzing the allocation of time while unemployed Aguiar et al. (2013) and when re-employed (Krueger and Mueller, 2012), the increased labour market participation of older individuals is likely to reduce their time spend on non-market activities such as leisure, home production, and providing informal child care to their grandchildren. Among the northern European countries, Dutch grandparents spend a relative large amount of time in taking care of their grandchildren, on average about 5 hours per week, compared to for example Swedish grandparents (only 3 hours)(Ghysels, 2011; Jappens and Van Bavel, 2012). A change in informal child care provision due to the reform is one of the potential channels through which there might be a spillover effect on grandchildren's outcomes. This effect is further

¹A few exceptions focussing on reforms in disability insurance include Dahl et al. (2014), Dahl and Gielen (2018) and De Haan and Schreiner (2018) who consider intergenerational effects of disability insurance reforms among prime-age individuals in the Netherlands and Norway.

amplified if the quality of child care provided by the grandparents is better (worse) than the alternative, e.g. formal child care.

This paper investigates the effect of the 2004 unemployment insurance reform in the Netherlands over multiple generations. First, we study the impact of the stricter eligibility criteria for grandparents (*1st generation*) on their grandchildren's educational performance on a standardized test in 6th grade (*3^d generation*). Second, we investigate potential channels driving the multigenerational effect: the spillover effect of the reform from grandparents through grandchildren can occur via (i) *direct* mechanisms - i.e. grandparents change their investment for their grandchildren and (ii) *indirect* mechanisms - i.e. mother's (*2nd generation*) might respond to the reform by changing her labour supply and/or fertility, which in turn can affect grandchildren's outcomes.

We make two important contributions to the existing literature. Firstly, our study uses unique administrative data covering three generations thereby allowing us to simultaneously consider three subsequent generations. We are the first to analyze the direct effects of grandparents' labor supply decisions on grandchildren's educational outcomes. In particular, this study is the first to provide evidence on a multigenerational spillover effect of a major reform in the Netherlands which successfully increased the labour supply of older individuals (Been and Knoef, 2017). There is a growing literature showing that recent reforms in disability insurance programs have had effects going beyond the targeted population e.g. intergenerational effects (Dahl and Gielen, 2018; Dahl et al., 2014; De Haan and Schreiner, 2018). Our evidence confirms that these effects on later generations also exist for recent reforms in other social insurance programs (i.e. unemployment insurance), but also that they even stretch to multiple subsequent generations.² Our evidence of intergenerational spillover effects from grandparents to grandchildren further corroborates the need for considering long term effects on future generations when introducing new policies as focussing only on the effects on the targeted (and possibly one subsequent) generation severely underestimates the long term impact of a welfare reform.

Secondly, our evidence on the underlying channels adds to the scarce literature on the impact of informal child care provided by the grandparents on grandchildren's outcomes. The recent economic literature on human capital formation (Cunha and Heckman, 2007, 2008) has triggered an enormous amount of evidence on the impact of different types of inputs received during childhood for children's later life outcomes. Early investments in

²A related paper by (Lindahl et al., 2015) also adopts a multigenerational approach but focuses on the transmission of human capital across several subsequent generations.

both various types of parental investments³ and formal child care⁴ have found to be crucial for individuals' outcomes later in life. However, the evidence base on the importance of informal child care on childrens' outcomes is rather limited. [Del Boca et al. \(2018\)](#) study a cohort of children in the UK and find a positive association between grandparental child care and children cognitive outcomes, mostly concentrated among advantaged households. [Lei \(2019\)](#) provides similar evidence for China, with stronger positive effects for girls.⁵ Contrary to these earlier papers, we exploit exogenous variation in grandparents' labour supply - which in turn changes their provision of informal childcare - to estimate the causal effect on outcomes of their grandchildren. We enrich our analysis by investigating both *direct* and *indirect* mechanisms, where the former includes channels going directly from grandparents (1st generation) to grandchildren (3rd generation) whereas the latter includes channels driven by a response to mother's (2nd generation) labor supply⁶ and fertility choices.⁷

We use a IV approach to study the multigenerational effect of the unemployment insurance reform in the Netherlands affecting the grandparents on grandchildren's outcomes. The reform changed grandparents' labour supply by decreasing their inflow into unemployment and increasing their outflow from unemployment ([Been and Knoef, 2017](#)). To control for unobserved differences in children outcomes across different years and between children whose grandparents have been affected by the policy or not we implement a IV strategy which exploits variation yield by the policy introduction date (1 January 2004) and the age eligibility criteria (57.5 and older) to instrument for grandparents being active in the labour market. We therefore compare the educational performance of grandchildren at age 12, whose grandparent activity/inactivity has been triggered by the reform.

We find a positive effect of the reform on grandchildren's educational performance of around 50% of a standard deviation.⁸ This effect is statistically significant and economically

³See, among others, [Cunha et al. \(2010\)](#); [Carneiro et al. \(2015\)](#); [Moroni et al. \(2019\)](#); [Attanasio et al. \(2020\)](#); [Baker and Milligan \(2010\)](#); [Ruhm \(2004, 2008\)](#); [Del Bono et al. \(2016\)](#)

⁴See, among others, [Cornelissen et al. \(2018\)](#); [Berlinski and Galiani \(2007\)](#); [Baker et al. \(2008\)](#); [Blau \(1990\)](#); [Felfe and Lalive \(2018\)](#); [Havnes and Mogstad \(2011b, 2015\)](#)

⁵The sociology literature has largely contributed to this topic but failing to provide evidence for a causal relationship.

⁶A vast amount of literature has shown the sensitivity of mothers' labour supply to the presence and costs of child care ([Blau and Robins, 1988](#); [Connelly, 1992](#); [Gustafsson and Stafford, 1992](#); [Leibowitz et al., 1992](#); [Michalopoulos et al., 1992](#); [Powell, 1992, 2002](#); [Ribar, 1995](#); [Kimmel, 1998](#); [Lokshin, 2004](#); [Berlinski and Galiani, 2007](#); [Kimmel and Connelly, 2007](#); [Tekin, 2007](#); [Lundin et al., 2008](#); [Lefebvre and Merrigan, 2008](#); [Cascio, 2009](#); [Goux and Maurin, 2010](#); [Herbst, 2010](#); [Bettendorf et al., 2015](#); [Cascio et al., 2015](#); [Givord and Marbot, 2015](#)).

⁷([Haan and Wrohlich, 2010](#); [Bauernschuster et al., 2016](#); [Bick, 2016](#); [Adda et al., 2013](#)).

⁸For identification of the causal effect of the reform on grandchildren's educational performance, we find that the reform increased the labor supply of grandfathers by 5.6%-points which is in line with prior studies by [Hullege and Van Ours \(2014\)](#), [Lammers et al. \(2013\)](#), and [Been and Knoef \(2017\)](#).

large. The large effect reflects the local effect nature of our results as well as the yearly accumulation of investments in grandchildren early in life. In addition, there is significant heterogeneity by grandparents' number of children (G2) and grandchild's birth order, thus revealing the presence of *direct* mechanisms driving this relationship. The positive effect of the reform decreases with grandparents' number of children and grandchildren's birth order. If we take grandparents' number of children and grandchildren's birth order as a proxy for grandparents' direct investment in their grandchildren, our results suggest that the reform increased the labour supply of older people at the cost of providing informal child care, which is substituted by higher quality formal child care. Finally, when exploring potential *indirect* mechanisms we find that mothers do not stay home to replacing grandparents' informal care since mothers' labour supply is found to increase due to the reform and fertility is being delayed.

The remainder of the paper is organized as follows. We first describe the institutional settings characterising the Dutch unemployment insurance scheme and formal child care in Section 2. A theoretical framework is introduced in Section 3. Section 4 discusses the empirical strategy, and the data is described in Section 5. We present our main results in Section 6 and provide some robustness analysis in Section 7. Finally, we conclude in section 8.

2 Institutional setting

2.1 Unemployment insurance scheme in the Netherlands

Employees in paid employment who loose their job are entitled unemployment insurance (UI) benefits in the Netherlands provided that they have worked at least 26 of the last 36 weeks and if the job loss is not culpable to the employee.⁹ The replacement rate is about 70% of last earnings¹⁰, which is fairly generous compared to the situation in other European countries.¹¹

⁹Culpable reasons to become unemployed are mostly instant dismissals by the employer and voluntary quits.

¹⁰Prior to 2016, replacement rates were 70% for the total duration of UI benefits. As of 2016, the replacement rate increased from 70% to 75% of the last earnings for the first two months with an absolute maximum of about 3,100 euros. From the third month onwards, the replacement rate is reduced to 70% with an absolute maximum of about 2,900 euros. In some specific sectors (e.g. agriculture, industry, and construction) collective agreements require employers to complement UI benefits to a 100% replacement rate.

¹¹The net replacement rate in the Netherlands for the first 2 months of job loss is one of the highest in the OECD and is about 30, 40, and 15 percentage points higher than in the U.S., U.K., and Germany, respectively (?).

Entitlement to a UI benefit comes with a mandatory job-search requirement, which aims to increase the probability of finding new employment. Not abiding the mandatory job-search requirements can have severe consequences ranging from financial sanctions to losing the entitlement to UI benefits.

Prior to October 2006, the maximum entitlement to UI benefits was age-dependent and amounted to a maximum of 42, 48 and 60 months for persons aged 50-54, 55-59 and 60-64 respectively. Since October 2006, the duration of benefits depends on work history with a minimum duration of three months. This is extended by one month for every year worked up to a maximum of 38 months for those who worked at least 4 out of the last 5 years. As of 2016, the maximum has been reduced to 24 months. In addition, the accumulation of months has been made less generous: one month for every year of work in the first 10 years of work history, and half a month for every additional year of work beyond the first 10 years. When UI benefits are exhausted, people can apply for asset- and income-based means-tested welfare benefits that guarantee a minimum standard of living.

2.2 Specific regulation for older workers

As older workers typically experienced difficulties with finding new employment, the Dutch unemployment insurance scheme included specific policies and exemptions targeted to older unemployed in order to protect them from experiencing long-term poverty when unemployment benefits would expire and re-employment options would not be available. As a result of these measures, Dutch unemployment insurance has long served as an attractive early retirement pathway for older individuals. Since the early 2000s, various reforms in UI have taken place aiming to increase elderly labor market participation and to limit the possibilities for early retirement.

First, older individuals experienced changes in the maximum duration for which they were entitled to benefits. Until August 2003, individuals aged 57.5 and above could extend the maximum benefit duration up to the age of 65 by applying for extended UI benefits. These extended UI benefits amounted 70% of minimum wage. From August 2003, extended UI benefits were abolished. At the same time, the *IOAW* was introduced to provide a minimum income provision for elderly born before January 1st 1965, who become unemployed after the age of 50, and whose UI benefit had expired. These benefits complement household income up to the subsistence level for those households that fall below this level. Hence, eligibility is means-tested based on household income, but assets are not taken into account (which is

the main difference compared to welfare benefits. In 2009, another supplementary income scheme was introduced, the *IOW*, which provided benefits of at most 70% of the minimum wage, depending on the level of income before unemployment, to individuals who become unemployed after the age of 60, and whose UI benefits expired. Compared to *IOAW* benefits, *IOW* benefits do not take into account household income, but only personal income. *IOW* was initially introduced as a temporary arrangement to alleviate job finding difficulties among older unemployed during the Great Recession. However, in 2014 and 2019 the arrangement has been extended for four years.

Second, older individuals faced a change in the job search requirements. Prior to 2004, unemployment recipients aged 57.5 and above were exempted from the obligation to actively search for a job. As of January 1st 2004, this exemption was lifted in order to stimulate older workers to exit unemployment. hence, as of that date, also older unemployed had to meet the job search requirement in order to retain their UI benefit.¹²

Our study exploits the 2004 change in mandatory job search requirements for unemployed aged 57.5 and above as an exogenous shock to elderly labor supply (Hulleger and Van Ours, 2014; Lammers et al., 2013; Been and Knoef, 2017)¹³ to study the impact this has had on outcomes of subsequent generations.

In our period of analysis, there are several reforms that have affected the labour supply decisions of older workers in the Netherlands,¹⁴ such as the abolishment of early retirement schemes (*VUT & prepensioen*) and simultaneous introduction of the life course arrangement (*Levensloopregeling*) in 2005,¹⁵ the decreased eligibility and generosity in disability insurance (*WIA*) in 2006,¹⁶ and the decreased duration in unemployment insurance benefits. However, none of these reforms coincide with the affected and unaffected groups in the 2004 UI reform.

¹²The job search requirement involved the unemployed to 1) have an intake meeting at the unemployment office, where individual criteria are made regarding the expected activities undertaken during unemployment; 2) have the obligation to accept suitable job-offers, where suitable job offers are defined by the educational level and the time spent in unemployment; 3) have to make at least a pre-determined number of applications (either by letter, e-mail, phone call or nuncupative contact with a company, registering at an agency, having a job interview and doing an assessment); 4) have to participate in educational programs and job search assistance when not being able to find work within six months; 5) have regular report meetings every 4-6 weeks in addition to the mandatory intake meeting and the follow-up to explain the further procedures.

¹³Petrongolo (2009) has found a similar effect of job search requirements on treated individuals including those below 57.5 years old in the UK

¹⁴For an overview of reforms from 1995-2016 aimed at the elderly in the Netherlands, see ?.

¹⁵The 2005 abolishment of early retirement schemes only affected those born after January 1st 1950. Those affected by this reform could start saving more in the tax-beneficial life course arrangement, although take-up rates are very low.

¹⁶The 2006 decrease in eligibility and generosity of disability insurance is not targeted at older workers and generally applies to all ages.

Therefore, we argue that the effects we find can be addressed to this 2004 UI reform.

2.3 Child care

2.3.1 Formal child care

As from 2005, the market for child care provision (including centre-based daycare, centre-based playgroups (*peuterspeelzalen*) and care by non-family members (part of which is also subsidized, the so-called guestparents (*gastouders*))) has been a private market in the Netherlands. Parents are free to choose the type of child care they prefer. Child care subsidies are paid to parents by the central government. These subsidies are paid per hour of care used, up to a maximum price per hour beyond which parents receive no additional subsidy.¹⁷ The subsidy depends on households' income and the number of children aged below 13 in formal child care per household. From 2005, several reforms in child care subsidies have taken place. In the period 2005-2008, child care subsidies were increased substantially thereby effectively cutting the net price of formal child care in half (Bettendorf et al., 2015). Despite the sudden increase in the generosity of child care subsidies, these reforms only had a modest impact on maternal labor supply (Bettendorf et al., 2015).

In response to the (larger than expected) rise in public spending on child care from 1 billion euros in 2004 to 3 billion euros in 2009, the government subsequently tried to curb the rise in public spending on child care by making it less generous as from 2012. The hourly subsidy cut for parents in 2012 was as large as 2 to 5%-points at the minimum for the first child but could be more than 10%-points for households with higher incomes. This led to a negative shock in the demand for formal child care with decreasing numbers of children attending child care centers (Akgunduz et al., 2015). Although the effect of this reform is expected to be large for households' monetary budget, Been and Jongen (2017) find no statistical evidence for any maternal or paternal labour supply changes.

Based on the evidence from Bettendorf et al. (2015), Akgunduz et al. (2015), and Been and Jongen (2017) we conclude that, whilst the use of formal child care is responsive to the net hourly price of formal child care, parents labour supply decisions are less so. Even maternal labour supply is not very responsive to the changes in the tax treatment of formal child care. For the identification of our effect the 2004 UI reform on grandchildren's educational outcomes this implies that our effect is not driven by any large labour supply effects of the

¹⁷Child care providers are allowed to set their own hourly price.

parents caused by anything else than the reform we study. Especially, since most of the net hourly price changes in formal child care occur after 2007 whereas our final sample considers the period 1999-2007 for identification (see Section 4).

2.3.2 Informal child care by grandparents

To give an impression of how important grandparents are in providing informal care to their grandchildren, we use some descriptive statistics from the SHARE 2004 data. This data allows us to make a comparison to other European countries. In Figure 3 we observe that only few grandparents spend time with their grandchildren on a daily basis in the Netherlands. About 35%, 23%, and 40% of the grandparents say they spend time with their children at least every week, every month, and less often respectively. This pattern of informal child care given by the grandparent is comparable to countries such as Denmark and Sweden, countries in which formal child care is broadly present, but very different from countries from Southern Europe with less-developed formal care systems. In these countries, grandparents taking care of their grandchildren on a daily basis is much more prevalent.

Typically, Figure 4 shows that the grandmother is more involved in informal care for their grandchildren than the grandfather in the Netherlands. 45% of grandmothers look after their grandchildren for at least one day a week. This is 30% for grandfathers. Part of the time spent with the grandchildren may be spent simultaneously with the grandmother and grandfather. Although grandmothers are more involved with looking after their grandchildren than grandfathers in the Netherlands, this gender-difference is less pronounced if we look at both inactive grandmothers and grandfather in Figure 5. The figure suggests that being active on the labour market still is an important determinant for spending time with grandchildren among grandfathers especially. Grandmothers more often spend time with grandchildren regardless of being active or inactive.

3 Theoretical framework

3.1 Setup of preferences, constraints, and intergenerational altruism

In this section we provide an analytical framework, building forth on [Del Boca et al. \(2014\)](#) and [Rupert and Zanella \(2018\)](#), in which grandparents (G1) and parents (G2) care about

children's (G3) ability. Our goal is not to estimate a structural model like [Del Boca et al. \(2014\)](#) and [Rupert and Zanella \(2018\)](#), but open up the black box of potential direct and indirect mechanisms from grandparents' labour supply decisions to grandchildren's educational outcomes. The grandparents and parents care about this outcome since they are both altruistic with respect to the G3's (future) success in life where we proxy this success by their ability at the age of 12. We argue that a higher ability at age 12 is more likely to lead to (future) success in life than a lower ability at age 12. Children's ability is modelled by the following arbitrary function z that differs between children.¹⁸

$$A_t = z(A_0, A_{t-1}, I_t^{G1}, I_t^{G2}, T_t^F) \quad (1)$$

with time $t = \{1, \dots, 12\}$. A_0 denotes the endowment at birth. We assume that any timing of fertility decisions (k_a) depending on the mother's age a affects $A_0(k_a, n)$ together with some unobserved factors n . I is the quality investment by parents and grandparents by spending quality time with the (grand)children: $I_t = f(\nu_t, \eta_t)$. Here, f is an arbitrary function that produces quality investments from monetary gifts/transfers ν and time investments η_t . Time spend in formal child care is denoted by T_t^F . Function z captures potential differences in the quality of time and goods devoted to the child.

The utility function of the parents (G2) is given by¹⁹

$$U_t^{G2} = u(C_t^{G2}, L_t^{G2}, A_t) \quad (2)$$

For simplicity, a unitary household model is assumed.²⁰ u is assumed to be $u' > 0$ and $u'' < 0$. We assume that parents receive utility U_t^{G2} , which is additively separable in preferences for consumption C_t^{G2} , leisure L_t^{G2} , and ability of the child A_t .

Parents optimize U_t^{G2} with respect to both a budget constraint and a time constraint. The budget constraint is given by

¹⁸For brevity, we leave out subscript i to indicate different children.

¹⁹For brevity, we leave out subscript i to indicate different parents.

²⁰For comparison, ? and [Ruhm \(2004\)](#) only consider mothers.

$$C_t^{G2} + p_F \cdot T_t^F + \nu_t^{G2} = w_t^{G2} \cdot h_t^{G2} + \mu_t^{G2} \quad (3)$$

with p_F the net price for an hour of formal child care relative to the market price of C_t ,²¹ w the (shadow) wage rate i.e. the price of time, h the number of hours worked for pay, and μ any non-labor income such as unemployment insurance benefits. We normalize the prices of market consumption C_t to one and assume no saving or borrowing as in [Del Boca et al. \(2014\)](#).²² The time constraint is given by

$$L_t^{G2} + h_t^{G2} + \eta_t^{G2} = H \quad (4)$$

Here, l measures leisure time and H the total time endowment (24 hours per day). The utility function of the grandparents (G1) is given by²³

$$U_t^{G1} = u(C_t^{G1}, L_t^{G1}, C_t^{G2}, L_t^{G2}, A_t) \quad (5)$$

Grandparents are altruistic with respect to both parents and children. We assume no reversed altruism from parents to grandparents and that the altruism from grandparents to parents run through A_t for simplicity. Grandparents' budget and time constraint can be described by

$$C_t^{G1} + \nu_t^{G1} = w_t^{G1} \cdot h_t^{G1} + \mu_t^{G1} \quad (6)$$

and

²¹Our overview of the institutional setting of formal child care in [Section 2.3](#) indicates that p_F can be considered constant over time in our period of analysis.

²²Assuming no saving or borrowing implies that households are assumed to be credit constrained.

²³For brevity, we leave out subscript i to indicate different grandparents.

$$L_t^{G1} + h_t^{G1} + \eta_t^{G1} = H \quad (7)$$

Furthermore, total time devoted to G3 should be positive:

$$\eta_t^{G1} + \eta_t^{G2} + T_t^F > 0 \quad (8)$$

respectively.

3.2 Reform and its intergenerational effect

The UI reform we study in this paper decreases the generosity of UI if one does not change behavior. If one does not comply by increasing time devoted to job search, UI benefits are cut or at least decreased. Therefore, according to our theoretical framework, the reform is a negative shock to μ_t^{G1} after which G1 reconsiders h_t^{G1} (assuming h_t^{G1} is work time as well as job search time) and the other choice variables.

Our main interest in this paper is to analyze $\frac{\partial A_{age=12}}{\partial \mu_{year=2004}^{G1}}$. The theoretical framework is not conclusive on whether $\frac{\partial A_{age=12}}{\partial \mu_{year=2004}^{G1}}$ is positive or negative. Therefore, we have to estimate this empirically. To analyze the intergenerational effects of grandparents on grandchildren's outcomes A_t empirically, we do not assume particular values of the parameters in $u(\cdot)$ and $z(\cdot)$ and estimate a structural model like [Del Boca et al. \(2014\)](#), but instead estimate reduced form models which give us more flexibility regarding particular parameter values assumed. To understand the effects of the reform on grandchildren, we need to understand the extent to which the reform affects h_t^{G1} . Hence, we estimate $\frac{\partial h_t^{G1}}{\partial \mu_{year=2004}^{G1}}$. If $\frac{\partial h_t^{G1}}{\partial \mu_{year=2004}^{G1}} < 0$, which is found by [Hulleger and Van Ours \(2014\)](#); [Lammers et al. \(2013\)](#); [Been and Knoef \(2017\)](#), then the reform changes both the monetary budget and the non-work time available in the time budget of G1. Depending on how G1 responds to the reform by reoptimizing choices of I_t^{G1} this affects G3 directly.

Additionally, potential indirect effects through G2 are at play. To understand these indirect effects involved in estimating $\frac{\partial A_{age=12}}{\partial \mu_{year=2004}^{G1}}$, we analyze the effect of the reform on G2's labor supply $\frac{\partial h_t^{G2}}{\partial \mu_{year=2004}^{G1}}$ and fertility decisions $\frac{\partial k_a}{\partial \mu_{year=2004}^{G1}}$. If both $\frac{\partial h_t^{G1}}{\partial \mu_{year=2004}^{G1}} < 0$ and

$\frac{\partial h_t^{G2}}{\partial \mu_{year=2004}^{G1}} < 0$, then it is likely that $\frac{\partial T_t^F}{\partial \mu_{year=2004}^{G1}} > 0$. Therefore, analyzing the labor supply of G1 and G2 allows us to study the extent to which increasing T_t^F implies better quality inputs such that $\frac{\partial A_{age=12}}{\partial T_t^F} > 0$. In order to understand $\frac{\partial h_t^{G2}}{\partial \mu_{year=2004}^{G1}}$, it is important to understand how G2 responds to the reform by delaying fertility decisions as G2 may postpone having kids till G1's retirement such that h_t^{G2} does not have to get adjusted. Therefore, we provide analyses regarding $\frac{\partial k_a}{\partial \mu_{year=2004}^{G1}}$.

4 Data & definitions

4.1 Data

We use administrative panel data from Statistics Netherlands which contains all Dutch citizens. In this data, individuals can be linked to their parents based on a unique identification number.²⁴ This allows us to construct a linked dataset containing information on three subsequent generations: grandparents (1st generation, henceforth G1), parents (2nd generation, henceforth G2), and grandchildren (3rd generation, henceforth G3). Our sample consists of grandchildren whose grandparents were aged between 50 and 63 years old in the period 1999-2007.²⁵ Information on demographic characteristics includes gender, age, number of children, whether they have a partner, and whether they have an immigrant background. For every individual in each of the three generations we can observe various socioeconomic characteristics by merging several data sources from Statistics Netherlands.

An overview of the timeline of the data is described in Figure 1. Labour market information of G1 is available for the years 1990-2016 (orange bar). Labour market information of G2 is available for the years 1990-2016 (blue bar). The test score of G3 is available for the years 2006-2019 (green bar). Since G1's test is taken at the age of 12 and we restrict our sample to those G3's aged 50-63 to identify the effect of the 2004 reform, we are left with a final sample that spans the years 1990-2007.

The labour market status of the grandparents is defined based on their main income source. Information on the various income sources is available from 1999 to 2016, and includes earnings from paid employment, income from self-employment, unemployment insurance and other sources of income such as disability insurance, welfare benefits, other benefits and

²⁴Access to these data can be obtained via a remote access facility after a confidentiality agreement with Statistics Netherlands has been signed.

²⁵This is the same age range as considered in [Been and Knoef \(2017\)](#).

pensions. Based on the amount of income from either source, we define the main source of income, and classify an individual as either active or inactive on the labour market.²⁶

4.2 Descriptive statistics

4.2.1 Grandparents - G3

In Table 1, provide general descriptive statistics for G1. It shows that we have about 8.5 million repeated observations in the period 1999-2007 for those aged 50-63 in the Netherlands. The inactive share of this group is about 50%. Most people in G1 have children (G2) and grandchildren (G3) with an average number of about 2 and 5, respectively. In Tables 2-3 we split up these descriptive statistics in the four groups affected and non-affected by the 2004 UI reform. We provide these statistics separately for men and women as their labour supply patterns are typically very different approaching retirement.

In particular, for the cohorts in our sample (e.g. those aged around 57.5 in 2004 at the time of the reform) labor supply at older ages was relatively low among women. Therefore, relatively few women were eligible for unemployment insurance benefits around that age. The Tables provide information separately for individuals in the control group (aged 50-57.5 years old) and treatment group (57.5-63 years old), and for individuals in the control (2000-2003) and treatment period (2004-2010), respectively. Tables 2-3 show that there are no differences in individual and household characteristics within groups and between periods. Differences in demographic characteristics between groups within periods reflect the difference in age that characterise the groups, e.g. grandparents in the treatment group have on average more grandchildren compared to grandparents in the control group due to their age.

Considering labour supply indicators in Tables 2-3, we find that labor market status differed substantially before and after 2004, and even more so for the treated individuals. Among men paid employment increased remarkably, together with a minor increase in self employment, whereas unemployment benefits and inactivity decreased. A similar pattern holds for women, although their average level of employment is much lower and their level of inactivity is much higher than for men. These descriptives suggest that the 2004 UI reform increased labour market activity. We test this formally in Section 6 using a Difference-in-Differences (DID) framework including tests for the identifying assumptions.

²⁶In order to replicate [Been and Knoef \(2017\)](#), we also consider constructing paid employment, self-employment, on unemployment insurance, or inactive from the main source of income.

4.2.2 Mothers - G2

Jumping one generation forward, we provide general descriptive statistics for mothers in G2 in Table 4 including various demographic characteristics, and indicators for labour supply (work dummy, earnings from paid employment and a part time work factor²⁷ and fertility (number of children and the age at first birth). It shows that we have about 5.5 million repeated observations in the period 1999-2007 for those G2 mothers with G1 grandparents aged 50-63 in the Netherlands.

In Tables 5 and 6, we provide descriptives for G2 by G1's treatment and control period and groups for grandfathers and grandmothers, respectively. In terms of demographic characteristics there are no differences within groups across periods. There are, however, differences across groups within periods reflecting the differences in mothers's age, e.g. the number of children is lower in the control as compared to the treatment group within periods. In terms of labour supply, within treatment groups, the part time factor increases indicating an increase in full time work among mothers. Similarly, the incidence of having a job increases within groups and across periods.

4.2.3 Grandchildren - G3

In Figure 2, we present the distribution of the test scores of grandchildren (G3) from a standardized CITO test in 6th grade.²⁸ In particular, we have test score information for overall test performance, as well as for language and math performance. The test scores are standardized with mean zero and standard deviation 1 within cohorts, in the full population of grandchildren. Figure 2 shows the distribution of the test scores by gender and reveals that girls outperform boys in language, and boys outperform girls in math. The gender difference is masked in the total score, containing both language and math scores.

5 Empirical Strategy

We are interested in estimating the causal effect of grandparents' extensive margin labour supply decisions on grandchildren's educational outcomes. To analyze this empirically, we are interested in estimating the following model:

²⁷The factor should be interpreted as follows: the higher the value the the more hours worked

²⁸In the Netherlands, this means that the CITO test is taken at the end of primary school and the score is an important input for decisions related to the level of the secondary school.

$$A_i^{age12} = \delta_0 + Active_i^{G1} \delta_1 + \mathbf{X}_i^{G1} \delta_2 + \mathbf{X}_i^{G3} \delta_3 + \epsilon_i \quad (9)$$

where i is the grandchild G3, A_i^{age12} is G3's test score at age 12, $Active_i^{G1}$ is the G3's G1 activity status at G3's birth, \mathbf{X}_i^{G1} the background characteristics of the grandparent (including age and age², immigrant, having partner, number of G1's children), and \mathbf{X}_i^{G3} the background characteristics of the grandchild (including gender, immigrant and year of test fixed-effects). ϵ_i is the error term.

We are specifically interested in δ_1 , which measures the effect of grandparents extensive margin labour supply on grandchildren's educational outcomes. Interpreting δ_1 causally in this model is difficult due to possible simultaneity in grandchildren's outcomes and grandparents' labour supply choices. For example, less talented children may have less talented grandparents who are more likely to be inactive on the labour market having more time to spend with their grandchildren. In order to interpret δ_1 causally, we use an instrumental variables (IV) estimator. In the first stage, we use the 2004 UI reform in the Netherlands in a Difference-in-Differences (DiD) setting in order to have exogenous variation in activity of G3.

$$Active^{G1} = \beta_0 + G_i P_i \beta_2 + G_i \beta_3 + P_i \beta_4 + \mathbf{X}_i^{G1} \delta_4 + \mathbf{X}_i^{G3} \delta_5 + \varphi_i \quad (10)$$

This first stage is inspired by [Been and Knoef \(2017\)](#) and exploits variation in job search requirements for older unemployed individuals induced by the unemployment insurance reform that came into effect on January 1st, 2004. As of this date, unemployment benefit recipients aged 57.5 and above had to actively search for a job in order to retain their benefits. The reform should be both *valid* and *relevant*. The first is true since the reform has no effect on child development other than through grandparents' labour supply decisions. The second is true if the reform actually affects grandparents' labour supply ($\beta_2 \neq 0$). We specify the treatment group in G_i , which is a dummy for G3's G1 aged 57.5 or above at G3's birth, and the treatment period in P_i , which is a dummy for G3 born after the reform.²⁹ Here, β_2 is the effect of the reform on G3's G1 labour market activity.

The main identification assumption in a standard DID framework would be that the

²⁹Compared to [Been and Knoef \(2017\)](#) we take a binomial instead of multinomial approach and consider a static instead of dynamic model. In our setting this additional heterogeneity is not necessary and we consider the simplified version model as a reference. However, estimating a multinomial dynamic model does not alter our main conclusions (see Tables [A.1](#) and [A.2](#)).

labour market status of the treatment and control group would have evolved in a similar way if the reform had not been introduced, i.e. common trends assumption. In our case the treatment is the introduction of a job search requirement for unemployment benefit recipients aged 57.5 and above, whereas this job search requirement was already in place for younger unemployed. Hence, our setting is a *DID in reverse*, where the introduction of the reform make the two groups more similar rather than more different, since the control group (individuals younger than 57.5) is always treated (Kim and Lee, 2019). In this setting, it is therefore likely that the trend between treatment and control group was different prior to the reform due to the different search requirement imposed. After 1 January 2004, the two groups were subject to the same treatment. Our estimation follows that of a standard DID estimation, but because the identification procedure identifies pre-treatment-period effects rather than post-treatment-period effects, the usual common trend assumption needs to be verified *after* the treatment rather than before. Figures A.3 and A.4 in the Appendix provide evidence that this is indeed the case, as the trend in unemployment insurance between treatment and control groups becomes more similar after the treatment, both for males and females.³⁰

The second stage is implemented as follows

$$A_i^{age12} = \delta_0 + Active_i^{G1} \delta_1 + \mathbf{X}_i^{G1} \delta_2 + \mathbf{X}_i^{G3} \delta_3 + G_i \delta_4 + P_i \delta_5 + \epsilon_i \quad (11)$$

allowing for arbitrary correlation between ϵ_i and φ_i . The parameter of interest δ_1 measures the causal effect of grandparents extensive margin labour supply on grandchildren's educational outcomes.

6 Results

In this Section, we describe our main results. First, we replicate the results obtained by Been and Knoef (2017) in our sample of grandparents and confirm that the reform increased the paid employment of older individuals at the expenses of unemployment benefits and inactivity (first stage of the IV). Second, we estimate the spillover effect of the reform on grandchildren's outcomes (second stage of the IV). Third, we explore potential *direct* mechanisms that can

³⁰Figures A.1 and A.2 in the Appendix show the common trend assumption considering the same dataset as in Been and Knoef (2017). The trends strongly resemble those in Figures A.3 and A.4. In Figures A.5 and A.6 in the Appendix, we show the trends pre- and post-reform trends in mothers' fertility decisions and grandchildren's test scores, respectively.

drive this relationship. And finally, potential *indirect* mechanisms are studied by studying mother’s labour supply and fertility decisions following the 2004 UI reform.

6.1 First stage: The effect of the reform on grandparents

In Table 7 we estimate Equation 10 and show the results of the impact of the reform on grandparents activity. In a simplified version of the model compared to [Been and Knoef \(2017\)](#)³¹ we show that the reform has significantly increased the labour supply of older individuals for G1 males (Column 1). In particular, introducing search requirements in UI has increased labour supply of older males by 5.6%-points. Since this effect is highly significant the assumption of *relevance* of the instrument is likely to hold in the IV.

We do not find such a significant effect for women (Column 2). This result is in line with the earlier work by [Hulleger and Van Ours \(2014\)](#), [Lammers et al. \(2013\)](#), and [Been and Knoef \(2017\)](#) who also showed stronger impact of the reform on male employment than on female employment. This is likely a consequence of the fact that many women in the analyzed cohorts are already retired or can be considered as a home maker at the age of 57.5. Unlike for grandfathers, this result anticipates that the first stage for grandmothers is not going to be strong enough for the IV to work. Therefore, we will only focus on grandfathers in estimating the effect of the UI reform on the educational outcome of grandchildren.

6.2 Second stage: The spillover effect on grandchildren

Given the evidence that the labor market status of G1 grandfathers is affected by the reform, a next step is to estimate the spillover effect this may have had on grandchildren’s educational outcomes. Table 8 shows the results of the estimation of the second stage of the IV in Equations 11.

In column (1), we present the reduced form estimation results and find that the reform has increased G1’s test score by 2.6% of a standard deviation. This coefficient should be interpreted as the Intention-to-Treat (ITT). In column (2), we estimate the naive OLS model in Equation 9 assuming that there is no simultaneity issue. The estimation results suggest that a working grandfather increases G1’s test score by 12.5% of a standard deviation. Taking into account the simultaneity using the IV approach, we show that a working grandfather

³¹In Tables A.1 and A.2 we show the corresponding results when using FE or multinomial logit models similar to [Been and Knoef \(2017\)](#).

increases G1’s test score by 52.1% of a standard deviation in column (3). The F-statistic (= 714.885) indicates that the instrument, i.e. the 2004 UI reform, is strong enough as an instrument to infer a causal relationship from the IV. The first stage and the effect of the instrument on grandfathers’ labour supply is shown in column (4) indicating that the reform increased labour supply by 2.4%-points for the grandfathers considered in our sample of G3.

These suggests that if the increased labour supply of grandparents induced a reduction of the informal child care for their grandchildren, a positive spillover effect of the reform on grandchildren’s outcomes suggests that the informal child care provided by the grandparents has been replaced by higher quality childcare for the grandchildren (either formal care or care provided by the child’s parents (G2)). A simple OLS estimation would underestimate the this effect because of the simultaneity involved in G3’s outcomes and G1’s labour supply.

Although we can not infer a causal relationship for the effect of grandmothers’ labour supply on G3’s outcome because of a weak instruments problem in the first stage, we show the corresponding results for grandmothers in Table 9. Both the ITT and the coefficient from the OLS estimation are relatively smaller than for grandfathers suggesting that the causal effect may be larger for grandfathers than for grandmothers.

A further investigation of the effect of G1’s labour supply on G3’s educational outcomes shows there is no differential effect between educational outcomes in language and math (Figure 6). This is true for both boys and girls with no significant differences between boys and girls (Figure 7). The corresponding estimation results are shown in Table A.3.

Figure 8 shows the results of the exposure to the treatment as the impact of informal child care provided by G1 can have differential effects at different ages of G1. We compare the test score of children depending on the activity status of the grandfathers at their birth up to when G3 is age 5. The effect disappear at age 3 which suggests that G1’s informal care has the most significant impact in the first three years of life. However, it remains difficult to disentangle the exposure and age effects. The corresponding estimation results for DID, OLS and IV are shown in Tables A.4, A.5 and A.6, respectively.

6.2.1 Possible *direct* channels

There may be several mechanisms through which the reform had spillover effects on grandchildren outcomes. The most straightforward channel is that, as a consequence of the reform that increased the labour supply of grandparents, they had less time available to provide informal care to their grandchildren. Although we lack data on informal and formal care

provision, we investigate this channel by considering heterogeneity in the spillover effect by grandchildren's birth order and the total number of children (G2) for each grandparent.

Grandchildren's birth order and the grandparents' total number of children (G2) can be considered a proxy for the direct investment that grandparents can devote to their grandchildren. We might well expect that grandparent spend much more time/resources with their first grandchild as compared to later borns. Figure 9 shows the heterogenous effect of the reform by birth order. The positive effect of the reform is decreasing with birth order, showing that the positive effect is concentrated among grandchildren who are more likely to spend more time with their grandparents. The corresponding estimation results can be found in Table A.7.

In Figure 10, we show similar evidence is provided for the number of G1's children (G2). Grandparents with many children will have less time/resources to devote to all their grandchildren. The effect is larger among those grandparents with fewer children (G2). The corresponding estimation results can be found in Table A.8.

All in all, we find evidence in favor of a direct mechanism, suggesting larger effects among grandchildren whose grandfathers are likely to have a larger investment. This can be interpreted as that the reform increased the labour supply of grandparents at the expenses of the informal child care they provide to their grandchildren, which is then replaced by higher quality alternative child care. Alternative child care can either be provided by the mother or by formal child care. Unfortunately, we cannot observe the use of formal child care for each of our children in the sample but, in the next section, we explore whether the alternative child care is provided by the mother. If mothers' labor supply does not decrease upon the reform, it is likely that formal child care has increased in response to fewer time investments by the grandfather according to Equation 8.

6.2.2 Possible *indirect* channels

In addition to a direct impact of grandfather labor market status on grandchildren's outcomes, there may be an *indirect* mechanism driving the relationship between the unemployment reform for grandparents and grandchildren outcomes due to the reform affecting mothers' choices. There are two different channels we consider here. Firstly, the raise of grandparents' employment (and relatedly the prospective reduction in informal care provided by the grandfather) might lead to a change in mothers' fertility decision, whereby mothers might decide to delay fertility up to the grandparents' retirement (Haan and Wrohlich, 2010;

Bauernschuster et al., 2016; Bick, 2016; Adda et al., 2013). To study this, we estimate the ITT on mothers' labour supply decisions

$$h_{t,i}^{G2} = \gamma_0 + G_i P_i \gamma_2 + G_i \gamma_3 + P_i \gamma_4 + \mathbf{X}_i^{G1} \gamma_4 + \mathbf{X}_i^{G3} \gamma_5 + \varepsilon_i \quad (12)$$

where $h_{t,i}^{G2}$ measures the labour supply of the mother.

Secondly, informal child care provision of grandparents may be substituted by other care. This can be care provided by the mother (in which case her labor supply goes down) or by a formal care provider (in which case maternal labour supply remains unaffected). Several papers have studied the impact of grandparents informal childcare provision on mother's labour supply (Posadas and Vidal-Fernandez, 2013; Zanella, 2017; Bratti et al., 2018). This literature suggests that an increase in grandparents' labour supply decreases mother's labour supply due to the lower informal child care provided by grandparents. On the other hand, there is also evidence from Norway showing that the introduction of subsidized child care did not affect the labour supply of mothers because the formal child care replaced the informal child care, thus suggesting a substitution between formal and informal child care without affecting mother's labour supply Havnes and Mogstad (2011a).

To study this, we estimate the ITT on mothers' fertility decisions

$$k_{a,i} = \theta_0 + G_i P_i \theta_2 + G_i \theta_3 + P_i \theta_4 + \mathbf{X}_i^{G1} \theta_4 + \mathbf{X}_i^{G3} \theta_5 + \phi_i \quad (13)$$

where $k_{a,i}$ is the fertility decision of the mother.

Table 10 shows the ITT of the reform on mothers' outcomes regarding labour supply (γ_2) and fertility (θ_2).³² We focus on various indicators for mother's labour supply: employment incidence (dummy) (Column 1), working full time (dummy) (Column 2), and yearly log earnings **is this correct?** (Column 3). The results suggest that the reform had a positive impact on mother's labour supply in terms of (i) increased employment incidence by 1.3%-points (Column 2); (ii) increased full time work incidence by 1.3%-points (Column 3), and (iii) increased earnings by 7.7%-points. In Table A.9 we show that this positive average effect is primarily driven by by lower educated mothers which corroborates the idea that children from families with a lower socioeconomic status benefit relatively more from formal child care. However, we should be careful in interpreting results that include mothers' education

³²In line with the labour supply literature we find smaller (but still significant) effects for fathers. See Table A.11. Also, when excluding separated fathers (Table A.12).

as using the information on education leaves us with a selective sample as shown in Table A.10.

Maternal fertility decisions are proxied by the number of children (Column 4) and the age at which they first gave birth (Column 5). We find that the reform slightly decreased the number of children with -0.006 children, on average. We find stronger effects for mothers postponing fertility decisions, i.e. mothers tend to delay their first child as a response to the reform by 0.505 years. Here, we should not that the positive effect on employment can partly be the result of the negative effects on fertility. In Table 11 we rule out that the effect is driven by those G3 conceived after the reform. This suggest that our results are not driven by selection into fertility.

Our results of the effects of G3's labour supply on G2's maternal labour supply are consistent with the existing evidence for Norway [Havnes and Mogstad \(2011a\)](#). Our results suggest that mothers do not replace the informal child care from grandparents by reducing their labour supply and thereby increasing their own informal child care. This is also consistent with the result that mothers do not decrease their labor supply following cuts in child care benefits ([Been and Jongen, 2017](#)). Instead, they rather tend to substitute between informal and formal child care.

7 Robustness checks and sensitivity analysis

To be completed

8 Conclusions

In this paper, we analyze the effect of old-age labour supply on grandchildren's educational outcomes by studying the multigenerational impact of a reform in unemployment insurance targeted at older workers in the Netherlands. We make two important contributions to the existing literature. Firstly, our study is the first to consider three subsequent generations available in administrative data in order to analyze the direct effects of grandparents' labor supply decisions on grandchildren's educational outcomes. For this, we use unique administrative data that covers three generations within families. Secondly, we provide detailed analyses of potential direct and indirect mechanism driving our results which adds to the scarce literature on the impact of informal child care provided by the grandparents on

grandchildrens' outcomes.

To infer causal estimates of the effect of grandparents' labour supply on grandchildren's outcomes, we use an IV-approach exploiting the reform as an instrumental variable. The reform introduced mandatory job search requirements for unemployment of 57.5 years and older on the 1st of January 2004. Prior research has shown that this significantly reduced the inflow to unemployment and increased the outflow from unemployment thereby increasing labour supply of older workers (Hullege and Van Ours, 2014; Lammers et al., 2013; Been and Knoef, 2017). This is confirmed by our analysis which suggest that the reform functions as a strong instrument in our IV-approach. We find substantial positive effects of grandparents' labour supply on grandchildren's educational outcomes, measured by test scores at the age of 12, as large as about 0.5 standard deviation. This effect is not driven by mothers postponing fertility decisions or decreasing labour supply. We find that this effect is primarily driven by grandparents who are most likely to have spend time with their grandchildren. Therefore, our results suggest that informal child care is primarily substituted by formal child care with formal child care being a higher-quality investment in children. This is especially true for children from families with a lower socioeconomic background. This result is robust to many sensitivity checks and heterogeneity analyses.

Our results are important as they show that there are strong multigenerational effects of labour supply decisions. Such effects should be taken into account in designing future social policy as the costs and benefits of social policy may exceed the targeted population. Additionally, our results suggest that formal child care has a positive effect on children's development. Based on these results, the use of formal child care could be stimulated because of positive effects on both maternal labour supply and child investments. However, policy should bear in mind the heterogeneous effects of the positive influence of formal child care on child development. Formal child care may especially be further stimulated for children from families with a lower socioeconomic status.

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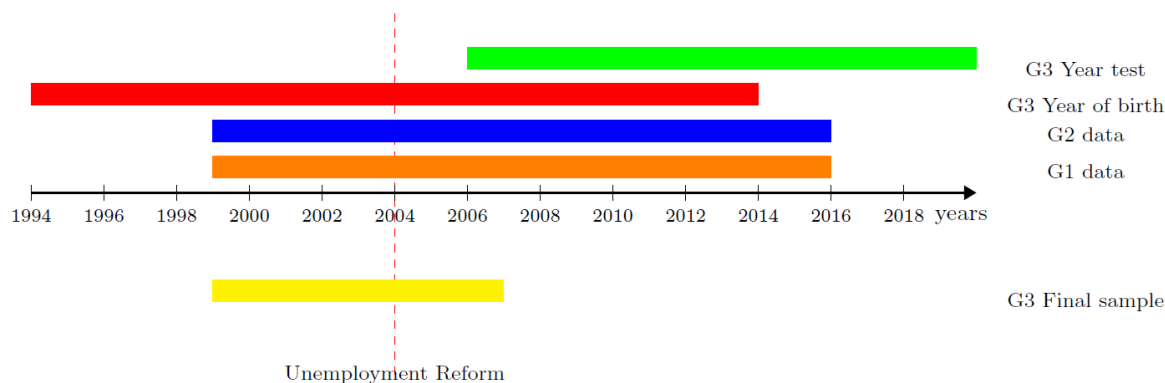
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9 Tables and Figures



Notes: The figure illustrates the timing of measurements of G1, G2 and G3 outcomes from SSB.

Figure 1: Timeline of the data

Table 1: G1 Descriptive Statistics: Household and individual characteristics

	Mean	Sd	Observations
Female	0.538	0.499	8555836
Grandparent age	57.121	3.635	8555836
Year of birth	1945	3.733	8555836
Immigrant	0.137	0.344	8555836
Partner	0.885	0.319	8223101
Number of children	2.151	1.058	8555836
Number of grandchildren	4.869	3.398	8555836
Paid Employment	0.415	0.493	8555836
Self Employment	0.059	0.236	8555836
Unemployment	0.023	0.149	8555836
Inactive	0.503	0.500	8555836
Treat Group (57.5-63)	0.528	0.499	8555836
Treat Period (2004-2007)	0.402	0.490	8555836

Table 2: G1 Men - Descriptive Statistics: Household and individual characteristics by treatment

	(2000-2003) Control Period				(2004-2007) Treatment Period			
	Age 50-57.5		Age 57.5-63		Age 50-57.5		Age 57.5-63	
	Control Group		Treatment Group		Control Group		Treatment Group	
	Mean	Sd	Mean	Sd	Mean	Sd	Mean	Sd
Grandparent age	53.775	2.053	59.866	1.836	54.517	1.888	60.263	1.840
Year of birth	1947.025	2.316	1941.343	2.201	1950.648	2.084	1945.211	2.066
Immigrant	0.135	0.341	0.141	0.348	0.157	0.364	0.129	0.335
Partner	0.927	0.260	0.927	0.261	0.913	0.282	0.920	0.271
Children in the hh	0.495	0.500	0.249	0.433	0.436	0.496	0.210	0.407
Number of children	2.099	1.005	2.235	1.127	2.159	1.048	2.099	1.008
Number of grandchildren	4.696	3.150	5.141	3.708	4.895	3.297	4.699	3.189
Paid Employment	0.700	0.458	0.420	0.494	0.671	0.470	0.432	0.495
Self Employment	0.086	0.281	0.073	0.260	0.082	0.275	0.069	0.254
Unemployment	0.012	0.109	0.048	0.213	0.024	0.152	0.041	0.198
Inactive	0.202	0.401	0.459	0.498	0.223	0.416	0.457	0.498
Observations	1304459		1102756		460123		1084322	

Table 3: G1 Women - Descriptive Statistics: Household and individual characteristics by treatment

	(2000-2003) Control Period				(2004-2007) Treatment Period			
	Age 50-57.5		Age 57.5-63		Age 50-57.5		Age 57.5-63	
	Control Group		Treatment Group		Control Group		Treatment Group	
	Mean	Sd	Mean	Sd	Mean	Sd	Mean	Sd
Grandparent age	53.584	2.078	59.822	1.838	54.331	1.941	60.137	1.847
Year of birth	1947.292	2.350	1941.416	2.216	1950.887	2.123	1945.380	2.081
Immigrant	0.136	0.343	0.132	0.338	0.164	0.370	0.126	0.332
Partner	0.871	0.335	0.839	0.368	0.859	0.348	0.835	0.371
Children in the hh	0.406	0.491	0.190	0.392	0.355	0.479	0.155	0.362
Number of children	2.101	1.022	2.288	1.154	2.156	1.069	2.113	1.028
Number of grandchildren	4.716	3.265	5.292	3.814	4.894	3.400	4.752	3.298
Paid Employment	0.391	0.488	0.189	0.392	0.424	0.494	0.227	0.419
Self Employment	0.053	0.225	0.036	0.186	0.046	0.210	0.035	0.184
Unemployment	0.010	0.100	0.018	0.133	0.018	0.131	0.019	0.135
Inactive	0.545	0.498	0.757	0.429	0.512	0.500	0.719	0.450
Observations	1594196		1112595		681393		1215992	

Table 4: G2 Women - Descriptive Statistics: Household and individual characteristics

	Mean	Sd	Observations
Mother age	30.697	4.355	5509506
Year of birth	1971	4.316	5509506
Immigrant	0.147	0.354	5509506
Partner	0.910	0.286	5478088
Number of children	1.362	1.074	5509506
Mother's age at 1st birth	27.666	3.943	5509506
Employment	0.776	0.417	5509506
Wage	21697.299	14461.036	4273581
Full time factor	0.624	0.286	3124712
Treat Group (57.5-63)	0.503	0.500	5509506
Treat Period (2004-2007)	0.377	0.485	5509506

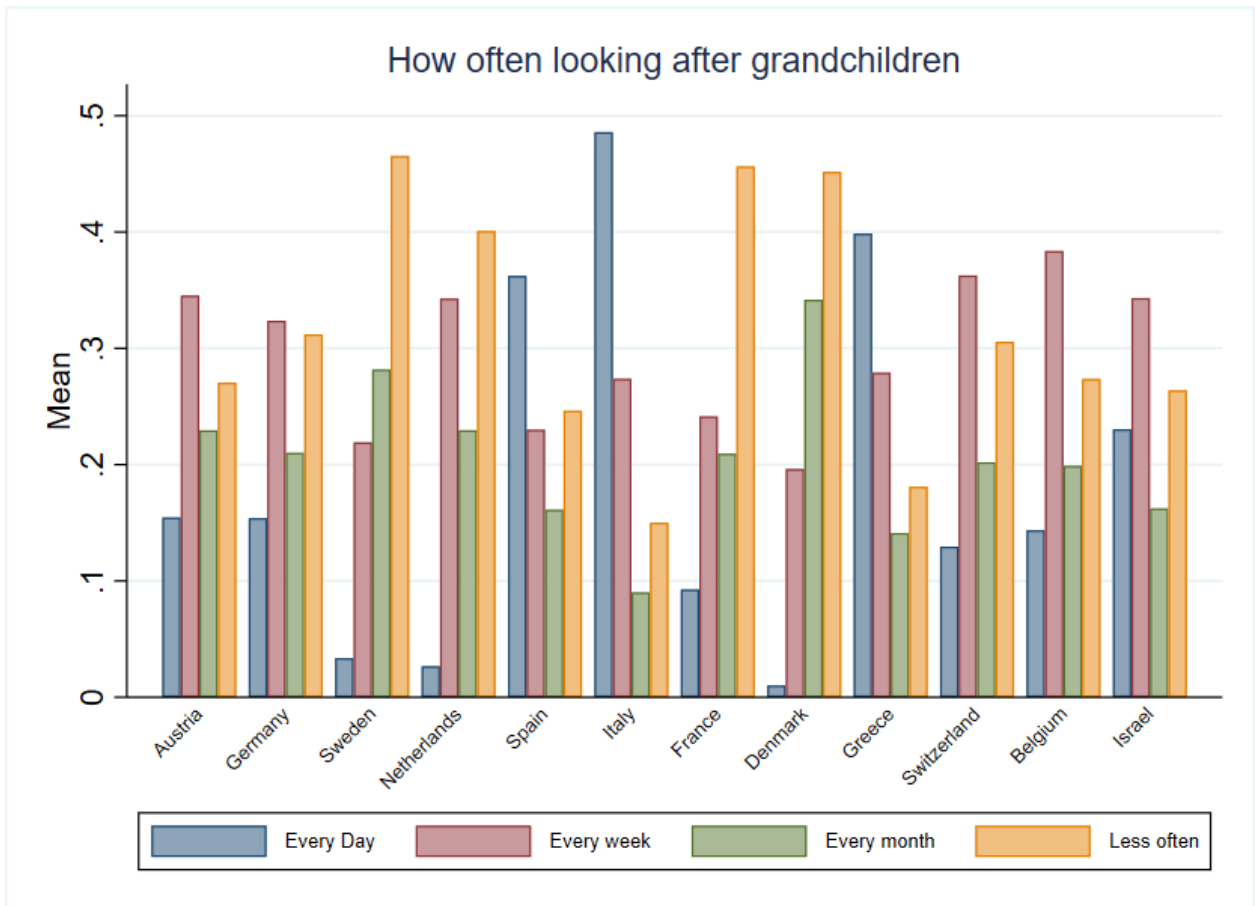
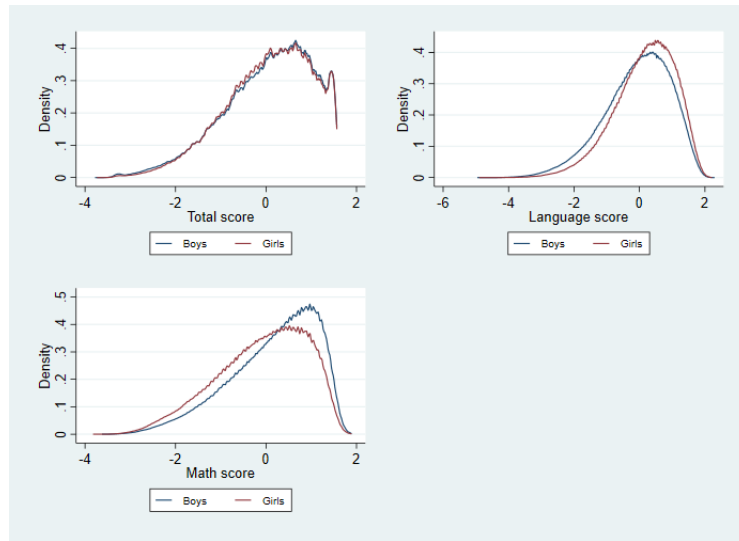
Table 5: G2 Women - Descriptive Statistics: G2 characteristics - By G1 men

	(2000-2003) Control Period				(2004-2007) Treatment Period			
	Age 50-57.5		Age 57.5-63		Age 50-57.5		Age 57.5-63	
	Control Group		Treatment Group		Control Group		Treatment Group	
	Mean	Sd	Mean	Sd	Mean	Sd	Mean	Sd
Mother age	27.469	3.556	31.427	3.741	28.920	3.529	33.202	3.645
Year of birth	1973.315	3.621	1969.588	3.775	1976.305	3.603	1972.228	3.680
Immigrant	0.120	0.325	0.132	0.338	0.153	0.360	0.121	0.326
Partner	0.910	0.286	0.924	0.265	0.913	0.282	0.929	0.257
Number of children	0.841	0.973	1.374	1.110	1.465	0.932	1.818	0.940
Mother's age at 1st birth	27.232	3.645	28.600	3.959	25.551	3.530	27.682	3.740
Employment	0.821	0.384	0.763	0.425	0.756	0.430	0.751	0.433
Wage	21230.423	13588.060	22389.338	14597.048	19248.929	12220.483	21491.349	14731.898
Full time factor	0.675	0.303	0.632	0.293	0.598	0.285	0.586	0.265
Observations	1057823		994148		394419		742011	

Table 6: G2 Women - Descriptive Statistics: G2 characteristics - By G1 women

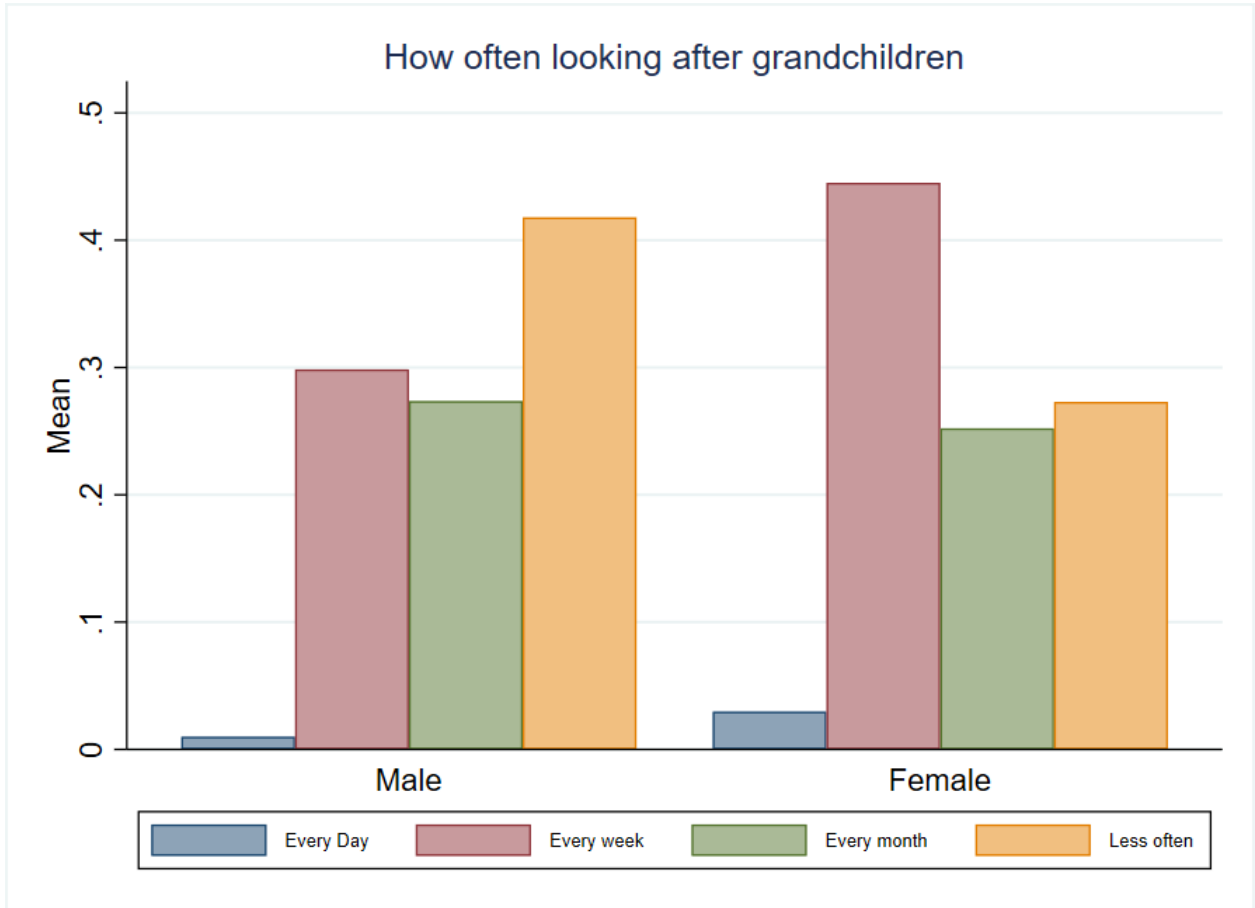
	(2000-2003) Control Period				(2004-2007) Treatment Period			
	Age 50-57.5		Age 57.5-63		Age 50-57.5		Age 57.5-63	
	Control Group		Treatment Group		Control Group		Treatment Group	
	Mean	Sd	Mean	Sd	Mean	Sd	Mean	Sd
Mother age	28.889	3.639	32.931	3.773	30.374	3.609	34.720	3.692
Year of birth	1972.022	3.704	1968.186	3.793	1974.949	3.674	1970.775	3.729
Immigrant	0.163	0.370	0.163	0.369	0.211	0.408	0.164	0.370
Partner	0.891	0.311	0.906	0.292	0.889	0.314	0.905	0.293
Number of children	1.007	1.033	1.537	1.120	1.580	0.937	1.904	0.936
Mother's age at 1st birth	27.717	3.838	29.049	4.176	26.127	3.727	28.161	3.956
Employment	0.806	0.395	0.752	0.432	0.756	0.429	0.749	0.434
Wage	22153.396	14764.279	22956.485	15772.464	20322.065	12950.127	22669.572	16144.676
Full time factor	0.671	0.300	0.625	0.288	0.604	0.280	0.594	0.263
Observations	848257		532569		438725		501554	

Figure 2: G3 Grandchildren - Test score - by gender



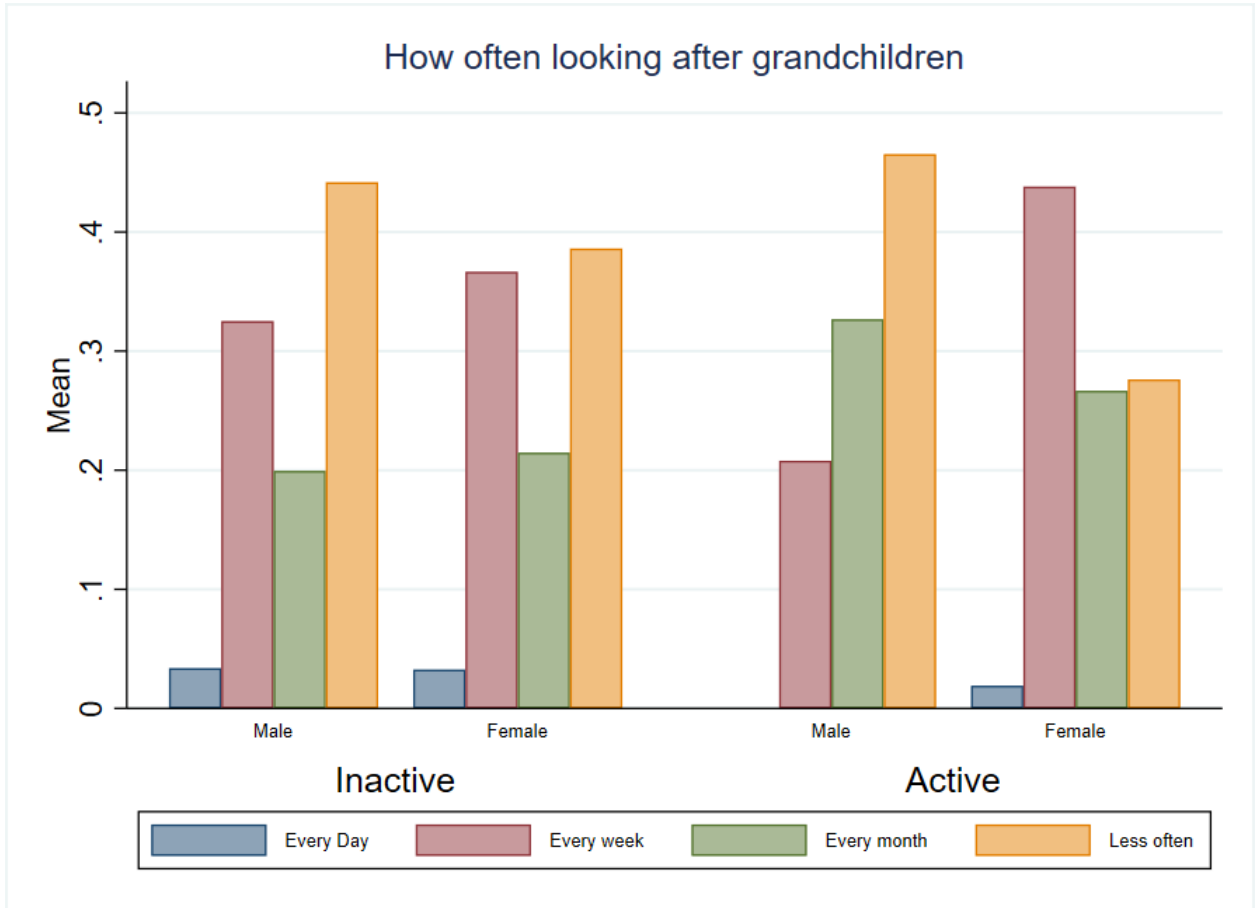
Notes: The figure shows the mean grandparents reply to how often do you look after your grandchildren. grandchildren

Figure 3: Grandparents time with grandchildren across countries



Notes: The figure shows the mean grandparents reply to how often do you look after your grandchildren.

Figure 4: Grandparents time with grandchildren in the Netherlands - by gender of grandparents



Notes: The figure shows the mean grandparents reply to how often do you look after your grandchildren

Figure 5: Grandparents time with grandchildren in the Netherlands - by gender of grandparents and activity status

Table 7: The impact of the reform on G1 activity status - By gender - OLS

	(1)	(2)
	Men	Women
Treat group (Age 57.5-63)	0.018*** (0.001)	0.004*** (0.001)
Treat Period (2004-2007)	-0.004*** (0.001)	0.052*** (0.001)
Treat group x Treat period	0.056*** (0.001)	0.001 (0.001)
G1 Immigrant	-0.161*** (0.002)	-0.069*** (0.002)
G1 age	0.603*** (0.003)	0.175*** (0.003)
G1 age sq	-0.006*** (0.000)	-0.002*** (0.000)
G1 Partner	0.156*** (0.002)	-0.021*** (0.001)
G1 N Children	-0.011*** (0.001)	-0.023*** (0.000)
Observations	3763279	4459822
R squared	0.177	0.078

Table 8: The impact of G1 being active on G3 outcomes - grandfathers

	(1)	(2)	(3)	(4)
	DID	OLS	IV	First Stage
Treat group (Age 57.5-63)	-0.000 (0.004)	0.004 (0.004)	-0.011** (0.005)	0.017*** (0.002)
Treat Period (2004-2010)	0.509*** (0.008)	0.521*** (0.007)	0.508*** (0.007)	0.021*** (0.003)
Treat group x Treat Period	0.026*** (0.004)			0.024*** (0.002)
Active		0.125*** (0.002)	0.521*** (0.087)	
Observations	942741	942741	942741	942741
R squared	0.026	0.029		0.096
Endogeneity test			0.000	
F-stat			714.885	

Table 9: The impact of G1 being active on G3 outcomes - grandmothers

	(1)	(2)	(3)	(4)
	DID	OLS	IV	First Stage
Treat group (Age 57.5-63)	0.001 (0.004)	0.007** (0.003)	0.067 (0.110)	0.004** (0.002)
Treat Period (2004-2010)	0.507*** (0.007)	0.514*** (0.007)	1.225 (1.242)	0.039*** (0.003)
Treat group x Treat Period	0.020*** (0.004)			-0.001 (0.002)
Active		0.100*** (0.002)	-18.565 (32.616)	
Observations	1128825	1128825	1128825	1128825
R squared	0.025	0.028		0.078
Endogeneity test			0.000	
F-stat			0.331	

Figure 6: The impact of G1 being active on G3 outcomes - by subject - IV

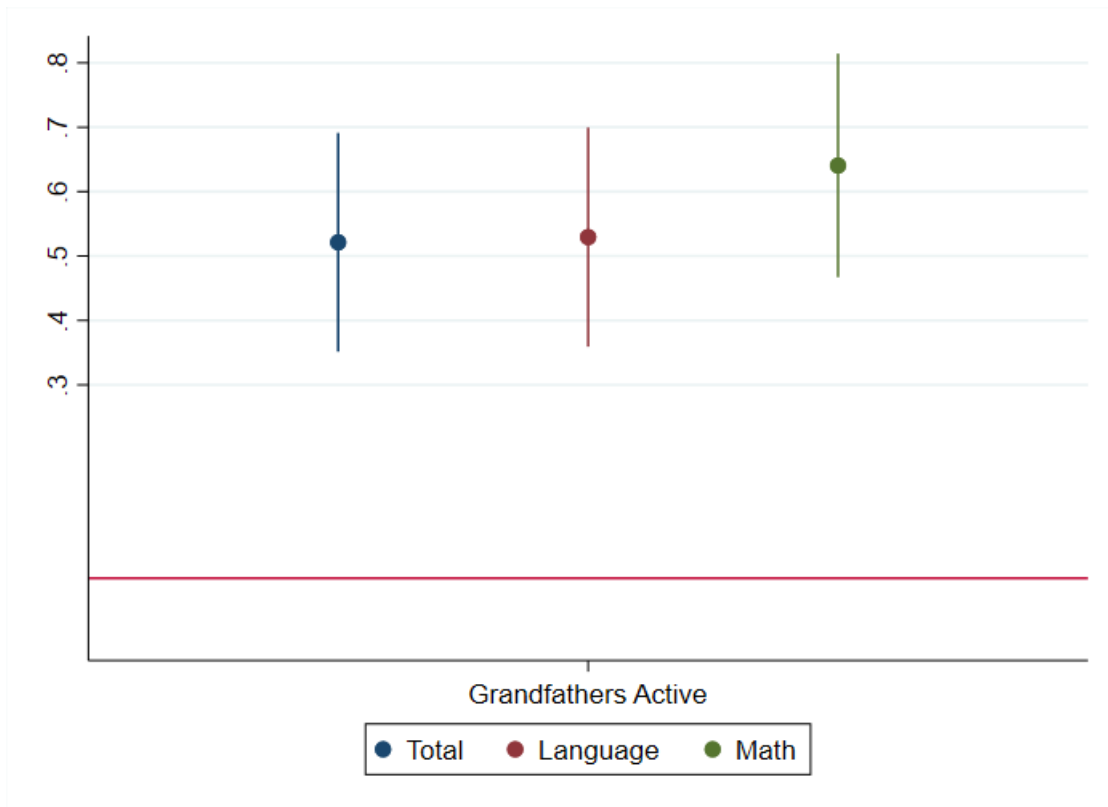


Figure 7: The impact of G1 being active on G3 outcomes - by subject and gender

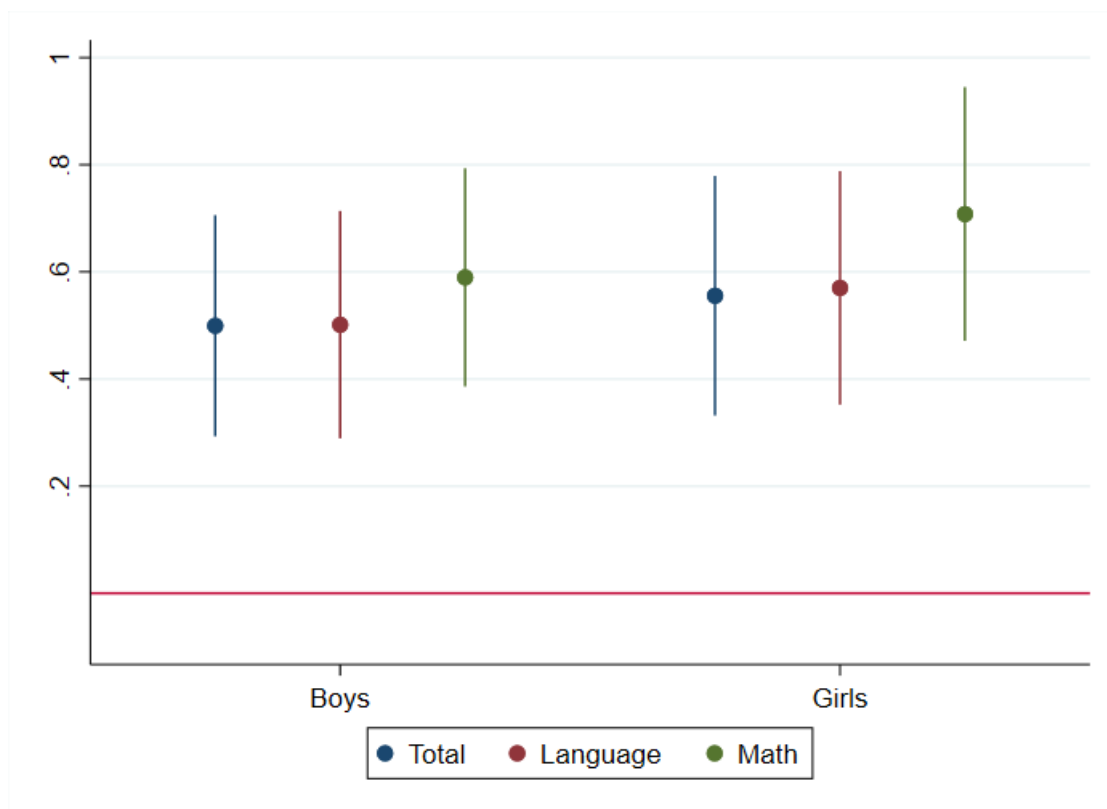


Figure 8: The impact of G1 being active on G3 outcomes - Exposure and Age effect - IV

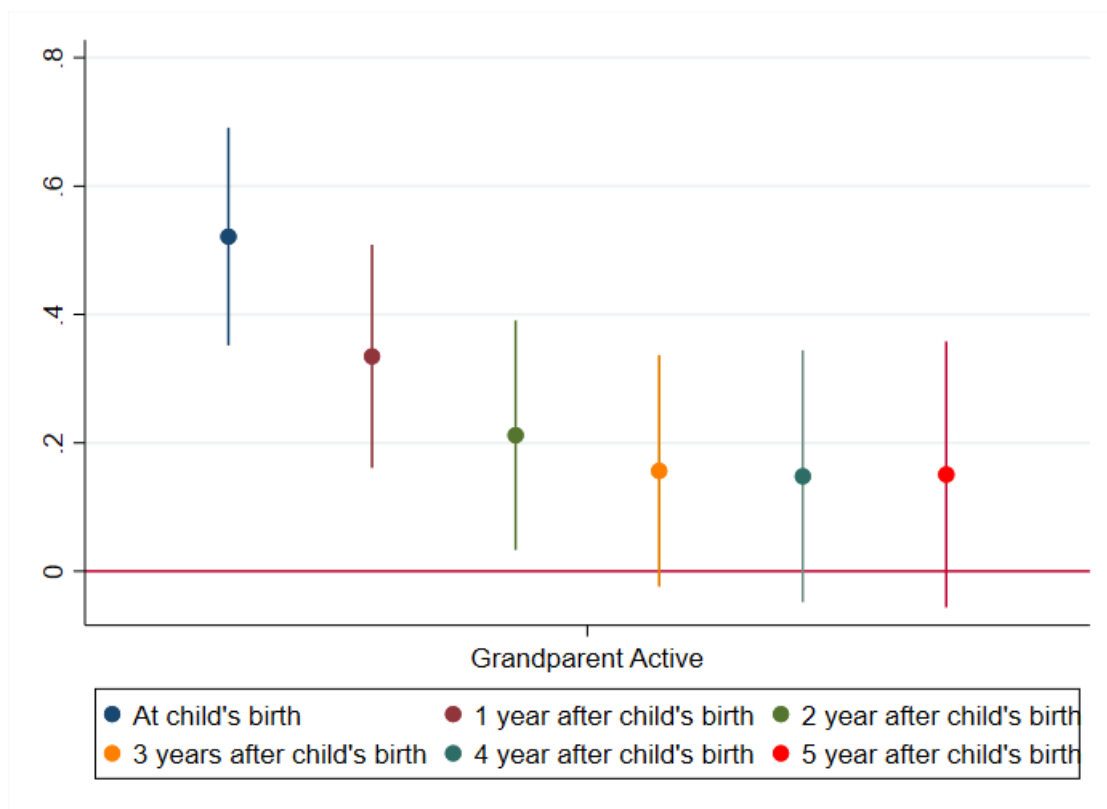


Figure 9: The impact of G1 being active on G3 outcomes - Birth order - IV

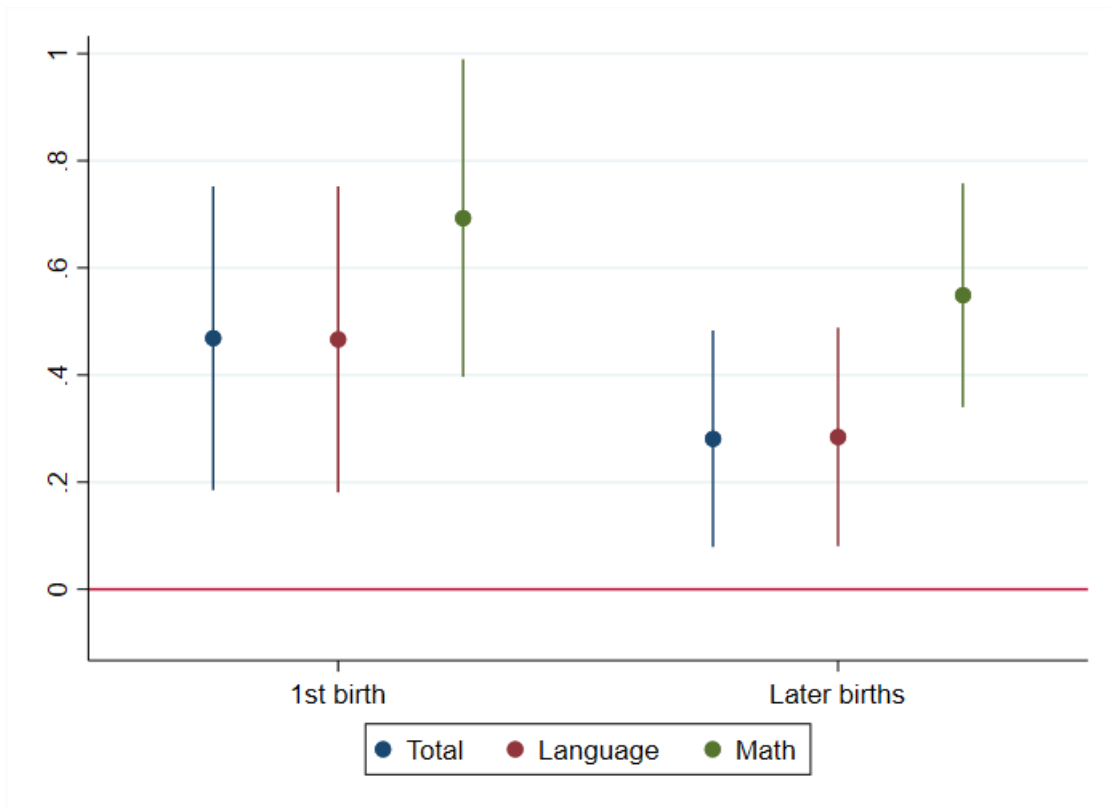


Figure 10: The impact of G1 being active on G3 outcomes - Number of G1's children - IV

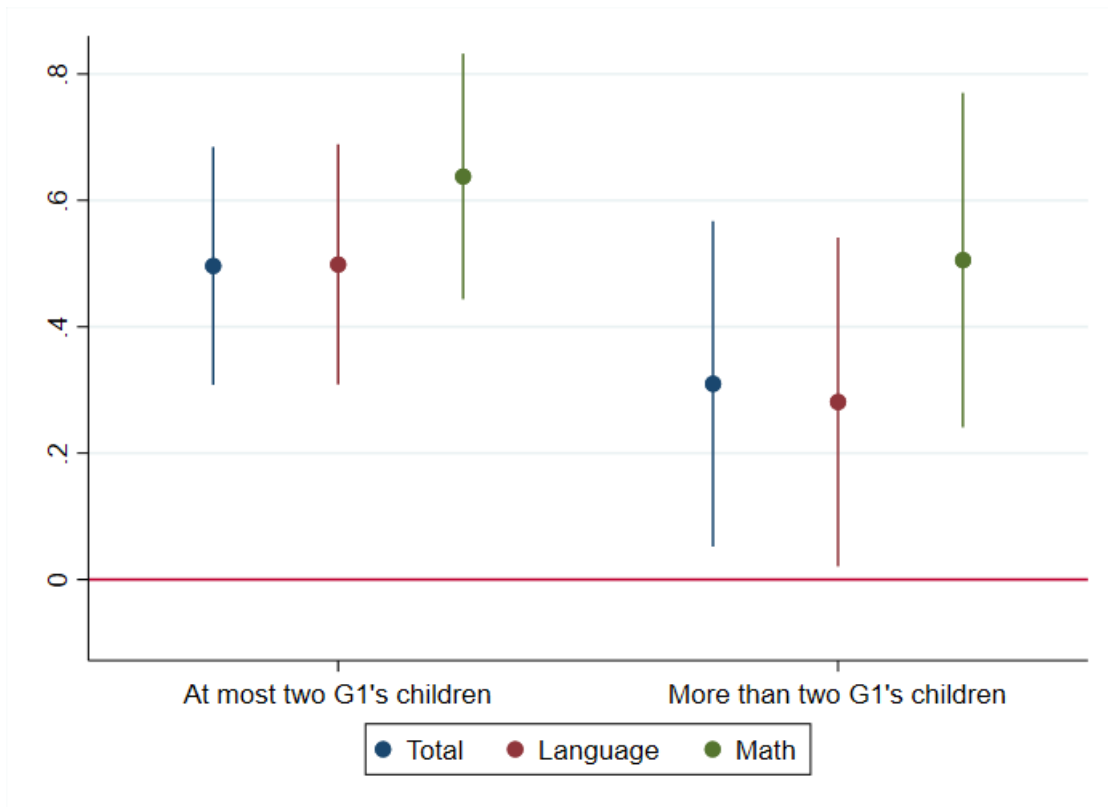


Table 10: The impact of the reform on G2 outcomes - Fixed effect models

	(1) Employment	(2) Full time	(3) Earnings	(4) Nchild	(5) Age at first birth
Treat group (Age 57.5-63)	-0.007*** (0.001)	-0.015*** (0.001)	-0.056*** (0.002)	0.028*** (0.001)	-0.020 (0.022)
Treat Period (2004-2010)	-0.026*** (0.001)	-0.041*** (0.001)	-0.146*** (0.002)	0.063*** (0.001)	-0.300*** (0.017)
Treat group × Treat Period	0.013*** (0.001)	0.013*** (0.001)	0.077*** (0.002)	-0.006*** (0.001)	0.505*** (0.025)
Observations	3670783	2147914	2853469	3670783	253574
R squared	0.016	0.063	0.052	0.582	0.275

Table 11: The impact of the reform on G3 outcomes - Is it a selection effect due to fertility?

	(1)	(2)
	DID	DID
Treat group (Age 57.5-63)	0.021*** (0.007)	0.004 (0.007)
Treat Period (2004-2010)		0.485*** (0.009)
Treat group × Treat Period		0.018** (0.007)
Conceived after reform=1	0.602*** (0.009)	
Treat group × Conceived after reform=1	-0.006 (0.007)	
Observations	325624	325624
R squared	0.058	0.054

A Appendix

Table A.1: The impact of the reform on G1 activity status - By gender - FE

	(1)	(2)
	Men	Women
Treat group (Age 57.5-63)	0.045*** (0.001)	0.012*** (0.001)
Treat Period (2004-2007)	-0.017*** (0.001)	-0.009*** (0.001)
Treat group x Treat period	0.003*** (0.001)	0.000 (0.001)
G1 Immigrant	0.000 (.)	0.000 (.)
G1 age	0.523*** (0.002)	0.185*** (0.002)
G1 age sq	-0.005*** (0.000)	-0.002*** (0.000)
G1 Partner	0.011*** (0.002)	-0.011*** (0.001)
gp_nchild	0.000 (.)	0.000 (.)
Observations	3763279	4459822
R squared	0.186	0.071

Table A.2: The impact of the reform on G1 activity status - By gender - Multinomial Logit
- Reference category Inactive

	(1)	(2)
	Men	Women
<hr/>		
paid_employed		
Treat group (Age 57.5-63)	0.095*** (0.011)	0.140*** (0.010)
Treat Period (2004-2007)	-0.174*** (0.013)	-0.088*** (0.012)
Treat group x Treat period	0.064*** (0.011)	-0.017 (0.011)
<hr/>		
self_employed		
Treat group (Age 57.5-63)	-0.030 (0.019)	-0.063*** (0.024)
Treat Period (2004-2007)	0.037 (0.023)	0.071*** (0.027)
Treat group x Treat period	0.116*** (0.020)	0.029 (0.024)
<hr/>		
unemployment_insurance		
Treat group (Age 57.5-63)	0.797*** (0.023)	0.641*** (0.026)
Treat Period (2004-2007)	0.537*** (0.026)	0.513*** (0.029)
Treat group x Treat period	-0.523*** (0.022)	-0.464*** (0.024)
<hr/>		
inactive		
Treat group (Age 57.5-63)	0.000 (.)	0.000 (.)
Treat Period (2004-2007)	0.000 (.)	0.000 (.)
Treat group x Treat period	0.000 (.)	0.000 (.)
<hr/>		
Observations	ii 3209005	3814923

Table A.3: The impact G1 being active on G3 outcomes - by gender

	(1)	(2)	(3)
	DID	OLS	IV
Treated x Boys	0.026*** (0.006)		
Treated x Girls	0.027*** (0.006)		
Active x Boys		0.121*** (0.003)	0.499*** (0.105)
Active x Girls		0.129*** (0.003)	0.556*** (0.114)
Treat Group x Boys	-0.000 (0.005)	0.003 (0.004)	-0.018 (0.020)
Treat Group x Girls	-0.001 (0.005)	0.005 (0.004)	-0.004 (0.019)
Treat Period x Boys	0.479*** (0.009)	0.491*** (0.008)	0.478*** (0.008)
Treat Period x Girls	0.540*** (0.009)	0.552*** (0.008)	0.538*** (0.008)
Girls=1	-0.022*** (0.004)	-0.028*** (0.005)	-0.065 (0.104)
Observations	942741	942741	942741
R squared	0.026	0.029	-0.004
Endogeneity test			0.000
F-stat			275.047

Table A.4: The impact of G1 being active on G3 outcomes - Exposure and Age effect - DID

	(1)	(2)	(3)	(4)	(5)	(6)
	yob	yob1	yob2	yob3	yob4	yob5
Treat group (Age 57.5-63)	-0.000 (0.004)	0.001 (0.004)	0.005 (0.004)	0.002 (0.005)	0.005 (0.005)	0.003 (0.006)
Treat Period (2004-2010)	0.509*** (0.008)	0.491*** (0.008)	0.473*** (0.008)	0.451*** (0.008)	0.428*** (0.009)	0.407*** (0.010)
Treat group x Treat Period	0.026*** (0.004)	0.016*** (0.004)	0.010** (0.005)	0.008 (0.005)	0.008 (0.005)	0.008 (0.006)
Observations	942741	925668	879541	806112	715188	614962
R-squared	0.026	0.031	0.031	0.033	0.034	0.034

Table A.5: The impact of G1 being active on G3 outcomes - Exposure and Age effect - OLS

	(1)	(2)	(3)	(4)	(5)	(6)
	yob	yob1	yob2	yob3	yob4	yob5
Treat group (Age 57.5-63)	0.004 (0.004)	0.003 (0.004)	0.004 (0.004)	0.001 (0.004)	0.005 (0.005)	0.002 (0.005)
Treat Period (2004-2010)	0.521*** (0.007)	0.497*** (0.007)	0.476*** (0.007)	0.452*** (0.007)	0.430*** (0.008)	0.409*** (0.008)
Active	0.125*** (0.002)	0.125*** (0.002)	0.122*** (0.002)	0.121*** (0.002)	0.122*** (0.003)	0.123*** (0.003)
Observations	942741	925668	879541	806112	715188	614962
R-squared	0.029	0.034	0.034	0.036	0.037	0.038

Table A.6: The impact of G1 being active on G3 outcomes - Exposure and Age effect - IV

	(1)	(2)	(3)	(4)	(5)	(6)
	yob	yob1	yob2	yob3	yob4	yob5
Treat group (Age 57.5-63)	-0.011** (0.005)	-0.004 (0.005)	0.001 (0.005)	-0.001 (0.006)	0.004 (0.006)	0.002 (0.006)
Treat Period (2004-2010)	0.508*** (0.007)	0.490*** (0.006)	0.474*** (0.006)	0.451*** (0.007)	0.429*** (0.007)	0.408*** (0.008)
Active	0.521*** (0.087)	0.335*** (0.089)	0.212** (0.091)	0.156* (0.092)	0.148 (0.100)	0.151 (0.106)
Observations	942741	925668	879541	806112	715188	614962
Endogeneity test	0.000	0.000	0.000	0.000	0.000	0.000
F-stat	714.885	664.328	621.513	603.790	505.314	448.112

Table A.7: The impact of G1 being active on G3 outcomes - by birth order

	(1)	(2)	(3)
	DID	OLS	IV
Treated x 1st Birth	0.022*** (0.008)		
Treated x Later births	0.013** (0.006)		
Active x 1st Birth		0.097*** (0.004)	0.469*** (0.145)
Active x Later births		0.126*** (0.003)	0.281*** (0.103)
Treat Group x 1st Birth	0.017*** (0.005)	0.017*** (0.005)	0.052* (0.031)
Treat Group x Later births	-0.001 (0.004)	0.001 (0.004)	-0.023* (0.012)
Treat Period x 1st Birth	0.476*** (0.009)	0.486*** (0.008)	0.476*** (0.008)
Treat Period x Later births	0.528*** (0.008)	0.531*** (0.007)	0.527*** (0.008)
Later births=1	-0.180*** (0.004)	-0.195*** (0.005)	-0.011 (0.128)
Observations	942741	942741	942741
R squared	0.032	0.035	0.024
Endogeneity test			0.020
F-stat			302.916

Table A.8: The impact of G1 being active on G3 outcomes - Number of G1's children

	(1)	(2)	(3)
	DID	OLS	IV
Treated x Few	0.027*** (0.005)		
Treated x Many	0.013* (0.008)		
Active x Few		0.088*** (0.003)	0.496*** (0.096)
Active x Many		0.193*** (0.004)	0.310** (0.131)
Treat Group x Few	0.025*** (0.004)	0.021*** (0.004)	0.041*** (0.014)
Treat Group x Many	-0.050*** (0.005)	-0.035*** (0.005)	-0.106*** (0.026)
Treat Period x Few	0.488*** (0.008)	0.503*** (0.007)	0.490*** (0.007)
Treat Period x Many	0.555*** (0.009)	0.551*** (0.008)	0.552*** (0.011)
Few G1 children=1	0.007 (0.004)	0.079*** (0.005)	-0.156 (0.108)
Observations	942741	942741	942741
R squared	0.027	0.030	0.007
Endogeneity test			0.000
F-stat			287.462

Table A.9: The impact of the reform on G2 outcomes - Including mother's education - FE

	(1)	(2)	(3)	(4)	(5)
	Employment	Full time	Earnings	Num Children	Age at 1st birth
Treat group (Age 57.5-63)	-0.022*** (0.005)	-0.015** (0.006)	-0.169*** (0.019)	-0.032*** (0.006)	-0.053 (0.139)
Treat Period (2004-2007)	-0.058*** (0.005)	-0.030*** (0.005)	-0.288*** (0.020)	-0.068*** (0.007)	-0.232 (0.157)
Treat group × Treat Period	0.036*** (0.007)	0.041*** (0.007)	0.250*** (0.026)	-0.068*** (0.008)	0.237 (0.300)
Treat group × Treat Period × Educ =2	0.007 (0.008)	0.003 (0.008)	-0.028 (0.028)	-0.015 (0.010)	0.201 (0.329)
Treat group × Treat Period × Educ =3	-0.018*** (0.007)	-0.010 (0.007)	-0.101*** (0.026)	0.003 (0.009)	0.277 (0.304)
Treat group × Treat Period × Educ =4	-0.046*** (0.007)	-0.055*** (0.007)	-0.307*** (0.026)	0.119*** (0.009)	0.196 (0.303)
Treat group × Treat Period × Educ =5	-0.058*** (0.007)	-0.078*** (0.008)	-0.401*** (0.027)	0.219*** (0.011)	0.069 (0.307)
Treat group × Treat Period × Educ =6	-0.102*** (0.013)	-0.141*** (0.014)	-0.657*** (0.044)	0.287*** (0.024)	-0.277 (0.358)
Observations	1996307	1153598	1599135	1996307	165749
R squared	0.013	0.047	0.026	0.538	0.328

Table A.10: Selection of the G2 sample - when including G2 education

	(1)		(2)		(3)
	Missing education		No missing education		diff
	Mean	sd	Mean	sd	Difference
Employment	0.748	0.434	0.801	0.399	-0.053***
Full-time factor	0.606	0.279	0.632	0.292	-0.027***
Wage	19760.045	12913.831	22291.846	14513.716	-2531.802***
G2 Number of children	1.433	1.077	1.239	1.063	0.194***
G2 age at 1st birth	27.511	3.623	27.580	3.998	-0.070***
G2 age	30.714	4.198	29.915	4.321	0.799***
G2's age sq	960.987	256.932	913.588	257.671	47.399***
G2 Immigrant	0.096	0.295	0.145	0.352	-0.048***
G2 Partner	0.955	0.208	0.899	0.302	0.056***
G1 age	57.415	3.574	57.117	3.610	0.299***
G1 age sq	3309.279	407.345	3275.331	410.201	33.948***
G1 Immigrant	0.118	0.322	0.163	0.370	-0.046***
G1 Partner	0.936	0.246	0.916	0.277	0.019***
Active	0.693	0.461	0.694	0.461	-0.001
Treat Group	0.565	0.496	0.531	0.499	0.034***
Treat Period	0.341	0.474	0.364	0.481	-0.022***
Observations	1162900		1996307		3159207

Table A.11: The impact of the reform on G2 outcomes - Fathers - Fixed effect models

	(1)	(2)	(3)
	Employment	Full time	Earnings
Treat group (Age 57.5-63)	-0.001*	-0.005***	-0.016***
	(0.001)	(0.001)	(0.001)
Treat Period (2004-2010)	-0.006***	-0.010***	-0.069***
	(0.001)	(0.001)	(0.002)
Treat group (Age 57.5-63) × Treat Period (2004-2010)	0.005***	0.006***	0.041***
	(0.001)	(0.001)	(0.002)
Observations	2798559	1732334	2475598
R squared	0.010	0.008	0.097

Table A.12: The impact of the reform on G2 outcomes - Fathers - Fixed effect models - Married or Cohabiting

	(1)	(2)	(3)
	Employment	Full time	Earnings
Treat group (Age 57.5-63)	0.001 (0.001)	-0.001 (0.001)	-0.000 (0.002)
Treat Period (2004-2010)	-0.001 (0.001)	-0.002** (0.001)	-0.036*** (0.002)
Treat Group x Treat Period	0.004*** (0.001)	0.002* (0.001)	0.020*** (0.003)
Observations	1328466	772307	1176086
R squared	0.010	0.006	0.049